CONTRACT DOCUMENTS
FOR

# WWTP Screw Press Procurement Rebid
# SS-2017-006

CITY OF MOUNT VERNON, WASHINGTON

JILL BOUDREAU, MAYOR

**CITY COUNCIL**

BOB FIEDLER
KEN QUAM
MARK HULST
DALE RAGAN
JOE LINDQUIST
MARY HUDSON
GARY MOLENAAR

For information on this project, contact:
Public Works Department (360) 336-6204
Gary Duranceau

# INCLUDED DOCUMENTS

**Bidding:**

*Request for Bid Proposals*

*Supplemental Instructions to Bidders*

*Proposal Form*

*Bid Bond Form*

*Bidders Checklist*

**Award:**

*Contract (to be executed by successful Bidder)*

*Retainage Options Form*

*Performance Bond Form*

*Irrevocable Letter of Credit*

**Plans, Maps, and Specifications:**

*Special Provisions*

*Division 10 Technical Special Provision*

*Wage Information*

**Appendices:**

*Appendix 1 – Dewatering Report*

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# CITY OF MOUNT VERNON
# REQUEST FOR BID PROPOSALS

The City of Mount Vernon is accepting sealed bid proposals for the following project.

| | |
|---|---|
| Project Name: | Wastewater Treatment Plant Screw Press Procurement |
| Project Number: | SS-2017-006 |
| Project Manager: | Gary Duranceau |
| Deadline for Submitting Bids: | 10:00 AM, Monday, June 5, 2017 |
| Submit Bids To: | Finance Director<br>PO Box 809<br>910 Cleveland Ave<br>Mount Vernon, WA 98283 |
| Bid Opening: | Bids will be opened at the above location and time. |
| Estimated Project Cost: | $300,000 - $350,000 |
| Project Duration: | The Screw Press shall be delivered by December 31, 2017. |

**Project Description:**
One new wastewater dewatering screw press and specified services for the Wastewater Treatment Plant for the City of Mount Vernon, Washington. Specified services will include delivery, installation observation, startup, testing, training and a ten (10) year maintenance contract. Installation of the successful bidder's dewatering screw press will be by the City's installation contractor.

**Bid Proposals:**
All bidding and construction shall be done in accordance with the Contract Documents including the 2014 Standard Specifications for Road, Bridge, Municipal Construction, as amended by the Special Provisions.

Must be prepared and submitted in accordance with Section 1-02 of the Project Specifications, and must be accompanied by a bid deposit or bid bond in the minimum amount of 5% of the proposal total.

Bid packets (including the project plans, specifications, proposal forms, and other project documents) may be obtained electronically at no cost from www.mountvernonwa.gov/bids.aspx. Hard copies may be purchased directly from the Mount Vernon Public Works Department at 1024 Cleveland Avenue, Mount Vernon, WA

for $50.00 Bid packets may be mailed upon request for an additional fee of $10.00. All fees are non-refundable.

Addenda will be issued online, and will be emailed or mailed to bidders who are on the plan holders list. Bidders who download the bid packets will not be automatically added to the plan holders list and are encouraged to email a request to be added.

The City of Mount Vernon reserves the right to reject any or all bid proposals, revise or cancel the work, complete the work by other means, or to postpone the bid award by up to thirty (30) days after bid opening.

Questions about this project may be directed as follows:
Email – mvengineering@mountvernonwa.gov
Phone – (360) 336-6204

CITY OF MOUNT VERNON
Doug Volesky, Finance Director
Published: Skagit Valley Herald & DJC: May 22, and May 29, 2017.

## SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

**PLEASE READ ALL INSTRUCTIONS CAREFULLY BEFORE PREPARING AND SUBMITTING YOUR BID.**

**1.** The City of Mount Vernon has furnished a **PROPOSAL FORM** in the bid package. This form must be completed in full and may not be otherwise altered or conditioned in any manner. The proposal form includes the following parts:

a. Bidder Declaration

b. Bidder Identification

c. Bidder Responsibility Information

d. Non-Collusion Declaration

e. Schedule of Bid Prices

f. Proposal Signature and Addenda Acknowledgement

**2.** All entries in the proposal forms, including signatures, must be **TYPEWRITTEN OR WRITTEN IN INK**.

**3.** The Bidder must submit a **UNIT PRICE FOR EVERY ITEM ON THE PROPOSAL FORM**. The unit prices must be written in figures with no more than two places to the right of the decimal point**.** In the event of an error, the unit price will take precedence over all other figures, and any corrections made will be based on the unit price.

**4.** **CORRECTIONS TO ENTRIES** must be made by striking through the entry in ink and making the correct entry in ink adjacent to the entry. A representative of the Bidder must initial the change in ink. Do not use “White Out” or similar product to make corrections.

**5.** Bid proposals must be **PROPERLY EXECUTED** with the signature of a person or persons legally authorized to bind the Bidder to a contract. The name of each person signing shall by typed or printed below the signature.

**6.** **BIDS SUBMITTED BY CORPORATIONS** must bear the seal of the corporation and give the state of incorporation. A bid submitted by an agent must have attached a current power of attorney certifying the agent’s authority to bind the Bidder. The name of each person signing must be typed or printed below the signature.

**7.** Bid proposals must not contain any **UNAUTHORIZED ADDITIONS, DELETIONS, OR CONDITIONS.**

**8.** The proposal forms must be completed in full. Any **MISSING VALUES OR OTHER MISSING INFORMATION** may cause the proposal to be deemed irregular.

**9.** A **BID DEPOSIT OR BID BOND** must be included with your bid. See Section 1-02.7.

**10.** Place the completed proposal forms and bid deposit or bid bond in a **SEALED OPAQUE ENVELOPE** marked:

Bid Proposal for PROJECT# SS-2017-006
WWTP Screw Press Procurement Rebid
(name of your company)
(address)
(phone number)

**MAIL THE ABOVE PACKAGE INSIDE A MAILING ENVELOPE OR DELIVER IT IN PERSON** to the following address **PRIOR TO THE BID OPENING DATE AND TIME** as stated in the Call for Bid Proposals:

City Finance Director
Mount Vernon City Hall
PO Box 809
910 Cleveland Avenue
Mount Vernon, Washington 98273

**11.** **CONSIDERATION OF BIDS** will begin when the bids are opened and read publicly at the place and time indicated in the "Request for Bid Proposals".

a. The apparent low bidder will typically be announced at the end of the bid opening.

b. A bid tabulation will be provided on the website (usually within 1 business day).

c. Prior to award, bids will be examined for eligibility based on bid responsiveness and bidder responsibility in accordance with the specifications and applicable laws.

d. The lowest remaining eligible bid will be awarded the contract within 30 days of bid opening in most cases. Bidder providing the lowest bid; provided the bid price does not exceed the funds available. Except that upon mutual consent of the lowest responsible Bidder and the City of Mount Vernon, the 30 calendar days may be extended. The next two lowest bids will be kept as eligible until the Contract is executed. Bidders whose bids are no longer eligible for consideration will be notified and their bid deposits released.

e. Once the contract has been executed, all bid deposits from the remaining unsuccessful bidders will be released.

# BID PROPOSAL FOR
# WWTP SCREW PRESS PROCUREMENT REBID
# PROJECT# SS-2017-006

TO: Mayor Boudreau and City Council Members
P.O. Box 809
Mount Vernon, WA 98273

**BIDDER**: _____

The undersigned declares that they have examined the Waste Water Treatment Plant project site and the conditions of work; and have carefully read and thoroughly understand the Contract Documents for the **"WWTP SCREW PRESS PROCUREMENT REBID",** governing the work embraced in this project and the method by which payment will be made for said work. The Undersigned hereby proposes to undertake and complete the work embraced in this project in accordance with said Contract Documents, and agrees to accept as payment for said work, the schedule of lump sum and/or unit prices as set forth in the "Bid" below.

**Bid Item No. 1: Screw Press.** This lump sum Bid Item includes all labor, equipment, materials and special services to furnish one screw press and appurtenances as specified in Section 46 76 27, and delivery of the equipment and appurtenances to the Mount Vernon Wastewater Treatment Plant, performing Special Services such as necessary startup, testing, training, and all associated state and local taxes, complete.

**Bid Item No. 2: Maintenance Contract.** This lump sum Bid items includes all labor, equipment, materials and special services to provide ongoing maintenance of the screw press as specified in Section 01 11 13 Article 1.2.A.2.

The undersigned acknowledge that payment will be based on the actual work performed and material used as measured or provided for in accordance with the said Contract Documents, and that no additional compensation will be allowed for any taxes not included in each lump sum.

| | |
|---|---|
| **Bid Item No. 1: Screw Press:** | _____ |
| **Bid Item No. 2: Maintenance Contract:** | _____ |
| **Sales Tax (8.7%):** | _____ |
| **Total Bid Items 1 and 2 and sales tax:** | _____ |

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## BIDDER IDENTIFICATION

The name of the Bidder submitting this proposal, the address, email, and phone number to which all communications concerned with this proposal shall be made, and the number which has been assigned indicating the Bidder is licensed to do business in the State of Washington are as follows:

Firm Name: _____

Contact Name: _____

Address: _____

_____

Telephone: _____ Contractor's Number: _____

The firm submitting this proposal is a: _____ Sole Proprietorship

_____ Partnership

_____ Corporation

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## PROPOSAL SIGNATURE AND ADDENDA ACKNOWLEDGEMENT

The Bidder is hereby advised that by signature of this proposal, he/she is deemed to have acknowledged all requirements and signed all certificates contained herein. The undersigned hereby agrees to pay labor not less than the prevailing rates of wages or less than the hourly minimum rate of wages as specified in the Specifications and Conditions, for this project. A proposal guaranty in an amount of five percent (5%) of the bid price, is attached hereto:

| | |
|---|---|
| ☐ CASH | IN THE AMOUNT OF _____ |
| ☐ CASHIER'S CHECK | _____ |
| ☐ CERTIFIED CHECK | Dollars ($_____) Payable to the city of Mount |
| ☐ PROPOSAL BOND | Vernon IN THE AMOUNT OF 5% OF THE BID. |

Receipt is hereby acknowledged that the following addenda have been received:

☐Addendum #1 ☐Addendum #2 ☐Addendum #3 ☐Addendum #4 ☐Addendum #5

**SIGNATURE OF AUTHORIZED OFFICIAL(S)**

*(PROPOSAL MUST BE SIGNED)*

_____
SIGNATURE:

_____
FIRM NAME:

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## 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

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## BIDDER RESPONSIBILITY INFORMATION FORM

The apparent two lowest Bidders must submit to the City within two business days of the bid opening day documentation sufficient in the sole judgment of the City demonstrating responsibility and meeting the criteria identified in Section 1-02.1. The Contracting Agency reserves the right to request such documentation from other Bidders as well, and to request further documentation as needed to assess bidder responsibility. Bidders are strongly encouraged, but not required, to submit the information requested in this form with their bids.

### GENERAL BIDDER RESPONSIBILTYINFORMATION

Name of Bidder : _____

Address: _____

_____

Phone Number: _____ Fax Number: _____

Type of work generally performed by manufacturer: _____

_____

Number of years the Bidder has been engaged in business under the present firm name indicated:

_____

Gross dollar amount of work presently under contract: _____

Gross dollar amount of contracts awarded but not started: _____

Name of the project manager you propose to employ on the WWTP Screw Press Procurement Rebid project and how long with your company:

_____

_____

Your bank or lending institution:

_____

_____

**RCW 39.04.350(1) INFORMATION**

RCW 39.04.350(1) provides:

(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 or 39.12.065(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.

Provide the following information with your bid proposal:

Washington State Department of Labor and Industries Workmen's Compensation

Account No.: _____

Washington State Department of Labor and Industries Contractor's Registration No:

Registration #: _____ Expiration Date: _____

Washington State Department of Employment Security Department No: _____

Washington State Excise Tax Registration No.: _____

## SUPPLEMENTAL BIDDER RESPONSIBILITY INFORMATION

### SIMILAR PROJECT INFORMATION

Provide the following information for at least ten (10) projects similar to the WWTP Screw Press Procurement Rebid in the past seven (7) years: similar projects may be those involving new equipment supplied for installation or supplied and installed in a municipal wastewater treatment plant. (May attach additional sheets as necessary to provide requested information.)

Project Name and Location: _____

Project Owner Name: _____

Year Completed: _____

Project Owner Contact Information including address and telephone number:

_____

_____

_____

Brief Description of the Work: _____

_____

Dollar amount of contract at award: _____

Dollar amount of contract at completion: _____

Project Name and Location: _____

Project Owner Name: _____

Year Completed: _____

Project Owner Contact Information including address and telephone number:

_____

_____

_____

Brief Description of the Work: _____

_____

Dollar amount of contract at award: _____

Dollar amount of contract at completion: _____

**COMPLETED PROJECT INFORMATION**

List all equipment supplied by the bidder within the last five (5) years with an initial contract price over $200,000:

| Project Name | Agency | Contact & Phone No. | Year Completed | Initial Amount |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**COMPLIANCE HISTORY INFORMATION**

Prevailing Wages: For projects the company worked on in the last five (5) years, provide the following information (attach additional pages if necessary) and describe any instances where your firm was required to pay either back wages or penalties for failure to comply with any state or federal prevailing wage laws. Include the nature of each violation, identifying the name of the project, the date of its completion, the public agency, the number of employees who were initially underpaid, and the amount of back wages and penalties your firm was required to pay):

Misc.: For projects the company worked on in the last five (5) years, provide the following:

Description of all litigation or formal claims in the past five (5) years presented by Bidder to owners or their engineers, including claims settled through negotiation, mediation or arbitration. Include the relevant contract issues, names of the involved parties, and the outcome (attach additional pages if necessary).

_____

_____

_____

_____

Description of all payments made by any surety company on Bidder's behalf as a result of any default or failure to satisfy any claims made against a performance or payment bond. Include the amount of each claim, name and telephone number of the claimant or bonding company, date of the claim, grounds for the claim, present status of the claim; and, if resolved, the date of resolution, method of resolution and the amount at which the claim was resolved (attach additional pages if necessary).

_____

_____

_____

_____

_____
Bidder

By: _____
Signature

_____
Title

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# BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____ as principal, and the _____ a corporation duly organized under the laws of the State of _____ and having its principal place of business at _____, in the State of Washington, as Surety, are held and firmly bound unto the City of Mount Vernon, a Municipal Corporation in the State of Washington, in the full and penal sum of five percent (5%) of the total bid amount appearing on the bid proposal of said principal for the work hereinafter described, for the payment of which, well and truly to be made, we bind our heirs, executors, administrators and assigns, and successors and assigns, jointly and severally, firmly by these presents.

The condition of this bond is such that, whereas, the principal herein is herewith submitting his or its bid proposal for **WWTP Screw Press Procurement Rebid, Project# SS-2017-006**, said bid proposal, by reference thereto, being hereby made a part hereof.

NOW, THEREFORE, if the bid proposal submitted by the PRINCIPAL is accepted, and the contract is awarded to said PRINCIPAL, and if said PRINCIPAL shall duly make and enter into and execute said contract and shall furnish the performance bond as required by the bidding and contract documents within a period of ten (10) days from and after said award, exclusive of the day of such award, then its obligation to pay the above-mentioned penal sum as liquidated damages shall be null and void, otherwise it shall remain and be in full force and effect.

Signed and Sealed this _____ day of _____, 2017.

Principal:

By: _____ (Seal)

Surety:

By: _____ (Seal)
Attorney-In-Fact

The Attorney-in-fact who executes this bond in behalf of the surety, must attach a copy of his power of attorney as evidence of his authority.

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# BIDDER'S CHECKLIST

This list is intended to assist the bidder in completing the Bidder's Proposal. The Bidder should carefully review the Proposal form, Contract Documents, and Supplemental Instructions to Bidders to ensure a responsive bid is submitted.

1. Has a bid bond or certified check been enclosed with your bid?
2. Is the amount of the bid guaranty at least five percent (5%) of the total amount of the bid?
3. Have all the pages of the Proposal Form been completed?
4. Have all items been bid on?
5. Have all the required signatures been added?
6. Have you read the Non-Collusion Declaration?
7. Have you shown your State Contractor's License Number on the proposal?
8. Have you acknowledged all addenda?

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# CONTRACT

## "WWTP SCREW PRESS PROCUREMENT REBID, SS-2017-006"

THIS AGREEMENT, made and entered into in quadruplicate this_____day of _____, 2017, by and between the City of Mount Vernon, Washington hereinafter called the City of Mount Vernon and _____, hereinafter called the Contractor.

WITNESSETH:

That in consideration of the terms and conditions contained herein and attached and made a part of this agreement, the parties hereto covenant and agree as follows:

1. The Contractor shall do all work and furnish all tools, equipment and materials, labor, services and other items incidental thereto necessary for the completion of the "**WWTP Screw Press Procurement Rebid**", as described in the attached proposal of work, including addenda, in accordance with the Contract Documents set forth in Article 7 below for the "**WWTP Screw Press Procurement Rebid**", which documents are incorporated by this reference, for the amount bid which are by this reference incorporated herein and made a part hereof, and shall perform any alterations in or additions to the work provided under this Contract and every part thereof.

2. If said work is not completed within the time specified, the Contractor agrees to pay to the City of Mount Vernon the sum as specified in Section 1.08.9 of the 2014 WSDOT/APWA Standard Specifications for each and every working day said work remains uncompleted and after expiration of the specified time, as liquidated damages. The Contractor shall provide and bear the expense of all equipment, work and labor of any sort whatsoever that may be required for the transfer of materials and for constructing and completing the work provided for in this Contract and every part thereof and shall guarantee said materials and work for a period of one year after completion of this Contract, except as may be modified by the plans, specifications, and/or Contract Documents.

3. The City of Mount Vernon agrees to pay the Contractor for the actual quantities in the completed work according to the schedule of unit prices set forth in the bid proposal hereto attached and made a part of this Contract.

4. The Contractor for himself, and for his heirs, executors, administrators, successors and assigns, does hereby agree to the full performance of all the covenants herein contained upon the part of the Contractor.

5. It is further provided that no liability shall attach to the City of Mount Vernon by reason of entering into this Contract, except as expressly provided herein.

6. The Contractor shall defend indemnify and hold the City, its officers, officials, employees and volunteers harmless from any and all claims, injuries, damages, loss or suits, including attorney fees, arising out of or in connection with the performance of this Contract, except for injuries and damages caused by the sole negligence of the City.

Should a court of competent jurisdiction determine that this Contract is subject to RCW 4.24.115, then, in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the Contractor and the City, its officers, officials, employees 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. This waiver has been mutually negotiated by the parties. The provisions of this section shall survive the expiration of termination of this Contract.

7. The Contract Documents, which comprise the entire agreement between the City and the Contractor concerning the **WWTP Screw Press Procurement Rebid** consist of the following:

- This Agreement including the Irrevocable Letter of Credit attached thereto;
- The Request for Proposals;
- The Supplemental Instructions to Bidders;
- The Contractor's Bid Proposal including the bid, bid schedule(s), if any, information required of bidder, and all required certificates and affidavits;
- The performance bond and the labor and material bond. The performance and payment bond surety must be a corporate surety, registered with the Washington State Insurance Commissioner's office, with an AM Best Company Rating of A- (Excellent) or better ;
- Irrevocable Letter Of Credit
- The Special Provisions including Division 10 Technical Special Provision and all documents incorporated by reference therein;
- Building Specifications;
- The 2014 WSDOT Standard Specification for Road, Bridge, and Municipal Construction as amended by the Special Provisions;
- The Plans (or drawings);
- All Addenda issued by the City;
- Change Orders and written Change directives issued after the effective date of this Agreement;
- WSDOT Standard Plans; and
- All documents included in or incorporated by reference in the project manual for the **WWTP Screw Press Procurement Rebid**.

**Insurance**

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

**No Limitation**

Insurance is not a limit of your liability. Contractor's maintenance of insurance, its scope of coverage and limits as required herein shall not be construed to limit the liability of the Contractor's liability 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, 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 11 85 or a substitute endorsement providing equivalent coverage.

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

4. Builder's Risk insurance covering interests of the City, the Contractor, Subcontractors, and Sub-subcontractors in the work. Builder's Risk insurance shall be on an 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 Builder's 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 Builder's 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 $2,000,000 each occurrence, $5,000,000 general aggregate and $5,000,000 products-completed operations aggregate limit.

3. Builder's 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 Builder's Risk insurance:

1. The Contractor's insurance coverage shall be primary insurance with respect to the City. Any insurance, self-insurance, or insurance pool coverage maintained by the City shall be in excess of the Contractor's insurance and shall not contribute with it.

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

3. The City of Mount Vernon, it's Employees, and HDR, shall be added as Additional Insured on the Certificate, and a separate endorsement shall be issued by the Company adding The City of Mount Vernon, it's Employees, and HDR. as Additional Insured to the General Liability and Automobile Policy and the Umbrellas Excess Policy, where required to meet minimum limits outlined above.

**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 extent covered by Builder's 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.

**H. Subcontractors**

Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the same insurance requirements as stated herein for the Contractor.

**I. Notice of Cancellation**

The Contractor shall provide the City and all Additional Insureds for this work with 30 days advance written notice of any policy cancellation date.

**J. Failure to Maintain Insurance**

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

**K. Venue**

The venue of all causes of action arising from the advertisement, award, execution, and performance of the Contract shall be in the Skagit Superior Court.

**L. Public Records Requests**

Contractor acknowledges that the City is subject to laws regarding the disclosure of public records as defined under the chapter 42.56 RCW- the Washington State Public Records Act. Documents and other records when prepared, owned, used, or retained by the City including records created by the Contractor in furtherance of the Project may be public records regardless of who possess such records or where they are located. Contractor agrees to maintain all records prepared, owned, used, by the City or created by the Contractor in the furtherance of the Project in accordance with retention schedules set forth under state law and upon request shall promptly release such records to the City. Contractor shall be solely responsible for all attorney fees and costs in any action and shall, indemnify, save and hold harmless the City from any costs, attorney's fees or penalty assessments under Chapter 42.56 RCW for withholding, destroying, altering, or delaying public disclosure of records created or otherwise possessed by the Contractor in furtherance of the Project.

If it is necessary for the Contractor to provide the City with proprietary information, the Contractor shall clearly mark the information on each page of the document(s) as "Proprietary

and Confidential". In the event the City receives a public record request for information and the Contractor has marked the requested document as "Proprietary and Confidential", Contractor may request withholding disclosure of such records by seeking an injunction prohibiting the City from disclosing the record under the Washington State Public Records Act or other judicial relief as allowed under law.

**M. Irrevocable Letter of Credit**

At time of contract execution Contractor will provide an Irrevocable Letter of Credit in the form included in the Contract Documents by an issuing institution acceptable to the City of Mount Vernon.
The Irrevocable Letter of Credit may not be canceled or amended without the City of Mount Vernon's prior written approval.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be executed the day and year first above written.

CONTRACTOR:

_____
Authorized Signature

_____
Printed

Tax ID No. _____

CITY OF MOUNT VERNON

_____
Jill Boudreau, Mayor

Attest:

_____
Doug Volesky, Finance Director

Approved as to Form:

_____
Kevin Rogerson, City Attorney

# RETAINAGE INVESTMENT OPTION

**CONTRACTOR:** _____

**PROJECT NAME:** **WWTP Screw Press Procurement Rebid, Project Ss-2017-006**

**DATE:** _____

Pursuant to R.C.W. 60.28.010, as amended, you may choose how your retainage under this contract will be held and invested. Please complete and sign this form indicating your preference. If you fail to do so, the Owner will hold your retainage as described in "Current Expense" option 1 below.

____1. Current Expense: The Owner will retain your money in its Current Expense Fund Account until thirty days following final acceptance of the improvement or work as completed. You will not receive interest earned on this money.

____2. Interest Bearing Account: The Owner will deposit retainage checks in an interest-bearing account in a bank, mutual savings bank, or savings and loan association, not subject to withdrawal until after the final acceptance of the improvement or work as completed or until agreed to by both parties. Interest on the account will be paid to you.

____3. Escrow/Investments: The Owner will place the retainage checks in escrow with a bank or trust company until thirty days following the final acceptance of the improvement or work as completed. When the moneys reserved are to be placed in escrow, the Owner will issue a check representing the sum of the moneys reserve payable to the bank or trust company and you jointly. This check will be converted into bonds and securities chosen by you and approved by the Owner and these bonds and securities will be held in escrow. Interest on these bonds and securities will be paid to you as interest accrues.

____4. Surety Bond: The Contractor will obtain a bond from a Surety Company, licensed to conduct business in the State of Washington for the estimated amount of Retainage based on 5% of the bid price. The Retainage Bond form will be provided by the City.

_____ _____

Contractor's signature Date

_____

Title

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**PERFORMANCE BOND**
**TO THE**
**CITY OF MOUNT VERNON, WASHINGTON**

KNOW ALL MEN BY THESE PRESENTS, that whereas the City of Mount Vernon, Washington has awarded to _____, hereinafter designated as the "Principal" a contract for the **WWTP Screw Press Procurement Rebid**, as hereto attached and made a part hereof and whereas, said Principal is required under the terms of said contract to furnish a bond for the faithful performance of said contract.

NOW THEREFORE, we the Principal and _____ *(surety)* a corporation, organized and existing under and by the virtue of the laws of the State of Washington, duly authorized to do business in the State of Washington, as surety are held and firmly bound unto the City of Mount Vernon, Washington in the sum of:

_____

_____ *($ _____ ) Total Contract Amount.*

Lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by those presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bonded Principal, his or its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the said Contract, and shall faithfully perform all the provisions of such Contract and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, at the time and in the manner therein specified or within such extensions of time as may be granted under said contract, and shall pay all laborer, mechanics, subcontractors, and material men and all persons who shall supply such person or persons, or subcontractors, with provisions and supplies for the carrying on of such work, on his or their part, the claims of any persons or persons arising under the contract to the extent such claims are provided for in RCW 39.08.010; the State of Washington with respect to taxes imposed pursuant to Titles 50,51, and 82 RCW which may be due; and shall indemnify and save harmless the City of Mount Vernon, Washington, their officers and agents from any claim for such payment and from any damage or expense by reason of failure of performance as specified in said contract; and shall further save harmless and indemnify said City of Mount Vernon, Washington, from any defect or defects in any of the workmanship entering into any part of the work or designated equipment covered by said contract, which shall develop or be discovered within one (1) year after the final acceptance of such work, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect; provided that the liability hereunder for defects in materials and workmanship for a period of one year after the acceptance of the works shall not exceed the sum of:

_____

_____ *($ _____ ) Total Contract Amount.*

And the said surety, for value received, hereby further stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affects its obligation this bond, and it does hereby waive notice of any change, extension of time, alterations, or additions to the terms of the Contract or the work or to the specifications.

The Surety hereby agrees that the modifications and changes may be made in the terms and provisions of the aforesaid Contract without notice to Surety, and any such modifications or changes increasing the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this Performance Bond in a like amount, such increase, however, not to exceed twenty-five percent (25%) of the original amount of this bond without the consent of the Surety.

IN WITNESS WHEREOF, the said Principal and the said Surety have caused this bond and two counterparts thereof to be signed and sealed by their duly authorized officers this _____ day of _____, 20___.

| Principal | Surety |
|---|---|
| By: _____ | By: _____ |
| Signature | Signature |
| _____ | _____ |
| Printed | Printed |
| Title: _____ | |
| ATTEST *(if corporation)*: _____ (Corporate Seal) | Name and address of local office/agent of Surety Company is: |
| By: _____ | _____ |
| Title: _____ | _____ |

Approved as to form:

_____
City Attorney

# IRREVOCABLE LETTER OF CREDIT
# TO THE
# CITY OF MOUNT VERNON, WASHINGTON

For Maintenance Contract

(Nature of issuer)
(Issuer's street and address)
(Issuer's city and state)

(Date)

Beneficiary: City of Mount Vernon, Washington, a municipal corporation herein called BUYER.

(name of issuer) Irrevocable Letter of Credit No.

To: City of Mount Vernon, Washington

We authorize you to draw on us for account of _____(screw press supplier's name and address) up to an aggregate amount of $_____ U.S. Dollars (100% of the amount bid for Bid Item 2) available by your drafts on us at sight accompanied by the Documents specified below:

(a) Copy of letter advising _____ (centrifuge supplier) of default in its obligations under WASTWATER TREATMENT PLANT SCREW PRESS REBID and providing 30 days to cure such default; and

(b) Beneficiary's signed and acknowledged statement that _____ (centrifuge supplier) has failed to cure the default and the time for cure has expired.

All drafts drawn under this Credit must be marked: "Drawn under _____ (name of issuer) Letter of Credit No. _____ dated _____ (date of the letter of credit).

We hereby undertake to honor all drafts drawn under and in compliance with the terms of this Credit, when accompanied by Documents as specified, if presented to us on or before _____ (expiration date).

(name of issuer)

By:

(title)

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# SPECIAL PROVISIONS

The 2014 "Standard Specifications for Road, Bridge, and Municipal Construction" as published by the Washington State Department of Transportation, hereinafter referred to as the "Standard Specifications", are hereby adopted for this Contract, as amended by these Special Provisions. Any references therein to the "Secretary" or to the "Engineer" shall be interpreted to mean the City of Mount Vernon Public Works Director or his designated representative. All references in the Standard Specifications, and Special Provisions, to the terms "State," "Department of Transportation," "Washington State Transportation Commission," "Commission," "Secretary of Transportation," "Secretary," "Headquarters," and "State Treasurer" shall be revised to read "Contracting Agency." The Contracting Agency is the City of Mount Vernon.

The work to be performed under this contract shall be done in accordance with these Special Provisions, the 2014 Standard Specifications for Road, Bridge, and Municipal Construction, including any amendments thereto.

# INTRODUCTION TO THE SPECIAL PROVISIONS

*(August 14, 2013 APWA GSP)*

The work on this project shall be accomplished in accordance with the *Standard Specifications for Road, Bridge and Municipal Construction*, 2014 edition, as issued by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA), Washington State Chapter (hereafter "Standard Specifications"). The Standard Specifications, as modified or supplemented by the Amendments to the Standard Specifications and these Special Provisions, all of which are made a part of the Contract Documents, shall govern all of the Work.

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

The project-specific Special Provisions are not labeled as such. The GSPs are labeled under the headers of each GSP, with the effective date of the GSP and its source. For example:

*(March 8, 2013 APWA GSP)*
*(April 1, 2013 WSDOT GSP)*
*(May 1, 2013 MV GSP)*

Also incorporated into the Contract Documents by reference are:

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

Contractor shall obtain copies of these publications, at Contractor's own expense.

**DIVISION 1**
**GENERAL REQUIREMENTS**

## 1-01 Definitions and Terms

### 1-01.3 Definitions
(*March 9, 2017 MV GSP*)

Supplement the heading **Contracting Agency** with the following:

The Contracting Agency is the City of Mount Vernon.

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

**Dates**

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

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

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

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

*Agreed Delivery Date*
The date all equipment and physical components covered in these Contract Documents are delivered to the Wastewater Treatment Plant. The Agreed Delivery Date shall be December 31, 2017.

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

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

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

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

Supplement this Section with the following:

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

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

All references to “final contract voucher certification” shall be interpreted to mean the final payment form established by the Contracting Agency.

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

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

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

**City**
The Contracting Agency and the City of Mount Vernon

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

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

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

**HDR and HDR Engineering**
HDR is the project designer. HDR is a representative of the City of Mount Vernon and may be requested by the City to assist in administration of the Contract by reviewing contract information, reviewing submittals, and observing the Work to determine, in general, if the Work is proceeding in accordance with the Contract Documents. HDR will not have any authority of the Project Engineer or the Contracting Agency. HDR will not supervise, direct, control, or have authority over or be responsible for Contractor’s means, methods, techniques, sequences or procedures of construction or the safety or the safety precautions

of the Contractor. HDR will not be responsible for the acts or omissions of the Contractor or of any Subcontractor, supplier, or of any other individual or entity performing any of the Work.

**Owner**
The Contracting Agency and the City of Mount Vernon

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

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

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

## 1-02 BID PROCEDURES AND CONDITIONS

(*March 9, 2017 MV GSP*)

### 1-02.1 Prequalification of Bidders

Delete this Section and replace it with the following:

#### 1-02.1 Qualifications of Bidder

Bidders must meet at least the minimum qualifications of RCW 39.04.350(1) to be considered a responsible bidder and qualified to be awarded a public works project.

RCW 39.04.350(1) Responsibility Criteria:

1. At the time of Bid submittal, a Certificate of Registration in compliance with chapter 18.27 RCW;

2. A current Washington Unified Business Identifier (UBI) number;

3. If applicable, Industrial Insurance (workers' compensation) coverage for the Bidder's employees working in Washington, as required in Title 51 RCW; a Washington Employment Security Department number, as required in Title 50 RCW; a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW; and/or an electrical contractor license, if required by Chapter 19.28 RCW; and

4. If bidding on a public works project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found to be 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.

5. Bidder must not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065 (3).

Additionally, in accordance with RCW 39.06.020, the Bidder shall verify responsibility criteria for each first tier subcontractor, and a subcontractor of any tier that hires other Subcontractors shall verify responsibility criteria for each of its subcontractors. Verification shall include that each subcontractor, at the time of subcontract execution, meets the responsibility criteria listed in items 1. through 5. above, and possess an Electrical Contractor license, if required by Chapter 19.28 RCW, or an Elevator Contractor license, if required by Chapter 70.87 RCW. This verification requirement, as well as the responsibility criteria, shall be included in every subcontract of every tier.

RCW 39.04.350(2) Supplemental Bidder Responsibility Criteria:

In addition to the responsibility criteria above, the Bidder must also meet the following supplemental bidder responsibility criteria to be submitted after bidding by the apparent low and second low responsive bidders within two business days of the bid opening, and by other bidders upon request:

A. Relevant Experience:

   1. Demonstrate successful past experience and competence in managing and manufacturing no less than ten (10) similar public works projects in the last seven (7) years. Similar projects may be those involving new equipment supplied for installation or supplied and installed in a municipal wastewater treatment plant. For each similar project submit in a well-organized tabular format the name, address and telephone number of the owner of the project, the name and location of project, a brief description of the work, the initial bid amount, the final contract amount, the initial contract time and final completion time. NOTE: the Contracting Agency may take into account the experience of the Bidder's Project Manager, Superintendents, and Labor Foremen when evaluating whether the Contractor meets the successful past experience requirement in this section.

   2. Provide a list of all equipment supplied by the bidder in the last ten (10) years with an initial contract price of $200,000 or more. Include the name of the project and owner, the initial contract price, and the telephone number, address and phone number owner.

B. Compliance History: For projects the company worked on in the last five (5) years, provide the following:

   1. Description of any instances where your firm was required to pay either back wages or penalties for failure to comply with any state or federal prevailing wage laws. Include the nature of each violation, identifying the name of the project, the date of its completion, the public agency, the number of employees who were initially underpaid, and the amount of back wages and penalties your firm was required to pay.

C. Legal Matters: For projects the company worked on in the last five (5) years, provide the following:

1. Description of all litigation or formal claims presented by Bidder to owners or their engineers, including claims settled through negotiation, mediation or arbitration. Include the relevant contract issues, names of the involved parties, and the outcome.

2. Description of all payments made by any surety company on Bidder's behalf as a result of default or failure to satisfy any claims made against a performance or payment bond on Bidder's behalf in connection with a construction project. Include the amount of each claim, name and telephone number of the claimant or bonding company, date of the claim, grounds for the claim, present status of the claim; and, if resolved, the date of resolution, method of resolution and the amount at which the claim was resolved.

NOTE: A Bidder may request that the Supplemental Bidder Responsibility criteria be modified. Such request shall be submitted in writing to the City no later than 5:00 PM, at least five (5) business days prior to the Bid Opening Date. The request shall be clearly marked "REQUEST TO MODIFY SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA – WWTP SCREW PRESS PROCUREMENT REBID, SS-2017-006" and shall explain in detail the reasons the Bidder believes the criteria should be modified. If the City determines a modification is necessary, an addendum to the bidding documents will be issued.

EVALUATION OF BIDDER RESPONSIBILITY:

A Contract shall only be awarded to a Bidder that demonstrates to the City's satisfaction that the Bidder is qualified to perform the Work and is, therefore, a responsible bidder. To be determined responsible, the Bidder must, in addition to satisfying the bidder responsibility criteria listed in section 1, ELIGIBILITY TO BID above:

a) Have adequate financial resources to perform the contract, or the ability to obtain them;
b) Have a satisfactory performance record;
c) Have a satisfactory record of integrity and business ethics;
d) Have the necessary production, construction, and technical equipment and facilities or the ability to obtain them; and
e) Be otherwise qualified and eligible to receive an award under applicable laws and regulations.

If the Bidder fails to supply information requested concerning responsibility within the time and the manner specified, the City may base its determination of responsibility upon any available information related to the responsibility criteria or may find the Bidder is not responsible.

The City reserves the right to inspect records, reports and other information which may be maintained by or for the Bidder to the extent necessary, as determined by the City to verify, clarify or otherwise consider the information provided by the Bidder.

DETERMINATION OF NON-RESPONSIBILITY:

If the City determines a Bidder to be not responsible, the City will provide, in writing, the reasons for the determination. The Bidder may appeal the determination in accordance with

the time period and procedures in Section 1-03.7 by presenting additional information. The City shall consider the additional information before issuing its final determination. If the City Public Work's Director's final determination affirms that the Bidder is not responsible, the City shall not execute a contract with any other bidder until two (2) business days after the Bidder determined to be not responsible has received the final determination.

**1-02.2 Plans and Specifications**
*(June 27, 2011 APWA GSP)*

Delete this section and replace it with the following:

Information as to where Bid Documents can be obtained or reviewed can be found in the Call for Bids (Advertisement for Bids) for the work.

After award of the contract, plans and specifications will be issued to the Contractor at no cost as detailed below:

| To Prime Contractor | No. of Sets | Basis of Distribution |
|---|---|---|
| Contract Provisions | 3 | Furnished automatically upon award. |

Additional plans and Contract Provisions may be obtained by the Contractor from the source stated in the Call for Bids, at the Contractor's own expense.

**1-02.4 Examination of Plans, Specifications, and Site of Work**

**1-02.4(1) General**

(*March 9, 2017 MV GSP*)
This section is supplemented as follows:

If the Bidder finds any discrepancy in, or omission from the specifications or plans, or if there is any doubt as to their meaning, the Bidder shall promptly notify Gary Duranceau email garyd@mountvernonwa.gov.

Questions received less than two (2) working days prior to the date of bid opening may not be answered.

Any interpretation or correction of the bid documents will be made only by addendum, and a copy of such addendum will be mailed or delivered to each person receiving a set of such bid documents. The Contracting Agency will not be responsible for any other explanations or interpretations of the bid documents. No oral interpretations by the Contracting Agency of any provision in the bid documents will be considered binding.

Any addenda issued during the time of bidding will be numbered consecutively and will be incorporated into these contract documents. The Bidder shall be responsible to ascertain, prior to submittal of a bid proposal that all addenda issued have been received, and are acknowledged on the "Bid Proposal Signature and Addendum Acknowledgment" form.

Addendums will only be issued to those contractors appearing on the Plan Holders List at Mount Vernon Public Works Department. It will be the responsibility of the contractor to ensure their name appears on the Plan Holders List. The list is posted on the City's Website at www.mountvernonwa.gov.

**1-02.5 Proposal Forms**
*(June 27, 2011 APWA GSP)*

Delete this section and replace it with the following:

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

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

**1-02.6 Preparation of Proposal**
*(June 27, 2011 APWA GSP)*

Supplement the second paragraph with the following:

4. If a minimum bid amount has been established for any item, the unit or lump sum price must equal or exceed the minimum amount stated.
5. Any correction to a bid made by interlineation, alteration, or erasure, shall be initialed by the signer of the bid.

Delete the last paragraph, and replace it with the following:

The Bidder shall make no stipulation on the Bid Form, nor qualify the bid in any manner.

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

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

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

**1-02.7 Bid Deposit**
*(March 8, 2013 APWA GSP)*

Supplement this section with the following:

Bid bonds shall contain the following:

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

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

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

(*March 9, 2017 MV GSP*)

All bid bonds shall be made payable to the City of Mount Vernon.

**1-02.9 Delivery of Proposal**
*(March 9, 2017 MV GSP)*

Delete this section and replace it with the following:

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

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

**1-02.10 Withdrawing, Revising, or Supplementing Proposal**
*(July 23, 2015 APWA GSP)*

Delete this section in its entirety, and replace it with the following:

After submitting a physical Bid Proposal to the Contracting Agency, the Bidder may withdraw, revise, or supplement it if:

1. The Bidder submits a written request signed by an authorized person and physically delivers it to the place designated for receipt of Bid Proposals, and
2. The Contracting Agency receives the request before the time set for receipt of Bid Proposals, and
3. The revised or supplemented Bid Proposal (if any) is received by the Contracting Agency before the time set for receipt of Bid Proposals.

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

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

**1-02.12 Public Opening of Proposals**
*(May 4, 2012 APWA GSP)*

Delete this section and replace it with the following:

Proposals will be opened and publicly read at the time indicated in the Call for Bids, <u>after</u> the deadline(s) for submitting all elements of the Bid Proposal including DBE Written Confirmation Documents and/or Good Faith Effort Documentation, unless the Bid opening has been delayed or canceled. Bidders, their authorized agents, and other interested parties are invited to be present.

(*March 9, 2017 MV GSP*)

The completed Bid Proposal and any other documents required in accordance with the Special Provisions, shall be received at the following location:

City Financial Director
Mount Vernon City Hall
910 Cleveland Avenue
Mount Vernon, WA 98273

All bid envelopes must be in an opaque envelope and plainly marked on the outside:

Proposal for Contract
(Name of Bidder)
WWTP Screw Press Procurement Rebid, SS-2017-006
City of Mount Vernon
Mount Vernon, WA 98273

Bid proposals shall be deposited prior to the date and time for receipt of bid proposals as indicated in the "Invitation to Bid", or such revised date as may be specified by an addendum. No oral, telephonic, telegraphic, or electronic bids or modifications will be considered.

## 1-02.13 Irregular Proposals

*(March 13, 2012 APWA GSP)*

Revise item 1 to read:

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

## 1-02.14 Disqualification of Bidders

*(March 8, 2013 APWA GSP, Option A)*

Delete this Section and replace it with the following:

A Bidder will be deemed not responsible if the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1), as amended.

As evidence that the Bidder meets the mandatory bidder responsibility criteria, the apparent two lowest Bidders must submit to the Contracting Agency within 24 hours of the bid submittal deadline, documentation (sufficient in the sole judgment of the Contracting Agency) demonstrating compliance with all responsibility criteria. The Contracting Agency

reserves the right to request such documentation from other Bidders as well, and to request further documentation as needed to assess bidder responsibility. The Contracting Agency also reserves the right to obtain information from third parties concerning a Bidder's compliance with the mandatory bidder responsibility criteria.

If the Contracting Agency determines the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1) and is therefore not a responsible Bidder, the Contracting Agency shall notify the Bidder in writing, with the reasons for its determination. If the Bidder disagrees with this determination, it may appeal the determination within two (2) business days of the Contracting Agency's determination by presenting its appeal and any additional information to the Contracting Agency. The Contracting Agency will consider the appeal and any additional information before issuing its final determination. If the final determination affirms that the Bidder is not responsible, the Contracting Agency will not execute a contract with any other Bidder until at least two business days after the Bidder determined to be not responsible has received the Contracting Agency's final determination.

### 1-02.15 Pre Award Information

*(August 14, 2013 APWA GSP)*

Revise this section to read:

Before awarding any contract, the Contracting Agency may require one or more of these items or actions of the apparent lowest responsible bidder:

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

## 1-03 Award and Execution of Contract

### 1-03.2 Award of Contract

(*March 9, 2017 MV GSP*)

Replace the first sentence in this section with the following:

Contract Award or Bid rejection will occur within 30 calendar days after Bid opening.

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

Revise this section to read:

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

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

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

If the bidder experiences circumstances beyond their control that prevents return of the contract documents within the calendar days after the award date stated above, the Contracting Agency may grant up to a maximum of 10 additional calendar days for return of the documents, provided the Contracting Agency deems the circumstances warrant it.

### 1-03.4 Contract Bond
*(December 8, 2014 APWA GSP)*

Revise the first paragraph to read:

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

1. Be on Contracting Agency-furnished form(s);
2. Be signed by an approved surety (or sureties) that:
   a. Is registered with the Washington State Insurance Commissioner, and
   b. Appears on the current Authorized Insurance List in the State of Washington published by the Office of the Insurance Commissioner,
3. Guarantee that the Contractor will perform and comply with all obligations, duties, and conditions under the Contract, including but not limited to the duty and obligation to indemnify, defend, and protect the Contracting Agency against all losses and claims related directly or indirectly from any failure:
   a. Of the Contractor (or any of the employees, subcontractors, or lower tier subcontractors of the Contractor) to faithfully perform and comply with all contract obligations, conditions, and duties, or

b. Of the Contractor (or the subcontractors or lower tier subcontractors of the Contractor) to pay all laborers, mechanics, subcontractors, lower tier subcontractors, material person, or any other person who provides supplies or provisions for carrying out the work;

4. Be conditioned upon the payment of taxes, increases, and penalties incurred on the project under titles 50, 51, and 82 RCW; and
5. Be accompanied by a power of attorney for the Surety's officer empowered to sign the bond; and
6. Be signed by an officer of the Contractor empowered to sign official statements (sole proprietor or partner). If the Contractor is a corporation, the bond(s) must be signed by the president or vice president, unless accompanied by written proof of the authority of the individual signing the bond(s) to bind the corporation (i.e., corporate resolution, power of attorney, or a letter to such effect signed by the president or vice president).

**1-03.7 Judicial Review**
(*March 9, 2017 MV GSP*)

Amend and Supplement WSDOT Section 1-03.7 so that it provides:

**1-03.7 Judicial Review**
Any decision made by the City regarding the Award and execution of the Contract or Bid rejection shall be conclusive subject to the scope of judicial review permitted under Washington law. All requests for judicial review shall be timely filed in the Superior Court of Skagit County, Washington.

Add the following to 2014 WSDOT Standard Specification Section 1-03.7 Judicial Review

ADMINISTRATIVE PROTEST PROCEDURES

Bidder agrees to comply with the protest procedures herein as a prerequisite to seeking judicial review of any decision by the City regarding the Award and execution of the Contract or Bid rejection.

Any protest concerning the Award and execution of the Contract or Bid rejection including without limitation:

1. Notice of Award;
2. Notice that a Bid or Proposal is irregular or non-responsive;
3. Notice that a Bidder is not responsible; or
4. Notice of Bid rejection

shall be submitted in writing by 5:00 PM on the third business day after the notification date. The notification date is defined as the date on which the City gave notification.

All such protests shall be in writing and submitted by hand, courier, faxsimile, or US mail. The protestor accepts all risks of the delivery method it chooses. The City is not responsible to assure the protest is received by the City within the protest deadlines. If the City does not receive the protest in a timely manner, the protest may be refused. Submit the protest to:

Public Works Director
City of Mount Vernon
1024 Cleveland Avenue
P. O. Box 809
Mount Vernon, WA 98273-0809
FAX: (360) 336-6299

To be considered, the protest must meet the following requirements:

1. The protestor must have submitted a Bid;
2. The protest must not be on a matter which should have been known to the Bidder before the bid deadline, including matters addressed under Section 1-02.4;
3. The protest must allege:
    a. A matter of bias, discrimination, or conflict of interest;
    b. Errors in determination of responsiveness or responsibility; and/or
    c. Non-compliance with the bid evaluation procedures described in the Contract Documents; and
4. The protest must be in writing, be submitted within the required deadline, state clearly that the Bidder is submitting a formal protest and include the following:
    a. The Bidder's company name, mailing address, phone number, and name of company individual responsible for submission of the protest;
    b. The project name;
    c. The specific action or decision protested;
    d. Indicate the basis and support for the protest, including specific facts and all documentation to support the protest;
    e. Indicate what relief or corrective action the Bidder believes the City should make;
    f. Demonstrate that the Bidder made every reasonable effort within the bidding process to resolve the issue, including asking questions, attending the pre-bid conference, seeking clarification, requesting addenda, and otherwise alerting the City to any perceived problems;
    g. Be signed by an authorized agent of the company;
    h. Where a bidder is protesting the City's determination that the bidder is not responsible, the City of Mount Vernon Public Works will consider additional information presented by the bidder before issuing a final decision.

The City of Mount Vernon Public Works Director will review and decide all such protests. The City of Mount Vernon Public Works Director's decision on the protest is conclusive and exhausts all administrative remedies.

## 1-04 Scope of the Work

### 1-04.1 Intent of the Contract
*(March 13, 2012 APWA GSP)*

This section is supplemented with the following:

One new wastewater dewatering screw press and specified services for the Wastewater Treatment Plant for the City of Mount Vernon, Washington. Specified services will include delivery, installation observation, startup, testing, training and annual maintenance contract. Installation will be by the City's contractor.

### 1-04.1(2) Bid Items Not Included in the Proposal
*(March 13, 2012 APWA GSP)*

Delete this section and replace with the following:

The CONTRACTOR shall include all costs of doing the work within the bid item prices. If the Contract Plans, Contract Provisions, Addenda, or any other part of the Contract requires work that has no specific bid item in the Proposal Form, the entire cost of that work shall be considered incidental and included within other bid items in the proposal.

### 1-04.2 Coordination of Contract Documents, Plans, Special Provisions, Specifications, and Addenda
*(March 9, 2017 MV GSP)*

Revise the second paragraph to read:
Any conflict or inconsistency in the parts of the contract shall be resolved by following this order of precedence (e.g., 1 presiding over 2, 2 over 3, 3 over 4, and so forth):

1. Addenda,
2. Proposal Form,
3. DIVISION 10 TECHNICAL SPECIAL PROVISION,
4. Special Provisions,
5. Amendments to the Standard Specifications,
6. Standard Specifications,
7. Contracting Agency's Standard Plans or Details (if any), and
8. WSDOT Standard Plans for Road, Bridge, and Municipal Construction.

## 1-05 Control of Work

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

Supplement this section with the following:

If the Contractor fails to remedy defective or unauthorized work within the time specified in a written notice from the Engineer, or fails to perform any part of the work required by the Contract Documents, the Engineer may correct and remedy such work as may be identified

in the written notice, with Contracting Agency forces or by such other means as the Contracting Agency may deem necessary.

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

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

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

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

## 1-05.11 Final Inspection

Delete this section and replace it with the following:

### 1-05.11 Final Inspections and Operational Testing

*(October 1, 2005 APWA GSP)*

**1-05.11(1) Substantial Completion Date**

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

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

Upon receipt of written notice concurring in or denying substantial completion, whichever is applicable, the Contractor shall pursue vigorously, diligently and without unauthorized interruption, the work necessary to reach Substantial and Physical Completion. The

Contractor shall provide the Engineer with a revised schedule indicating when the Contractor expects to reach substantial and physical completion of the work.

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

**1-05.11(2) Final Inspection and Physical Completion Date**
When the Contractor considers the work physically complete and ready for final inspection, the Contractor by written notice, shall request the Engineer to schedule a final inspection. The Engineer will set a date for final inspection. The Engineer and the Contractor will then make a final inspection and the Engineer will notify the Contractor in writing of all particulars in which the final inspection reveals the work incomplete or unacceptable. The Contractor shall immediately take such corrective measures as are necessary to remedy the listed deficiencies. Corrective work shall be pursued vigorously, diligently, and without interruption until physical completion of the listed deficiencies. This process will continue until the Engineer is satisfied the listed deficiencies have been corrected.

If action to correct the listed deficiencies is not initiated within 7 days after receipt of the written notice listing the deficiencies, the Engineer may, upon written notice to the Contractor, take whatever steps are necessary to correct those deficiencies pursuant to Section 1-05.7.
The Contractor will not be allowed an extension of contract time because of a delay in the performance of the work attributable to the exercise of the Engineer's right hereunder.

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

**1-05.11(3) Operational Testing**
It is the intent of the Contracting Agency to have at the Physical Completion Date a complete and operable system. Therefore when the work involves the installation of machinery or other mechanical equipment; street lighting, electrical distribution or signal systems; irrigation systems; buildings; or other similar work it may be desirable for the Engineer to have the Contractor operate and test the work for a period of time after final inspection but prior to the physical completion date. Whenever items of work are listed in the Contract Provisions for operational testing they shall be fully tested under operating conditions for the time period specified to ensure their acceptability prior to the Physical Completion Date. During and following the test period, the Contractor shall correct any items of workmanship, materials, or equipment which prove faulty, or that are not in first class operating condition. Equipment, electrical controls, meters, or other devices and equipment to be tested during this period shall be tested under the observation of the Engineer, so that the Engineer may determine their suitability for the purpose for which they were installed. The Physical Completion Date cannot be established until testing and corrections have been completed to the satisfaction of the Engineer.

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

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

### 1-05.13 Superintendents, Labor and Equipment of Contractor

*(August 14, 2013 APWA GSP)*

Delete the sixth and seventh paragraphs of this section.

Add the following new section:

### 1-05.16 Water and Power

*(October 1, 2005 APWA GSP)*

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

## 1-07 Legal Relations and Responsibilities to the Public

### 1-07.1 Laws to be Observed

*(October 1, 2005 APWA GSP)*

Supplement this section with the following:

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

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

The Contractor shall maintain at the project site office, or other well known place at the project site, all articles necessary for providing first aid to the injured. The Contractor shall establish, publish, and make known to all employees, procedures for ensuring immediate removal to a hospital, or doctor's care, persons, including employees, who may have been injured on the project site. Employees should not be permitted to work on the project site before the Contractor has established and made known procedures for removal of injured persons to a hospital or a doctor's care.

The Contractor shall have sole responsibility for the safety, efficiency, and adequacy of the Contractor's plant, appliances, and methods, and for any damage or injury resulting from their failure, or improper maintenance, use, or operation. The Contractor shall be solely and completely responsible for the conditions of the project site, including safety for all persons and property in the performance of the work. This requirement shall apply continuously, and not be limited to normal working hours. The required or implied duty of the Engineer to conduct construction review of the Contractor's performance does not, and shall not, be intended to include review and adequacy of the Contractor's safety measures in, on, or near the project site.

(*March 9, 2017 MV GSP*)

Sentence 2 of paragraph 1 shall be revised to read:

> The Contractor shall indemnify, defend, and save harmless the City of Mount Vernon (including the Mayor, Council Members, any agents, officers, and employees) against any claims that may arise because the Contractor (or any employee of the Contractor or Subcontractor or material person) violated a legal requirement.

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

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

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

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

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

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

**1-07.2(2) State Sales Tax — Rule 170**
WAC 458-20-170, and its related rules, apply to the constructing and repairing of new or existing buildings, or other structures, upon real property. This includes, but is not limited to, the construction of streets, roads, highways, etc., owned by the state of Washington; water mains and their appurtenances; sanitary sewers and sewage disposal systems unless such sewers and disposal systems are within, and a part of, a street or road drainage system;

telephone, telegraph, electrical power distribution lines, or other conduits or lines in or above streets or roads, unless such power lines become a part of a street or road lighting system; and installing or attaching of any article of tangible personal property in or to real property, whether or not such personal property becomes a part of the realty by virtue of installation.

For work performed in such cases, the Contractor shall collect from the Contracting Agency, retail sales tax on the full contract price. The Contracting Agency will automatically add this sales tax to each payment to the Contractor. For this reason, the Contractor shall not include the retail sales tax in the unit bid item prices, or in any other contract amount subject to Rule 170, with the following exception.

Exception: The Contracting Agency will not add in sales tax for a payment the Contractor or a subcontractor makes on the purchase or rental of tools, machinery, equipment, or consumable supplies not integrated into the project. Such sales taxes shall be included in the unit bid item prices or in any other contract amount.

**1-07.2(3) Services**

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

## 1-07.13 Contractor's Responsibility for Work

**1-07.13(1) General**
(*March 9, 2017 MV GSP*)

This section is supplemented with the following:

It is understood that the plans, specifications and standard details do not purport to control the method of performing the work, but only the requirements as to the nature of the completed work.

The Contractor shall be responsible for the method of performing the work. Suggestions as to the method included in the plans and special provisions shall be deemed advisory only; and the feasibility of such methods, or the lack thereof, shall not affect the Contractor's liability or status as an independent Contractor under this contract.

The City of Mount Vernon provides no specific staging area. The Contractor will be responsible for detaining, staging, and storage areas.

## 1-07.17 Utilities and Similar Facilities

**Section 1-07.17(2) Utility Construction, Removal, or Relocation by Others**
(*March 9, 2017 MV GSP*)

This section is supplemented with the following:

Locations and dimensions shown in the Plans for existing facilities are in accordance with available information obtained without uncovering, measuring, or other verification.

The following addresses and telephone numbers of utility companies known or suspected of having facilities within the project limits are supplied for the Contractor's convenience:

| UTILITY | CONTACT | PHONE |
|---|---|---|
| Puget Sound Energy | Mike Schroyer | (360) 766-5464 |
| Potelco | Jason Downing | (360) 661-2987 |
| IntoLight | Bryan Waters | (425) 456-2558 |
| Frontier | Dean DuPris | (360) 757-7621 |
| Cascade Natural Gas | Ted McCammant | (360) 708-4689 |
| Comcast | Bill Inama | (360) 815-6354 |
| Skagit County PUD | Barbara Barthel | (360) 848-4438 |
| Black Rock Cable | Randy Wilson | (360) 305-9635 |

**1-07.18 Public Liability and Property Damage Insurance**

Delete this section in its entirety, and replace it with the following:

**1-07.18 Insurance**
*(January 24, 2011 APWA GSP)*

**1-07.18(1) General Requirements**

A. The Contractor shall obtain the insurance described in this section from insurers approved by the State Insurance Commissioner pursuant to RCW Title 48. The insurance must be provided by an insurer with a rating of A-: VII or higher in the A.M. Best's Key Rating Guide, which is licensed to do business in the state of Washington (or issued as a surplus line by a Washington Surplus lines broker). The Contracting Agency reserves the right to approve or reject the insurance provided, based on the insurer (including financial condition), terms and coverage, the Certificate of Insurance, and/or endorsements.

B. The Contractor shall keep this insurance in force during the term of the Contract and for thirty (30) days after the Physical Completion date, unless otherwise indicated (see C. below).

C. If any insurance policy is written on a claims made form, its retroactive date, and that of all subsequent renewals, shall be no later than the effective date of this Contract. The policy shall state that coverage is claims made, and state the retroactive date. Claims-made form coverage shall be maintained by the Contractor for a minimum of 36 months following the Final Completion or earlier termination of this Contract, and the Contractor shall annually provide the Contracting Agency with proof of renewal. If renewal of the claims made form of coverage becomes unavailable, or economically prohibitive, the Contractor shall purchase

an extended reporting period ("tail") or execute another form of guarantee acceptable to the Contracting Agency to assure financial responsibility for liability for services performed.

D. The insurance policies shall contain a "cross liability" provision.

E. The Contractor's and all subContractors' insurance coverage shall be primary and non-contributory insurance as respects the Contracting Agency's insurance, self-insurance, or insurance pool coverage.

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

G. Upon request, the Contractor shall forward to the Contracting Agency a full and certified copy of the insurance policy(s).

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

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

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

### 1-07.18(2) Additional Insured

(*March 9, 2017 MV GSP*)

All insurance policies, with the exception of Professional Liability and Workers Compensation, shall name the following listed entities as additional insured(s):

- the Contracting Agency and its officers, elected officials, employees, agents, HDR and volunteers

The above-listed entities shall be additional insured(s) for the full available limits of liability maintained by the Contractor, whether primary, excess, contingent or otherwise, irrespective of whether such limits maintained by the Contractor are greater than those required by this Contract, and irrespective of whether the Certificate of Insurance provided by the Contractor pursuant to 1-07.18(3) describes limits lower than those maintained by the Contractor.

### 1-07.18(3) Subcontractors

Contractor shall ensure that each subcontractor of every tier obtains and maintains at a minimum the insurance coverages listed in 1-07.18(5)A and 1-07.18(5)B. Upon request of the Contracting Agency, the Contractor shall provide evidence of such insurance.

### 1-07.18(4) Evidence of Insurance

The Contractor shall deliver to the Contracting Agency a Certificate(s) of Insurance and endorsements for each policy of insurance meeting the requirements set forth herein when the Contractor delivers the signed Contract for the work. The certificate and endorsements must conform to the following requirements:

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

**1-07.18(5) Coverages and Limits**

The insurance shall provide the minimum coverages and limits set forth below. Providing coverage in these stated minimum limits shall not be construed to relieve the Contractor from liability in excess of such limits. All deductibles and self-insured retentions must be disclosed and are subject to approval by the Contracting Agency. The cost of any claim payments falling within the deductible shall be the responsibility of the Contractor.

**1-07.18(5)A Commercial General Liability**

A policy of Commercial General Liability Insurance, including:

Per project aggregate
Premises/Operations Liability
Products/Completed Operations – for a period of one year following final acceptance of the work.
Personal/Advertising Injury
Contractual Liability
Independent Contractors Liability
Stop Gap / Employers' Liability
Explosion, Collapse, or Underground Property Damage (XCU)
Blasting (only required when the Contractor's work under this Contract includes exposures to which this specified coverage responds)

Such policy must provide the following minimum limits:

| | |
|---|---|
| $1,000,000 | Each Occurrence |
| $2,000,000 | General Aggregate |
| $1,000,000 | Products & Completed Operations Aggregate |
| $1,000,000 | Personal & Advertising Injury, each offence |

Stop Gap / Employers' Liability

| | |
|---|---|
| $1,000,000 | Each Accident |
| $1,000,000 | Disease - Policy Limit |
| $1,000,000 | Disease - Each Employee |

**1-07.18(5)B Automobile Liability**

Automobile Liability for owned, non-owned, hired, and leased vehicles, with an MCS 90 endorsement and a CA 9948 endorsement attached if "pollutants" are to be transported. Such policy(ies) must provide the following minimum limit:

| | |
|---|---|
| $1,000,000 | combined single limit |

**1-07.18(5)C Workers' Compensation**

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

**1-07.24 Rights of Way**

*(October 1, 2005 APWA GSP)*

Delete this section in its entirety, and replace it with the following:

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

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

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

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

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

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

statement shall include the parcel number, address, and date of signature. Written releases must be filed with the Engineer before the Completion Date will be established.

**1-07.26 Personal Liability of Public Officers**
(*March 9, 2017 MV GSP*)

This section is revised to read:

Neither the Mayor, the Council Members, the Engineer, nor any other officer, employee, HDR or agent of the City of Mount Vernon shall be personally liable for any acts or failure to act in connection with the Contract, it being understood that in such matters, they are acting solely as agents of the City of Mount Vernon.

## 1-08 PROSECUTION AND PROGRESS

Add the following new section:

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

Add the following new section:

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

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

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

The Contractor shall prepare and submit at the preconstruction conference the following:

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

Add the following new section:

**1-08.0(2) Hours of Work**
(*March 9, 2017 MV GSP*)

Except in the case of emergency or unless otherwise approved by the Engineer, the normal working hours for the Contract shall be between 7:00 a.m. and 4:30 p.m. Monday through Friday. If the Contractor desires different than the normal working hours stated above, the request must be submitted in writing prior to the preconstruction conference, subject to the provisions below. The working hours for the Contract shall be established at or prior to the preconstruction conference.

All working hours and days are also subject to local permit and ordinance conditions (such as noise ordinances).

If the Contractor wishes to deviate from the established working hours, the Contractor shall submit a written request to the Engineer for consideration. This request shall state what hours are being requested, and why. Requests shall be submitted for review no later than 2 working days prior to the day(s) the Contractor is requesting to change the hours.

If the Contracting Agency approves such a deviation, such approval may be subject to certain other conditions, which will be detailed in writing. For example:

1. On non-Federal aid projects, requiring the Contractor to reimburse the Contracting Agency for the costs in excess of straight-time costs for Contracting Agency representatives who worked during such times. (The Engineer may require designated representatives to be present during the work. Representatives who may be deemed necessary by the Engineer include, but are not limited to: survey crews; personnel from the Contracting Agency's material testing lab; inspectors; and other Contracting Agency employees or third party consultants when, in the opinion of the Engineer, such work necessitates their presence.)
2. Considering the work performed on Saturdays, Sundays, and holidays as working days with regard to the contract time.
3. Considering multiple work shifts as multiple working days with respect to contract time even though the multiple shifts occur in a single 24-hour period.
4. If a 4-10 work schedule is requested and approved the non-working day for the week will be charged as a working day.
5. If Davis Bacon wage rates apply to this Contract, all requirements must be met and recorded properly on certified payroll

**1-08.1 Subcontracting**
(*March 9, 2017 MV GSP*)

Supplement this section with:

"Prior to any Subcontractor or Agent beginning work on this project, the Contractor shall submit to the Engineer a certification (WSDOT Form 420-004) that a written agreement between the Contractor and the Subcontractor, or between the Subcontractor and any Agent to the Subcontractor, has been executed.

A Subcontractor or an Agent to the Subcontractor will not be permitted to perform any work under the contract until the following documents have been completed and submitted to the Engineer.

1. Request to Sublet Work (Form 421-012)
2. Statement of Intent to Pay Prevailing Wages (Form 700-029-000)

The Contractor's records pertaining to the requirements of this Special Provision shall be open to inspection or audit by representatives of the Department during the life of the contract and for a period of not less than three years after the date of acceptance of the contract. The Contractor shall retain these records for that period. The Contractor shall also guarantee that these records of all Subcontractors and Agents shall be open to similar inspection or audit for the same period.

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

Revise this section to read:

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

**1-08.4 Prosecution of Work**

Delete this section and replace it with the following:

**1-08.4 Notice to Proceed and Prosecution of Work**
*(July 23, 2015 APWA GSP)*

Notice to Proceed will be given after the contract has been executed and the contract bond and evidence of insurance have been approved and filed by the Contracting Agency. The Contractor shall not commence with the work until the Notice to Proceed has been given by the Engineer. The Contractor shall commence construction activities on the project site within ten days of the Notice to Proceed Date, unless otherwise approved in writing. The Contractor shall diligently pursue the work to the physical completion date within the time specified in the contract. Voluntary shutdown or slowing of operations by the Contractor shall not relieve the Contractor of the responsibility to complete the work within the time(s) specified in the contract.

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

## 1-08.5 Time for Completion

*(August 14, 2013 APWA GSP, Option A)*

Revise the third and fourth paragraphs to read:

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

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

Revise the sixth paragraph to read:

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

1. The physical work on the project must be complete; and
2. The Contractor must furnish all documentation required by the contract and required by law, to allow the Contracting Agency to process final acceptance of the contract. The following documents must be received by the Project Engineer prior to establishing a completion date:
   a. Certified Payrolls (per Section 1-07.9(5)).
   b. Material Acceptance Certification Documents
   c. Quarterly Reports of Amounts Credit as DBE Participation, as required by the Contract Provisions.
   d. Final Contract Voucher Certification
   e. Copies of the approved "Affidavit of Prevailing Wages Paid" for the Contractor and all Subcontractors
   f. Property owner releases per Section 1-07.24

## 1-08.9 Liquidated Damages

*(March 9, 2017 MV GSP)*

Delete this Section and replace it with the following:

Time is of the essence of the Contract. Delays interfere with commerce and cost tax payers undue sums of money, adding time needed for administration, engineering, inspection, and supervision. Delayed delivery of the equipment will result in financial impacts to the City of Mount Vernon. Because the City finds it impractical to calculate the cost of delays, it has adopted the following method to calculate liquidated damages in lieu of actual delay damages for Contractor's failure to deliver the equipment on or before the Agree Delivery Date of December 31, 2017

Accordingly, the Contractor agrees as follows:

1. To pay $3,500 in liquidated damages per each month prorated to the nearest day that the delivery of equipment extend beyond the Agree Delivery Date.
2. To authorize the Engineer to deduct these liquidated damages from any money due or coming due to the Contractor.

In the event the liquidated damages clause is held unenforceable, the City may assert a claim of actual delay damages against the Contractor.

## 1-09.9 Payments

*(March 13, 2012 APWA GSP)*

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

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

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

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

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

The value of the progress estimate will be the sum on the payment provisions of the technical specifications:

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

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

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

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

**1-09.13 Claims Resolution**
*(March 13, 2012 APWA GSP)*

Delete Sections 1-09.13(1),(2), (3) and (4) in their entirety and replace with the following:

**1-09.13 Claims Resolution**
*(March 13, 2012 APWA GSP)*

The Contractor and the Contracting Agency mutually agree that those claims in submitted in accordance with Section 1-09.11 and Sections incorporated therein including Section 1-04.5 and not resolved by voluntary nonbinding ADR processes, if any, shall be resolved through litigation. The venue for such actions shall be Skagit County Superior Court. The provisions of Sections1-04.5 and 1-09.11must be complied with in full, as a condition precedent to the Contractor's right to seek claim resolution through any nonbinding alternative dispute resolution process, binding arbitration or litigation.
(*****)

Add the following Division 10:

**DIVISION 10**
**TECHNICAL SPECIAL PROVISION**

## 10-01 GENERAL

The attached technical specifications in the Construction Specification Institute (CSI) format are made a part of this project.

**DIVISION 01 - GENERAL REQUIREMENTS**

| | |
|---|---|
| 01 11 13 | SUMMARY OF GOOD AND SPECIAL SERVICES |
| 01 20 03 | MEASUREMENT AND PAYMENT |
| 01 25 13 | PRODUCT SUBSTITUTIONS |
| 01 33 00 | SUBMITTALS |
| 01 33 04 | OPERATION AND MAINTENANCE MANUALS |
| 01 40 00 | QUALITY ASSURANCE |
| 01 61 03 | EQUIPMENT: BASIC REQUIREMENTS |

**DIVISION 05 - METALS**

| | |
|---|---|
| 05 50 00 | METAL FABRICATIONS |

**DIVISION 10 - SPECIALTIES**

| | |
|---|---|
| 10 14 00 | IDENTIFICATION DEVICES |

**DIVISION 26 - ELECTRICAL**

| | |
|---|---|
| 26 05 00 | ELECTRICAL: BASIC REQUIREMENTS |
| 26 05 19 | WIRE AND CABLE: 600 VOLT AND BELOW |
| 26 05 26 | GROUNDING AND BONDING |
| 26 05 33 | RACEWAYS AND BOXES |
| 26 09 16 | CONTROL EQUIPMENT ACCESSORIES |
| 26 28 00 | OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES |

**DIVISION 46 - WATER AND WASTEWATER EQUIPMENT**

| | |
|---|---|
| 46 76 27 | SCREW PRESS SYSTEM |

**Prevailing Wages:**

Current prevailing wage data are not printed or bound herein. It is the Contractors responsibility to incorporate the most recent wage rate and benefits applicable to Skagit County into the Bid. They are available at the:

Department of Labor and Industries
Prevailing Wage Section
P.O. Box 44540
Olympia, Washington 98504-4540 or online at

**http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates/default.asp**

The General Contractor and his sub-contractors are to pay for all filing fees for Statements of Intent to Pay Prevailing Wages and Affidavits at $25.00 each document submitted. Pay for any change in rate during the course of construction.

Submit forms to address noted above.

**SECTION 01 11 13**
SUMMARY OF GOOD AND SPECIAL SERVICES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Project Summary: This project involves the supply of one (1) new screw press system for the City of Mount Vernon Wastewater Treatment Plant.

B. Related sections include but are not necessarily limited to:
   1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 – General Requirements.

### 1.2 GOODS AND SPECIAL SERVICES COVERED BY CONTRACT

A. The Bid Form includes one (1) Bid Item for the project. The Goods and Special Services to be furnished include:
   1. Bid Item No. 1: Screw Press
      a. All labor, equipment, materials, and appurtenances for furnishing the screw press and ancillary systems, including a flocculation tank and mixer, as specified in these Contract Documents.
      b. The equipment shall be delivered to the Mount Vernon Wastewater Treatment Plant.
      c. Special Services shall include, but are not limited to:
         1) Shop Drawings.
         2) Operations and Maintenance Manuals
         3) Manufacturer's Field Services such as all the necessary startup, testing, and training of Buyer's operations and maintenance personnel as quality control and quality assurance of the delivered equipment.
      d. Conduct performance testing of equipment to show compliance with performance requirements.
      e. The completion of all the furnishing of Goods and Special Services shall be on or before the dates or within the number of calendar days indicated in the Agreement.

   2. Bid Item No. 2: Maintenance Contract
      a. Maintenance Contract for ten (10) year period after successful startup of equipment.
         1) Maintenance contract shall cover all materials, labor and equipment to perform all scheduled and unscheduled maintenance for the screw press in accordance with Final Operations and Maintenance Manual with the following exception.
            a) Buyer shall perform all routine greasing and oil changes required as part of the maintenance schedule.

## 1.3 MAINTENANCE CONTRACT OPERATING PROVISION

A. Buyer will operate Seller's equipment pursuant to the requirements of the current edition of the Seller's standard Operations and Maintenance Manual in print as of May 2017. Standard manual shall be supplied by the apparent low Bidder within 10 days of bid opening. There will be no modifications, deletions, additions, or exceptions to the basis of maintenance contract requirements.

B. Damage caused by vandalism, neglect, acts of God, or abuse will not be covered by the maintenance contract.

C. Buyer will operate the unit maximum of 15,600 hours per five-year period and no more that the hourly maximum capacity stated in Sludge Characteristics and PERFORMANCE AND DESIGN REQUIREMENTS herein.

D. Buyer currently records daily totals of feed from the sludge storage tank and daily polymer flow. These records can be made available to Seller on a monthly basis.

E. Buyer will make progress payments for the maintenance contract at the end of each maintenance contract year in equal payments over the life of the maintenance contract.

## 1.4 WORK BY OTHERS

A. Buyer or Buyer's Installation Contractor will install the screw press and ancillary systems purchased on this contract.

## 1.5 FABRICATION SCHEDULE

A. Within ten (10) days of Notice to Proceed, the Seller shall submit their fabrication schedule to meet the scheduled sequence, milestones, and limitations. The schedule shall be a bar chart showing, as a minimum, the schedule for the following activities:
   1. Fabrication of equipment.
   2. Equipment delivery.
   3. Final Shop Drawings.

## 1.6 OTHERS WORKING AT PROJECT SITE

A. The Seller shall coordinate the delivery of the equipment and appurtenances with the Buyer.

## 1.7 SUBSTANTIAL COMPLETION

A. For the purposes of establishing when the Project is substantially complete and suitable for its intended purpose, the following functional components and work elements shall be completed:
   1. Final shop drawings submitted and approved.
   2. Goods delivered to the site.
   3. Final operations and maintenance manuals submitted and approved.
   4. Manufacturer's Field Services are complete.
   5. Satisfactory completion of performance testing.

## 1.8 REGULATORY REQUIREMENTS

A. Comply with all Federal, State, and local laws, regulations, codes, and ordinance applicable to furnishing the Goods and Special Services.
B. References in the Contract Documents to local codes shall mean City of Mount Vernon, WA.
C. Other standards and codes that apply to furnishing the Goods and Special Services are designated in the Specifications.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION (NOT USED)

**END OF SECTION**

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**SECTION 01 20 03**
MEASUREMENT AND PAYMENT

## PART 1 - APPLICATIONS FOR PAYMENT

### 1.1 GENERAL

A. Submit applications for payment to Engineer in accordance with the schedule established by Conditions of the Contract and Agreement Between Buyer and Seller.

B. Related sections include but are not necessarily limited to:
   1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 – General Requirements.

### 1.2 FORMAT AND DATA REQUIRED

A. Submit applications typed on attached Seller's Application and Certificate of Payment, or a similar form, with itemized data typed on 8-1/2" x 11" white paper continuation sheets.

B. Provide itemized data on continuation sheet:
   1. Format, schedules, line items, and values: Those of the Schedule of Values.

### 1.3 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application form:
   1. Fill in required information, including that for Change Orders executed prior to the date of submittal application.
   2. Fill in summary of dollar values to agree with the respective totals indicated on the continuation sheets.
   3. Execute certification with the signature of a responsible officer of the Seller's firm.

B. Continuation sheets:
   1. Fill in total list of all scheduled component items of Work, with item number and the scheduled dollar value for each item.
   2. Fill in the dollar value in each column for each scheduled line item when work has been performed or products stored, rounding off values to nearest dollar.
   3. List each Change Order executed prior to the date of submission at the end of the continuation sheets.
      a. List by Change Order number and description, as for an original component item of work.

### 1.4 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When Buyer or Engineer requires substantiating data, Seller shall submit suitable information, with a cover letter identifying:
   1. Project.
   2. Application number and date.
   3. Detailed list of enclosures.
   4. For stored products:
      a. Item number and identification as shown on application.

b. Description of specific material stored at the site (upon verification of payment from supplier).

B. Submit one copy of data and cover letter for each copy of application.

**1.5 PREPARATION OF APPLICATION FOR FINAL PAYMENT**

A. Fill in application form as specified for progress payments.

**1.6 SUBMITTAL PROCEDURE**

A. Applications for payment must be agreed upon by the Seller and Engineer and submitted to Buyer on or before the 2nd Tuesday of each month. If statement is not received in final form prior to this date, the application may not be processed until the following payment period.

B. Number: One (1) copy of each application.

C. When Engineer finds the application properly completed and correct, he will transmit a Certificate for Payment to Buyer, with a copy to Seller.

**1.7 PAYMENTS**

A. As stated in the Agreement.

B. Failure to submit schedules and plans:

1. Progress payments will be withheld if updated schedules are not submitted with payment requests.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

# Seller's Progress Estimate



| To (Buyer): | From (Seller): | _____ |
|---|---|---|
| City of Mount Vernon, Public Works Department<br>1024 Cleveland Avenue<br>Mount Vernon, WA 98273 | | HDR Engineering, Inc.<br>500 108th Avenue NE Suite 1200<br>Bellevue, WA 98004<br>Phone (425) 773-1384<br>Attention : John Koch |
| Buyer's Project No.: SS-2017-006 | Seller's Project No.: | Engineer's Project No.: 167427 |
| For (Contract): | Application No.: | Application Period: |

## Application for Payment

### Change Order Summary

| Change Orders approved by Buyer | | Additions | Deductions |
|---|---|---|---|
| Number | Date Approved | | |
| | | | |
| | TOTALS | | |
| | | | |
| NET CHANGE BY CHANGE ORDERS | | | |

| | |
|---|---|
| **1. ORIGINAL CONTRACT SUM** | **$** |
| **2. Net change by Change Orders** | **$** |
| **3. CONTRACT SUM TO DATE (Line 1±2)** | **$** |
| **4. TOTAL COMPLETED AND STORED TO DATE (Column F on Progress Estimate)** | **$** |
| **6. TOTAL AMOUNT DUE TO DATE** | **$** |
| **7. SALES TAX: 8.2% of Completed Work and Stored Material (Line 4)** | **$** |
| **8. AMOUNT ELIGIBLE TO DATE** | **$** |
| **9. LESS PREVIOUS PAYMENTS (Line 8 from prior Certificate)** | **$** |
| **10. AMOUNT DUE THIS APPLICATION** | **$** |
| **11. BALANCE TO FINISH, PLUS RETAINAGE (Column G on Progress Estimate)** | **$** |

## Seller's Certification

The undersigned Seller certifies that to the best of the Seller's knowledge, information and belief, the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Seller for Work for which previous Certificates for Payment were issued and payments received from the Buyer, and that current payment shown herein is now due.

| Seller: | |
|---|---|
| By: | Date: |

**Payment of $ _____ is recommended.**

**HDR Engineering, Inc.**

| By: | Date: |
|---|---|

# Seller's Progress Estimate



| For (contract): | | | | | Application Number: | | | |
|---|---|---|---|---|---|---|---|---|
| Application Period: | | | | | Application Date: | | | |
| A | | B | C | D | E | F | | G |
| Item | | Scheduled Value | Work Completed | | Materials Presently Stored (not in C or D) | Total Completed and Stored to Date (C+D+E) | % F (B) | Balance to Finish (B-F) |
| Spec. Sect. No. | Description | | From Previous Application (C+D) | This Period | | | | |
| | | | | | | | | |
| | Totals | | | | | | | |

# Seller's Progress Estimate



| For (contract): | | | | | | | | | Application Number: |
|---|---|---|---|---|---|---|---|---|---|
| Application Period: | | | | | | | | | Application Date: |
| Invoice No. | Shop Drawing Transmittal No. | Materials Description | Stored Previously | | Stored this Month | | Incorporated in Work | | Materials Remaining in Storage ($) |
| | | | Date (Month/Year) | Amount ($) | Amount ($) | Subtotal | Date (Month/Year) | Amount ($) | |
| | | | | | | | | | |
| | | | | | | | | | |

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**SECTION 01 33 00**
SUBMITTALS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Mechanics and administration of the submittal process for:
      a. Shop Drawings.
      b. Samples.
      c. Informational submittals.
   2. General content requirements for Shop Drawings.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 01 - General Requirements.
   3. Operations and Maintenance Manual submittal requirements are specified in Specification Section 01 33 04.
   4. Specification Sections in Division 02 through Division 16 identifying required submittals.

### 1.2 DEFINITIONS

A. Shop Drawings:
   1. See General Conditions.
   2. Product data and samples are Shop Drawing information.
   3. Initial and Revised Construction Baseline Schedules.
   4. Schedule of Values.

B. Informational Submittals:
   1. Submittals other than Shop Drawings and samples required by the Contract Documents that do not require approval.
   2. Representative types of informational submittal items include but are not limited to:
      a. Construction Record Schedules (progress schedules).
      b. Installed equipment and systems performance test reports.
      c. Seller's installation certification letters.
      d. Instrumentation and control commissioning reports.
      e. Warranties.
      f. Service agreements.
      g. Construction photographs.
      h. Survey data.
      i. Health and safety plans.
      j. Work plans.
      k. Delegated designs per performance specification requirements
   3. For-Information-Only submittals upon which the Engineer is not expected to conduct review or take responsive action may be so identified in the Contract Documents.

## 1.3 SUBMITTAL SCHEDULE

A. Schedule of Shop Drawings:
   1. Submitted and approved within 4 weeks of receipt of Notice to Proceed.
   2. Account for multiple transmittals under any Specification Section where partial submittals will be transmitted.

B. Informational Submittals:
   1. Reports and installation certifications submitted within five (5) working days of conducting testing or examination.

C. The submittal schedule shall include the following columns as a minimum:

| Submittal Section | Submittal Description | Planned Submittal Date | Submittal Need Date | Actual Submittal Date | Actual Return Date | Disposition |
|---|---|---|---|---|---|---|
| | | | | | | |

## 1.4 PREPARATION OF SUBMITTALS

A. Legibility:
   1. All submittals and all pages of all copies of a submittal shall be completely legible.
   2. Submittals which, in the Engineer's sole opinion, are illegible will be returned without review.

B. Shop Drawings and Samples:
   1. Scope of any submittal and letter of transmittal:
      a. Limited to one (1) Specification Section.
      b. Do not submit under any Specification Section entitled (in part) "Basic Requirements" unless the product or material submitted is specified, in total, in a "Basic Requirements" Specification Section.

   2. Numbering letter of transmittal:
      a. Use the Specification Section number followed by a series number ("-xx" and beginning with "01"); increase the series number sequentially with each additional transmittal for that Specification Section.

   3. Describing transmittal contents:
      a. Provide listing of each component or item in submittal capable of receiving an independent review action.
      b. Identify for each item:
         1) Manufacturer and Manufacturer's Drawing or data number.
         2) Contract Document tag number(s).
         3) Unique page numbers for each page of each separate item.
      c. When submitting "or-equal" items that are not the products of named manufacturers, include the words "or-equal" in the item description.

   4. Seller certification of review and approval:
      a. Seller's review and approval certification stamp shall be applied either to the letter of transmittal or a separate sheet preceding each independent item in the submittal.
         1) Stamp may be either a wet ink stamp or electronically embedded.

2) Clearly identify the person who reviewed the submittal and the date it was reviewed.
3) Shop Drawing submittal stamp shall read "(Seller's Name) has satisfied Seller's obligations under the Contract Documents with respect to Seller's review and approval as stipulated in the General Conditions."

b. Submittals containing multiple independent items shall be prepared with each item listed on the letter of transmittal or on an index sheet for all items listing the discrete page numbers for each page of each item, which shall be stamped with the Seller's review and approval stamp.
   1) Each independent item shall have a cover sheet with the transmittal number and item number recorded.
      a) Provide clear space of 3 IN SQ for Engineer stamping.
   2) Individual pages or sheets of independent items shall be numbered in a manner that permits the entire contents of a particular item to be readily recognized and associated with Seller's certification.

5. Resubmittals:
   a. Number with original Specification Section and series number with a suffix letter starting with "A" on a (new) duplicate transmittal form.
   b. Do not increase the scope of any prior transmittal.
   c. Account for all components of prior transmittal.
      1) If items in prior transmittal received "A" or "B" Action code, list them and indicate "A" or "B" as appropriate.
         a) Do not include submittal information for items listed with prior "A" or "B" Action in resubmittal.
      2) Indicate "Outstanding-To Be Resubmitted At a Later Date" for any prior "C" or "D" Action item not included in resubmittal.
         a) Obtain Engineer's approval to exclude items.

6. For 8-1/2 x 11 IN, 8-1/2 x 14 IN, and 11 x 17 IN size sheets, provide three (3) copies of each submittal for Engineer.
   a. All other size sheets:
      1) Submit one (1) reproducible transparency or high resolution print and one (1) additional print of each Drawing until approval is obtained.
      2) Utilize mailing tube; do not fold.
      3) The Engineer will mark and return the reproducible to the Seller for reproduction and distribution.

7. Seller shall not use red color for marks on transmittals.
   a. Duplicate all marks on all copies transmitted, and ensure marks are photocopy reproducible.
   b. Engineer will use red marks or enclose marks in a cloud.

8. Transmittal contents:
   a. Coordinate and identify Shop Drawing contents so that all items can be easily verified by the Engineer.
   b. Provide submittal information or marks defining specific equipment or materials utilized on the Project.
      1) Generalized product information, not clearly defining specific equipment or materials to be provided, will be rejected.

c. Identify equipment or material project application, tag number, Drawing detail reference, weight, and other Project specific information.
d. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
e. Do not modify the manufacturer's documentation or data except as specified herein.
f. Submit items such as equipment brochures, cuts of fixtures, product data sheets or catalog sheets on 8-1/2 x 11 IN pages.
    1) Indicate exact item or model and all options proposed.
g. When a Shop Drawing submittal is called for in any Specification Section, include as appropriate, scaled details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout Drawings, rough-in diagrams, wiring diagrams, controls, weights and other pertinent data in addition to information specifically stipulated in the Specification Section.
    1) Arrange data and performance information in format similar to that provided in Contract Documents.
    2) Provide, at minimum, the detail specified in the Contract Documents.
h. If proposed equipment or materials deviate from the Contract Drawings or Specifications in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet.

9. Samples:
    a. Identification:
        1) Identify sample as to transmittal number, manufacturer, item, use, type, project designation, tag number, Specification Section or Drawing detail reference, color, range, texture, finish and other pertinent data.
        2) If identifying information cannot be marked directly on sample without defacing or adversely altering samples, provide a durable tag with identifying information securely attached to the sample.
    b. Include application specific brochures, and installation instructions.
    c. Provide Seller's review and approval certification stamp or Seller's Submittal Certification form as indication of Seller's checking and verification of dimensions and coordination with interrelated work.
    d. Resubmit revised samples of rejected items.

C. Informational Submittals:
    1. Prepare in the format and detail specified in Specification requiring the informational submittal.

## 1.5 TRANSMITTAL OF SUBMITTALS

A. Shop Drawings and Samples:
    1. Transmit all submittals to:
        Gary Duranceau
        Wastewater Division Manager
        City of Mount Vernon

Wastewater Treatment Plant
1401 Britt Slough Road
Mount Vernon, WA  98273Mount Vernon, WA 98273-0809
e-mail : garyd@mountvernonwa.gov

2. Utilize two (2) copies of attached Exhibit A to transmit all Shop Drawings and samples.
3. All submittals must be from Seller.
   a. Submittals will not be received from or returned to subSellers.

B. Electronic Transmission of Submittals:
   1. Transmittals may be made electronically.
      a. Protocols and processes will be determined by the Buyer.
   2. Scan all transmittals into Adobe Acrobat Portable Document Format (PDF), latest version, with printing enabled.
      a. Do not password protect or lock the PDF document.
      b. Rotate sheets that are normally viewed in landscape mode so that when the PDF file is opened the sheet is in the appropriate position for viewing.
   3. Required signatures may be applied prior to scanning for transmittal.

## 1.6 ENGINEER'S REVIEW ACTION

A. Shop Drawings and Samples:
   1. Items within transmittals will be reviewed for overall design intent and will receive one (1) of the following actions:
      a. A - FURNISH AS SUBMITTED.
      b. B - FURNISH AS NOTED (BY ENGINEER).
      c. C - REVISE AND RESUBMIT.
      d. D - REJECTED.
      e. E - ENGINEER'S REVIEW NOT REQUIRED.

   2. Submittals received will be initially reviewed to ascertain inclusion of Seller's approval stamp.
      a. Submittals not stamped by the Seller or stamped with a stamp containing language other than that specified herein will not be reviewed for technical content and will be returned without any action.

   3. In relying on the representation on the Seller’s review and approval stamp, Buyer and Engineer reserve the right to review and process poorly organized and poorly described submittals as follows:
      a. Submittals transmitted with a description identifying a single item and found to contain multiple independent items:
         1) Review and approval will be limited to the single item described on the transmittal letter.
         2) Other items identified in the submittal will:
            a) Not be logged as received by the Engineer.
            b) Be removed from the submittal package and returned without review and comment to the Seller for coordination, description and stamping.
            c) Be submitted by the Seller as a new series number, not as a re-submittal number.
      b. Engineer, at Engineer’s discretion, may revise the transmittal letter item list and descriptions, and conduct review.

1) Unless Seller notifies Engineer in writing that the Engineer's revision of the transmittal letter item list and descriptions was in error, Seller's review and approval stamp will be deemed to have applied to the entire contents of the submittal package.

4. Submittals returned with Action "A" or "B" are considered ready for fabrication and installation.
   a. If for any reason a submittal that has an "A" or "B" Action is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal.
   b. Destroy or conspicuously mark "SUPERSEDED" all documents having previously received "A" or "B" Action that are superseded by a resubmittal.

5. Submittals with Action "A" or "B" combined with Action "C" (Revise and Resubmit) or "D" (Rejected) will be individually analyzed giving consideration as follows:
   a. The portion of the submittal given "C" or "D" will not be distributed (unless previously agreed to otherwise at the Preconstruction Conference).
      1) One (1) copy or the one (1) transparency of the "C" or "D" Drawings will be marked up and returned to the Seller.
         a) Correct and resubmit items so marked.
   b. Items marked "A" or "B" will be fully distributed.
   c. If a portion of the items or system proposed are acceptable, however, the major part of the individual Drawings or documents are incomplete or require revision, the entire submittal may be given "C" or "D" Action.
      1) This is at the sole discretion of the Engineer.
      2) In this case, some Drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package."
      3) Distribution to the Buyer and field will not be made (unless previously agreed to otherwise).

6. Failure to include any specific information specified under the submittal paragraphs of the Specifications will result in the submittal being returned to the Seller with "C" or "D" Action.

7. Calculations required in individual Specification Sections will be received for information purposes only, as evidence calculations have been performed by individuals meeting specified qualifications, and will be returned stamped "E. Engineer's Review Not Required" to acknowledge receipt.

8. Seller shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Buyer will record time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Seller shall be responsible for charges to Buyer for such time. Buyer may impose a set-off against payments due to Seller to secure reimbursement for such charges.

9. Transmittals of submittals which the are considered as "Not Required" submittal information, which is supplemental to but not essential to prior submitted information, or items of information in a transmittal which have been reviewed and received "A" or "B" action in a prior submittal, will be returned with action "E. Engineer's Review Not Required."

10. Samples may be retained for comparison purposes.
    a. Remove samples when directed.
    b. Include in bid all costs of furnishing and removing samples.

11. Approved samples submitted or constructed, constitute criteria for judging completed work.
    a. Finished work or items not equal to samples will be rejected.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**EXHIBIT A**

# Shop Drawing Transmittal

**No. _____-_____**

**(Spec Section) (Series)**

| | | | |
|---|---|---|---|
| Project Name: WASTEWATER TREATMENT PLANT SCREW PRESS | | Date Received: | |
| Project Buyer: CITY OF MOUNT VERNON | | Checked By: | |
| Seller: | HDR Engineering, Inc. | Log Page: | |
| Address: | Address: | HDR No.: | |
| | | Spec Section: | |
| | | Drawing/Detail No.: | |
| Attn: | Attn: | 1st. Sub | ReSub. |
| Date Transmitted: | Previous Transmittal Date: | | |

| Item No. | No. Copies | Description | Manufacturer | Mfr/Vendor Dwg or Data No. | Action Taken* |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
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| | | | | | |

Remarks:

* The Action designated above is in accordance with the following legend:

A - Furnish as Submitted

B - Furnish as Noted

C - Revise and Submit
1. Not enough information for review.
2. No reproducibles submitted.
3. Copies illegible.
4. Not enough copies submitted.
5. Wrong sequence number.
6. Wrong resubmittal number.
7. Wrong spec. section.
8. Wrong form used.
9. See comments.

D - Rejected

E - Engineer's review not required
1. Submittal not required.
2. Supplemental Information. Submittal retained for informational purposes only.
3. Information reviewed and approved on prior submittal.
4. See comments.
5. Delegated Design - Submittal received as requested by the Contract Documents. The Engineer did not review the engineering or technical content of the submittal.

Engineer's review and approval is limited to determine whether items covered by this submittal will, after installation or incorporation in the Work, conform in general to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole. Any deviation from plans or specifications not depicted in the submittal or included but not clearly noted by the Seller may not have been reviewed. Review by the Engineer shall not serve to relieve the Seller of the contractual responsibility for any error or deviation from contract requirements.

Comments:

By Date

Distribution: Seller File Field Buyer Other

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**EXHIBIT AA**

# Seller's Submittal Certification

Shop Drawing Transmittal No.: _____
Contract/Project Name: _____
_____
Company Name: _____

has

1. reviewed and coordinated this Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
2. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
3. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
4. determined and verified all information relative to Seller's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

☐ This Submittal **does not** contain any variations from the requirements of the Contract Documents.

☐ This Submittal **does** contain variations from the requirements of the Contract Documents. A separate description of said variations and a justification for them is provided in an attachment hereto identified as: "Shop Drawing Transmittal No. _____Variation and Justification Documentation"

Insert picture file or electronic signature of Authorized Representative

_____ _____
Authorized Representative Date

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Revision Log

**END OF SECTION**

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**SECTION 01 33 04**
OPERATION AND MAINTENANCE MANUALS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Administration of the submittal process for Operation and Maintenance Manuals.
   2. Content requirements for Operation and Maintenance Manuals.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 01 - General Requirements.
   3. General submittal requirements are specified in Specification Section 01 33 00.
   4. Sections in Division 02 through Division 16 identifying required Operation and Maintenance Manual submittals.

### 1.2 DEFINITIONS

A. Equipment Operation and Maintenance Manuals:
   1. Contain the technical information required for proper installation, operation and maintenance of process, electrical and mechanical equipment and systems.

B. Building Materials and Finishes Operation and Maintenance Manuals:
   1. Contain the information required for proper installation and maintenance of building materials and finishes.

### 1.3 SUBMITTALS

A. List of all the Operation and Maintenance Manuals required by the Contract as identified in Division 02 through Division 16.

B. Operation and Maintenance Manuals:
   1. Draft and final electronic copies.
   2. Final paper copies: One (1).

### 1.4 SUBMITTAL SCHEDULE

A. Draft Operation and Maintenance Manuals:
   1. Submit approvable draft manuals in electronic format (PDF) within 2 weeks following the bid opening.

B. Final Operation and Maintenance Manuals:
   1. Final approval of Operation and Maintenance Manuals in electronic format (PDF) must be obtained 45 days prior to equipment start-up.
   2. Provide paper copies and CD-ROMs of approved final Operation and Maintenance Manuals in electronic format (PDF), a minimum of 30 days prior to equipment start-up.

## 1.5 PREPARATION OF SUBMITTALS

A. General:
   1. All pages of the Operation and Maintenance Manual submittal shall be legible.
      a. Submittals which, in the Engineer's sole opinion, are illegible will be rejected without review.
   2. Identify each equipment item in a manner consistent with names and identification numbers used in the Contract Documents, not the manufacturer's catalog numbers.
   3. Neatly type any data not furnished in printed form.
   4. Operation and Maintenance Manuals are provided for Buyer's use, to be reproduced and distributed as training and reference materials within Buyer's organization.
      a. This requirement is:
         1) Applicable to both paper copy and electronic files.
         2) Applicable to materials containing copyright notice as well as those with no copyright notice.
   5. Notify supplier and/or manufacturer of the intended use of Operations and Maintenance Manuals provided under the Contract.

B. Operation and Maintenance Manual Format and Delivery:
   1. Draft electronic submittals:
      a. Provide manual in Adobe Acrobat Portable Document Format (PDF), latest version.
      b. Create one (1) PDF file for each equipment Operation and Maintenance Manual.
      c. Do not password protect or lock the PDF document.
      d. Drawings or other graphics must be converted to PDF file format from the original drawing file format and made part of the PDF document.
      e. Scanning of drawings is to be used only where actual file conversion is not possible and drawings must be scanned at a resolution of 300 dpi or greater.
      f. Rotate sheets that are normally viewed in landscape mode so that when the PDF file is opened the sheet is in the appropriate position for viewing.
      g. Create bookmarks in the navigation frame, for the Operation and Maintenance Manual cover, the Table of Contents, and each top level entry in the Operation and Maintenance Table of Contents.
      h. Using Adobe Acrobat Standard or Adobe Acrobat Professional, set the PDF document properties, initial view as follows:
         1) Select File →Properties→Initial View.
         2) Select the Navigation tab: Bookmarks Panel and Page.
         3) Select the Page layout: Single Page.
         4) Select the Magnification: Fit Page.
         5) Select Open to page: 1.
         6) Set the file to open to the cover page of the manual with bookmarks to the left, and the first bookmark linked to the cover page.
      i. Set the PDF file "Fast Web View" option to open the first several pages of the document while the rest of the document continues to load.
         1) To do this:
            a) Select Edit→Preferences→ Documents→Save Settings.
            b) Check the Save As optimizes for Fast Web View box.

j. PDF file naming convention:
   1) Use the Specification Section number, the manufacturer's name and the equipment description, separated by underscores.
   2) Example: 11083_Sanitaire_Coarse_Bubble_Diffusers.pdf.
   3) Do not put spaces in the file name.

2. Final electronic submittals:
   a. Submit two (2) copies in PDF file format on two (2) CD-ROM discs (one (1) copy per CD-ROM), each secured in a jewel case.
   b. CD-ROM Labeling:
      1) Provide the following printed labeling on all CD-ROM discs:
         a) Project name.
         b) Specification Section.
         c) Equipment names and tag(s).
         d) Manufacturer name.
         e) Date (month, year).
   c. CD-ROM Jewel Case Holder:
      1) Insert jewel cases containing labled CD-ROM discs in three-ring binder holder (C-Line Products, www.c-lineproducts.com stock number CLI-61968 or equivalent) at the front of each final paper copy.

3. Final paper copy submittals:
   a. Quantity: Provide two (2) copies.
   b. Paper: 8.5 x 11 IN or 11 x 17 IN bright white, 20 pound paper with standard three-hole punching.
   c. 3-Ring Binder:
      1) Provide D-ring binder with clear vinyl sleeves (i.e. view binder) on front and spine.
      2) Insert binder title sheet with the following information under the front and spine sleeves:
         a) Project name.
         b) Specification Section.
         c) Equipment names and tag(s),
         d) Manufacturer name,
         e) Date (month, year),
      3) Provide plastic sheet lifters prior to first page and following last page.
   d. Drawings:
      1) Provide all drawings at 11 x 17 IN size, triple folded and three-hole punched for insertion into manual.
      2) Where reduction is not practical to ensure readability, fold larger drawings separately and place in three-hole punched vinyl envelopes inserted into the binder.
      3) Identify vinyl envelopes with drawing numbers.
   e. Use plastic coated dividers to tab each section of each manual in accordance with the Table of Contents.

C. Equipment Operation and Maintenance Manual Content:
   1. Provide a cover page as the first page of each manual with the following information:
      a. Manufacturer(s) Name and Contact Information.
      b. Vendor's Name and Contact Information.
      c. Date (month, year).
      d. Project Buyer and Project Name.
      e. Specification Section.
      f. Project Equipment Tag Numbers.
      g. Model Numbers.
      h. Engineer's Name.
      i. Seller's Name.
   2. Provide a Table of Contents for each manual.
   3. Provide Equipment Record sheets as follows:
      a. Printed copies of the Equipment Record (Exhibits B1, B2 and B3), as the first tab following the Table of Contents.
      b. Exhibits B1-B3 are available as Fillable PDF Form documents from the Engineer.
      c. Each section of the Equipment Record must be completed in detail; simply referencing the related equipment Operation and Maintenance Manual sections for nameplate, maintenance, spare parts or lubricant information is not acceptable.
      d. For equipment involving separate components (for example, a motor and gearbox), a fully completed Equipment Record is required for each component.
      e. Submittals that do not include the Equipment Record(s) will be rejected without further content review.
   4. Provide a printed copy of the Manufacturer's Field Services report following the Equipment Record sheets.
   5. Provide the following detailed information:
      a. Use equipment tag numbers from the Contract Documents to identify equipment and system components.
      b. Equipment function, normal and limiting operating characteristics.
      c. Instructions for assembly, disassembly, installation, alignment, adjustment, and inspection.
      d. Operating instructions for start-up, normal operation, control, shutdown, and emergency conditions.
      e. Lubrication and maintenance instructions.
      f. Troubleshooting guide.
      g. Mark each sheet to clearly identify specific products and component parts and data applicable to the installation for the Project; delete or cross out information that does not specifically apply to the Project.
      h. Parts lists:
         1) A parts list and identification number of each component part of the equipment.
         2) Exploded view or plan and section views of the equipment with a detailed parts callout matching the parts list.
         3) A list of recommended spare parts.
         4) List of spare parts provided as specified in the associated Specification Section.

5) A list of any special storage precautions which may be required for all spare parts.

i. General arrangement, cross-section, and assembly drawings.
j. Electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams, and interconnection diagrams.
k. Test data and performance curves.
l. As-constructed fabrication or layout drawings and wiring diagrams.
m. Copy of the equipment manufacturer's warranty meeting the requirements of the Contract.
n. Copy of any service contracts provided for the specific piece of equipment as part of the Contract.

6. Additional information as required in the associated equipment or system Specification Section.

D. Building Materials and Finishes Operation and Maintenance Manual Content:
1. Building products, applied materials and finishes:
   a. Include product data, with catalog number, size, composition and color and texture designations.
   b. Provide information for ordering custom manufactured products.
2. Necessary precautions:
   a. Include product MSDS for each approved product.
   b. Include any precautionary application and storage guidelines.
3. Instructions for care and maintenance:
   a. Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods and recommended schedule for cleaning and maintenance.
4. Moisture protection and weather exposed products:
   a. Include product data listing, applicable reference standards, chemical composition, and details of installation.
   b. Provide recommendations for inspections, maintenance and repair.
5. Additional requirements as specified in individual product specifications.

## 1.6 TRANSMITTAL OF SUBMITTALS

A. Operation and Maintenance Manuals.
1. Transmit all submittals to:
   a. The address specified in Specification Section 01 33 00.
2. Transmittal form: Use Operation and Maintenance Manual Transmittal, Exhibit A.
3. Transmittal numbering:
   a. Number each submittal with the Specification Section number followed by a series number beginning with "-01" and increasing sequentially with each additional transmittal, followed by "-OM" (for example: 11061-01-OM).
4. Submit draft and final Operation and Maintenance Manual in electronic format (PDF) to Engineer, until manual is approved.

B. Expedited Return Delivery:
1. Include prepaid express envelope or air bill in submittal transmittal package for any submittals Seller expects or requires express return mail.
2. Inclusion of prepaid express envelope or air bill does not obligate Engineer to conduct expedited review of submittal.

## 1.7 ENGINEER'S REVIEW ACTION

A. Draft Electronic (PDF) Submittals:
   1. Engineer will review and indicate one of the following review actions:
      a. A - ACCEPTABLE
      b. B - FURNISH AS NOTED
      c. C - REVISE AND RESUBMIT
      d. D - REJECTED
   2. Submittals marked as Acceptable or Furnish As Noted will be retained; however, the transmittal form will be returned with a request for the final paper and electronic documents to be submitted.
   3. Copies of submittals marked as Revise and Resubmit or Rejected will be returned with the transmittal form marked to indicate deficient areas.
   4. Resubmit until approved.

B. Final Paper Copy Submittals:
   1. Engineer will review and indicate one (1) of the following review actions:
      a. A - ACCEPTABLE
      b. D - REJECTED
   2. Submittals marked as Acceptable will be retained with the transmittal form returned as noted.
   3. Submittals marked as Rejected will be returned with the transmittal form marked to indicate deficient areas.
   4. Resubmit until approved.

## PART 2 - PRODUCTS - (NOT USED)

## PART 3 - EXECUTION - (NOT USED)

**EXHIBIT A**

# Operation and Maintenance Manual Transmittal _____-_____ - OM

**(Spec Section) (Series)**

| | | |
|---|---|---|
| Project Name: | | Date Received: |
| Project Owner: | | Checked By: |
| Contractor: | Owner: | Log Page: |
| Address: | Address: | HDR No.: |
| Attn: | Attn: | |
| | | 1st. Sub. ReSub. |
| Date Transmitted: | Previous Transmittal Date: | |

| No. Copies | Description of Item | Manufacturer | Dwg. or Data No. | Action Taken* |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Remarks:

To:

From:
*HDR Engineering, Inc.*

Date:

* The Action designated above is in accordance with the following legend:

A - Acceptable
B - Furnish as Noted
C - Revise and Resubmit
D - Rejected

Comments:

By Date

Distribution: Contractor File Field Owner Other

(Jun 1990; Revised Oct 2001, Revised Nov 2007, Revised 2013) Copyright 1991-2014 HDR Engineering, Inc.

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**EXHIBIT B1**

# Equipment Record

## Equipment Data and Spare Parts Summary

| | |
|---|---|
| Project Name | Specification Section: |
| Equipment Name | Year Installed: |
| Project Equipment Tag No(s). | |
| Equipment Manufacturer | Project/ Order No. |
| Address | Phone |
| Fax / Web Site | E-mail |
| Local Vendor/Service Center | |
| Address | Phone |
| Fax / Web Site | E-mail |

### MECHANICAL NAMEPLATE DATA

| | | | | |
|---|---|---|---|---|
| Equip. | | Serial No. | | |
| Make | | Model No. | | |
| ID No. | Frame No. | HP | RPM | Cap. |
| Size | TDH | Imp. Sz. | CFM | PSI |
| Other: | | | | |

### ELECTRICAL NAMEPLATE DATA

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Equip. | | | | Serial No. | | | | |
| Make | | | | Model No. | | | | |
| ID No. | Frame No. | HP | V. | Amp. | HZ | PH | RPM | SF |
| Duty | Code | Ins. Cl. | Type | NEMA | C Amb. | Temp. Rise | Rating | |
| Other: | | | | | | | | |

### SPARE PARTS PROVIDED PER CONTRACT

| Part No. | Part Name | Quantity |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

### RECOMMENDED SPARE PARTS

| Part No. | Part Name | Quantity |
|---|---|---|
| | | |
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EXHIBIT B2

# Equipment Record

## Recommended Maintenance Summary

| Equipment Description | Project Equip. Tag No(s). | |
|---|---|---|

| RECOMMENDED BREAK-IN MAINTENANCE (FIRST OIL CHANGES, ETC.) | INITIAL COMPLETION * FOLLOWING START-UP | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | D | W | M | Q | S | A | RT | Hours |
| | | | | | | | | |
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| RECOMMENDED PREVENTIVE MAINTENANCE | PM TASK INTERVAL * | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | D | W | M | Q | S | A | RT | Hours |
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* D = Daily W = Weekly M = Monthly Q = Quarterly S = Semiannual A = Annual Hours = Run Time I

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**EXHIBIT B3**

# Equipment Record

## Lubrication Summary

| Equipment Description | Project Equip. Tag No(s). |
|---|---|
| | |

| Lubricant Point | | | | | | |
|---|---|---|---|---|---|---|
| Lubricant Type | | Manufacturer | Product | AGMA # | SAE # | ISO |
| | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| Lubricant Point | | | | | | |
| Lubricant Type | | Manufacturer | Product | AGMA # | SAE # | ISO |
| | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| Lubricant Point | | | | | | |
| Lubricant Type | | Manufacturer | Product | AGMA # | SAE # | ISO |
| | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| Lubricant Point | | | | | | |
| Lubricant Type | | Manufacturer | Product | AGMA # | SAE # | ISO |
| | 1 | | | | | |
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| | 5 | | | | | |
| Lubricant Point | | | | | | |
| Lubricant Type | | Manufacturer | Product | AGMA # | SAE # | ISO |
| | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| Lubricant Point | | | | | | |
| Lubricant Type | | Manufacturer | Product | AGMA # | SAE # | ISO |
| | 1 | | | | | |
| | 2 | | | | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |

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**END OF SECTION**

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**SECTION 01 40 00**
QUALITY ASSURANCE

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Seller shall pay all costs associated with specified shop tests of materials and equipment, including retesting of items that fail original tests.
B. Related requirements specified elsewhere:
   1. Inspections and testing required by laws, ordinances, rules, regulations, orders, or approvals of public authorities: Conditions of the Contract.

## PART 2 - PRODUCTS

### 2.1 SELLER'S FIELD SERVICES

A. Seller shall provide and pay for the services of Seller's factory service technician representative to perform the specified services on Seller supplied equipment.
B. Seller shall schedule Seller's field services to avoid conflicting with other field testing.
C. Seller's Authorized Representative shall complete the requirements of this Section and provide preliminary, interim and final Seller's Field Service Reports and its certification of the equipment's proper installation and operation and commencement of the warranty period.

### 2.2 QUALIFICATION OF SELLER'S REPRESENTATIVE

A. Authorized representative of the Seller.
B. Experienced in the application, installation, operation, and training of the subject equipment.
C. Submit qualifications of Seller's representative.

### 2.3 SELLER'S SERVICES PROVIDED BY THE REPRESENTATIVE

A. The Seller shall provide the following Seller's services as listed in individual specification sections for minimum time periods shown therein. All costs shall be at the expense of the Seller to provide the Seller's services. If minimum time not shown provide time as necessary to fulfill service requirements shown below:
   1. Installation Check:
      a. Seller's representative to perform installation and preoperational check as follows.
         1) Inspect, check, and adjust equipment as required and approve installation.
         2) Site visits to be between 7:00 a.m. and 3:30 p.m., on Monday through Friday.
         3) Revisit as often as required to correct all problems and until equipment installation and operation are acceptable to Buyer or Buyer's duly authorized representative:
            a) The cost of additional visits due wholly or in part to deficiencies in Seller's equipment or documentation shall be at no additional cost to Buyer.

   2. Startup:
      a. Seller's representative to start-up and check operation of equipment:
         1) Be present when equipment is placed in operation.

2) Check for proper operation.
3) Check for motor overloads by measuring amperage and voltage on each phase.

3. Seller's Field Service Report:
   a. Submit two (2) preliminary copies of handwritten, typed or electronically produced Seller's field service report (enclosed at end of this section) after services have been performed but prior to Seller's Representative leaving the site:
      1) Submit one copy to Engineer.
      2) Submit one copy to Buyer or Buyer's duly authorized representative.
   b. Submit five (5) copies of final Seller's field service report (enclosed at end of this section) and neatly written, typed or electronically produced within forty-eight (48) hours after the Seller's Representative has completed his inspections and services certifying that:
      1) Equipment is properly installed and lubricated.
      2) Equipment is in accurate alignment.
      3) Equipment is free from any undue stress imposed by connecting anchor bolts.
      4) Equipment has operated satisfactorily under full load conditions.
      5) Signature acknowledgement of Buyer's or Buyer's duly authorized representative's acceptance.

4. Manufacture's Training Service:
   a. Prior to final inspection or acceptance, fully instruct Buyer's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems, for the time period (s) specified in individual specification sections at no cost to the Buyer.
   b. Operation and maintenance information shall constitute the basis of instruction. Review contents of information with personnel in full detail to explain all aspects of operations and maintenance.
   c. Training must be scheduled 7 days in advance with the Buyer. Prior to scheduling training an outline that lists the topics to be covered and time that will be spent on each topic must be submitted and approved by the Engineer. Trainer shall be available to Buyer for a minimum period of 4 consecutive hours, or as required by the individual equipment specifications, between 7:00 AM and 3:30 PM local time. Each session will be held on a different calendar day or different work shift.
   d. Conduct all personnel training after completion of Equipment Startup for the equipment for which training is being conducted:
      1) Personnel training on individual equipment or systems will not be considered completed unless:
         a) All pre-training deliverables are received and approved a minimum of fourteen (14) days before commencement of training on the individual equipment or system.
         b) No system malfunctions occur during training.
         c) All provisions of field and classroom training specifications are met.
      2) Training not in compliance with the above will be performed again in its entirety by the Seller at no additional cost to Buyer.

e. Field and classroom training requirements:
   1) Hold classroom training on-site.

   2) Training instructor: Factory trained and employed, and familiar with giving both classroom and "hands-on" instructions:
      a) Be at classes on time. Session beginning and ending times to be coordinated with the Buyer and indicated on the master schedule. Normal time lengths for class periods can vary, but brief rest breaks should be scheduled and taken. Costs to reschedule session due to late arrival by instructor will be borne by Seller.

   3) Organize training sessions into maintenance verses operation topics and identify on schedule.

   4) Plan for minimum class attendance of 10 people at each session and provide sufficient classroom materials, samples, and handouts for those in attendance.

   5) Instructors have a typed agenda and well prepared instruction material. The use of visual aids, e.g., films, pictures, and slides are recommended during the classroom training programs. Deliver agendas to the Engineer a minimum of 7 days prior to the classroom training. Provide equipment required for presentation of films, slides, and other visual aids.

   6) In the on-site operator training sessions, cover the information required in the Operation and Maintenance manuals submitted according to Section 01 33 04 and the following areas as applicable:
      a) Operation of equipment.
      b) Theory of operation.
      c) Start up procedures.
      d) Shutdown procedures.
      e) Selection of proper polymer types and dosages.
      f) Lubrication of equipment.
      g) Maintenance and repair of equipment.
      h) Replacement parts for the equipment
      i) Troubleshooting of equipment.
      j) Preventive maintenance procedures.
      k) Adjustments to equipment.
      l) Optimizing equipment performance.
      m) Capabilities.
      n) Operational safety.
      o) Emergency situation response.
      p) Takedown procedures (disassembly and assembly).
      q) Recordkeeping.
      r) Instrumentation and controls.
      s) Others deemed important by seller.

7) Address above paragraphs, a), b), c), d), e), f), g), h), i), j), r) etc. in the operation sessions.

8) Address above paragraphs c), d), e), f), g), h), i), j), k), k) etc. in the maintenance sessions.

9) Maintain a log of classroom training including instructors, topics, dates, time, and attendance.

10) Submit Post-Training Report including:
    a) Classroom training log.
    b) List of individuals trained.
    c) Summary of training agenda.
    d) Summary of questions and answers provided.
    e) Recommendations for follow-up training.

## PART 3 - EXECUTION

### 3.1 FIELD TESTING

A. Seller shall pay all costs associated with field testing of his equipment as specified in the individual sections with the following exceptions:
   1. Buyer shall pay for power.

### 3.2 TESTING

A. Provide all materials, labor, and equipment required for testing.
B. Perform all tests in presence of Buyer.
C. Prepare and submit to Engineer five (5) copies of written reports detailing the results of the tests and identifying corrective action for materials and equipment which fail to pass field tests.
D. Repair all materials and equipment which fail during testing with no additional cost to Buyer.

### 3.3 SCHEDULES

A. Seller's Field Services:
   1. Seller's field services as specified in individual specification sections or as specified in Section 46 76 27 Screw Press.

## SELLER FIELD SERVICE REPORT

PROJECT: City of Mount Vernon
Wastewater Treatment Plant Screw Press

CONTRACT:

I. Description

A. Specification Section Number: _____

B. Seller: _____

C. Representative: _____

D. Type of Service: Initial___ Interim___ Final ___

II. General Review

A. The above referenced equipment/material/supplies have been inspected, checked, and adjusted. Yes___ No____

(please explain)_____

_____

B. The above referenced equipment/material/supplies were placed upon properly prepared or suitable substrate. DNA___ Yes___ No___

(please explain)_____

_____

C. The above referenced equipment/material/supplies are free from any undue stress imposed by any connected piping, anchor bolts or any other load.
DNA___ Yes___ No___

(please explain)_____

_____

D. The above referenced equipment/material/supplies have operated under design conditions. DNA___ Yes___ No___
(please explain)_____

_____

E. The above referenced equipment/material/supplies have been installed per the Seller's recommendations and the Procurement Documents, are approved, and require no corrective work. Yes___ No___

(please explain)_____

_____

F. The above referenced equipment/material/supplies are acceptable to the Seller as installed providing the following corrective action is performed (please list):

1. _____
2. _____
3. _____
4. _____
5. _____

III. Inspection Checklist

| | Item | OK | Readings or Comments |
|---|---|---|---|
| A. | Bearings | _____ | _____ |
| B. | Belts | _____ | _____ |
| C. | Lubrication Levels | _____ | _____ |
| D. | Vibration (Report attached) | _____ | _____ |
| E. | AMPS | _____ | _____ |
| F. | Volts | _____ | _____ |
| G. | Rotation | _____ | _____ |
| H. | Alignment | _____ | _____ |
| I. | Anchor Bolts | _____ | _____ |
| J. | Grout | _____ | _____ |
| K. | Substrate Approval | _____ | _____ |
| L. | Other | | |
| | 1. Motor Megger Test | _____ | _____ |
| | 2. _____ | _____ | _____ |
| | 3. _____ | _____ | _____ |

IV. O&M Manuals

The O&M manual as presented contains all information required for proper operation, maintenance, and instruction of this system. DNA___ Yes___ No___

(please explain)_____

_____

V. Preventive Maintenance

The preventive maintenance summary outlined in the O&M manual is acceptable for operation of the system throughout the warranty period. DNA___ Yes___ No___

(please explain)_____

_____

VI. Spare Parts

All spare parts specified with the system are in new condition and are available on-site for transfer to the Buyer. DNA___ Yes___ No____

(please explain)_____

_____

VII. Operator Training/Classroom Instruction

Operator training and classroom instruction has been performed per the requirements of the Procurement Documents. DNA___ Yes___ No___

(please explain)_____

_____

VIII. Remarks:

_____

_____

_____

IX. Certification

I hereby certify, that I, _____, am a duly authorized representative of the Seller, that I am empowered by the Seller to inspect, approve, and operate his equipment. That I am authorized to make recommendations required to assure that the equipment furnished by the Seller is complete and operational, except as modified herein. I also certify that all information contained herein is true and accurate.

By: _____
Authorized Representative

For: _____

Date: _____

X. Acknowledgements

By: _____

For: _____
(Seller)

Date: _____

By: _____

For: HDR Engineering, Inc
(Engineer)

Date: _____

**END OF SECTION**

**SECTION 01 61 03**
EQUIPMENT: BASIC REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Requirements of this Specification Section apply to all equipment provided on the Project including those found in other Divisions even if not specifically referenced in individual "Equipment" Articles of those Specification Sections.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Bearing Manufacturers Association (ABMA).
   2. American Gear Manufacturers Association (AGMA).
   3. ASTM International (ASTM):
      a. E1934, Standard Guide for Examining Electrical and Mechanical Equipment with Infrared Thermography.
      b. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   4. Hydraulic Institute (HI):
      a. 9.6.4, Centrifugal and Vertical Pumps for Vibration Measurements and Allowable Valves.
   5. International Electrotechnical Commission (IEC).
   6. Institute of Electrical and Electronics Engineers, Inc. (IEEE).
   7. International Organization for Standardization (ISO):
      a. 1940, Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance Tolerances.
   8. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
      b. ICS 6, Enclosures for Industrial Control and System.
      c. MG 1, Motors and Generators.
   9. InterNational Electrical Testing Association (NETA):
      a. ATS, Acceptance Testing Specification for Electrical Power Distribution Equipment and Systems.
   10. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC):
         1) Article 430, Motors, Motor Circuits, and Controllers.
   11. National Institute for Certification in Engineering Technologies (NICET).
   12. National Institute of Standards and Technology (NIST).
   13. Occupational Safety and Health Administration (OSHA):
      a. 29 CFR 1910, Occupational Safety and Health Standards, referred to herein as OSHA Standards.

14. Underwriters Laboratories, Inc. (UL).
    a. 508, Standard for Safety Industrial Control Equipment.
    b. 508A, Standard for Safety Industrial Control Panels.
15. Vibration Institute.

B. Natural frequency analysis firm:
    1. An independent firm, whose sole or principal part of its business is the calculation of and analysis of natural frequencies of rotating equipment.
    2. Minimum of 10 years experience.
    3. Employs a registered professional engineer who has experience in finite element analysis, rotordynamic analysis and experimental modal analysis.
        a. Minimum five (5) years combined field testing and data analysis experience.
        b. Qualified Vibration Category III certification from the Vibration Institute.

C. Electrical Equipment and Connections Testing Program:
    1. Testing firm:
        a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration , and adjusting of systems.
        b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
    2. Field personnel:
        a. Minimum of one (1) year field experience covering all phases of electrical equipment inspection, testing, and calibration.
        b. Relay test technician having previous experience with testing and calibration of relays of the same manufacturer and type used on project and proficient in setting and testing the types of protection elements used.
        c. Supervisor certified by NETA or NICET.
    3. Analysis personnel:
        a. Minimum three (3) years combined field testing and data analysis experience.
        b. Supervisor certified by NETA or NICET.

D. Miscellaneous:
    1. A single manufacturer of a "product" shall be selected and utilized uniformly throughout Project even if:
        a. More than one (1) manufacturer is listed for a given "product" in Specifications.
        b. No manufacturer is listed.
    2. Equipment, electrical assemblies, related electrical wiring, instrumentation, controls, and system components shall fully comply with specific NEC requirements related to area classification and to NEMA 250 and NEMA ICS 6 designations and defined in the Electrical specifications.
    3. Variable speed equipment applications: The driven equipment manufacturer shall have single source responsibility for coordination of the equipment and VFD system and verify their compatibility.

## 1.3 DEFINITIONS

A. Product: Manufactured materials and equipment.

B. Major Equipment Supports - Supports for Equipment:

1. Located on or suspended from elevated slabs with supported equipment weighing 2000 LBS or greater, or;
2. Located on or suspended from roofs with supported equipment weighing 500 LBS or greater, or;
3. Located on slab-on-grade or earth with supported equipment weighing 5000 LBS or more.

C. Equipment:
1. One (1) or more assemblies capable of performing a complete function.
2. Mechanical, electrical, instrumentation or other devices requiring an electrical, pneumatic, electronic or hydraulic connection.
3. Not limited to items specifically referenced in "Equipment" articles within individual Specifications.

D. Installer or Applicator:
1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
2. Installer and applicator are synonymous.

## 1.4 SUBMITTALS

A. Shop Drawings:
1. General for all equipment:
   a. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   b. Data sheets that include manufacturer's name and complete product model number.
      1) Clearly identify all optional accessories that are included.
   c. Acknowledgement that products submitted comply with the requirements of the standards referenced.
   d. Manufacturer's delivery, storage, handling, and installation instructions.
   e. Equipment identification utilizing numbering system and name utilized in Drawings.
   f. Equipment installation details:
      1) Location of anchorage.
      2) Type, size, and materials of construction of anchorage.
      3) Anchorage setting templates.
      4) Manufacturer's installation instructions.
   g. Equipment area classification rating.
   h. Shipping and operating weight.
   i. Equipment physical characteristics:
      1) Dimensions (both horizontal and vertical).
      2) Materials of construction and construction details.
   j. Equipment factory primer and paint data.
   k. Manufacturer's recommended spare parts list.
   l. Equipment lining and coatings.
   m. Equipment utility requirements include air, natural gas, electricity, and water.
   n. Ladders and platforms provided with equipment:
      1) Certification that all components comply fully with OSHA requirements.
      2) Full details of construction/fabrication.
      3) Scaled plan and sections showing relationship to equipment.

2. Mechanical and process equipment:
   a. Operating characteristics:
      1) Technical information including applicable performance curves showing specified equipment capacity, rangeability, and efficiencies.
      2) Brake horsepower requirements.
      3) Copies of equipment data plates.
   b. Piping and duct connection size, type and location.
   c. Equipment bearing life certification.
   d. Equipment foundation data:
      1) Equipment center of gravity.
      2) Criteria for designing vibration, special or unbalanced forces resulting from equipment operation.

3. Electric motor:
   a. Motor manufacturer and model number.
   b. Complete motor nameplate data.
   c. Weight.
   d. NEMA design type.
   e. Enclosure type.
   f. Frame size.
   g. Winding insulation class and temperature rise.
   h. Starts per hour.
   i. Performance data:
      1) Guaranteed minimum efficiencies at 100 percent, 75 percent, and 50 percent of full load
      2) Guaranteed minimum power factor at 100 percent, 75 percent, and 50 percent of full load.
      3) Locked rotor and full load current at rated terminal voltage and minimum permissible or specified terminal voltage.
      4) Starting, full load, and breakdown torque at rated terminal voltage and minimum permissible or specified terminal voltage.
   j. Bearing data and lubrication system.
      1) Equipment driver and connected gear reducer, if applicable.
   k. Thermal protection system including recommended alarm and trip settings for winding and bearing RTD's.
   l. Fabrication and/or layout drawings:
      1) Dimensioned outlined drawing.
      2) Connection diagrams including accessories (strip heaters, thermal protection, etc.).
   m. Certifications:
      1) When utilized with a reduced voltage starter, certify that motor and driven equipment are compatible.
      2) When utilized with a variable frequency controller, certify motor is inverter duty and the controller and motor are compatible.
         a) Include minimum speed at which the motor may be operated for the driven machinery.
   n. Electrical gear:
      1) Unless specified in a narrow-scope Specification Section, provide the following:

a) Equipment ratings: Voltage, continuous current, kVa, watts, short circuit with stand, etc., as applicable.

2) Control panels:
   a) Panel construction.
   b) Point-to-point ladder diagrams.
   c) Scaled panel face and subpanel layout.
   d) Technical product data on panel components.
   e) Panel and subpanel dimensions and weights.
   f) Panel access openings.
   g) Nameplate schedule.
   h) Panel anchorage.

4. Systems schematics and data:
   a. Provide system schematics where required in system specifications.
      1) Acknowledge all system components being supplied as part of the system.
      2) Utilize equipment, instrument and valving tag numbers defined in the Contract Documents for all components.
      3) Provide technical data for each system component showing compliance with the Contract Document requirements.
      4) For piping components, identify all utility connections, vents and drains which will be included as part of the system.

5. Qualifications for:
   a. Natural frequency analysis firm and personnel.
   b. Electrical equipment and connections testing firm and personnel.

6. Equipment Monitoring and Testing plans, in accordance with PART 3 of this Specification Section:
   a. Electrical equipment and connection testing.

B. Contract Closeout Information:
   1. Operation and Maintenance Data:
      a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

C. Informational Submittals:
   1. Sample form letter for equipment field certification.
   2. Certification that equipment has been installed properly, has been initially started up, has been calibrated and/or adjusted as required, and is ready for operation.
   3. Certification for major equipment supports that equipment foundation design loads shown on the Drawings or specified have been compared to actual loads exhibited by equipment provided for this Project and that said design loadings are equal to or greater than the loads produced by the equipment provided.
   4. Field noise testing reports if such testing is specified in narrow-scope Specification Sections.
   5. Notification, at least one (1) week in advance, that motor testing will be conducted at factory.

6. Certification from equipment manufacturer that all manufacturer-supplied control panels that interface in any way with other controls or panels have been submitted to and coordinated with the supplier/installer of those interfacing systems.
7. Motor test reports.
8. Certification prior to Project closeout that electrical panel drawings for manufacturer-supplied control panels truly represent panel wiring including any field-made modifications.
9. Provide three (3) bound final written reports documenting natural frequency testing, vibration monitoring and testing for specified equipment.
    a. Include the acceptance criteria of all equipment tested.
    b. Provide individual tabbed sections for information associated with each piece of tested equipment.
10. Preliminary field quality control testing format to be used as a basis for final field quality control reporting.
11. Testing and monitoring reports in accordance with PART 3 of this Specification Section.
12. Certification that driven equipment and VFD are compatible.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
    1. Motors:
        a. Baldor.
        b. General Electric.
        c. Marathon Electric.
        d. Siemens.
        e. Toshiba
        f. Teco-Westinghouse.
        g. U.S. Motors.
        h. WEG.

    2. Mechanical variable speed drives:
        a. Reeves.
        b. U.S. Motors (VariDrive).

B. Submit request for substitution in accordance with Division 1.

### 2.2 MANUFACTURED UNITS

A. Electric Motors:
    1. Where used in conjunction with adjustable speed AC or DC drives, provide motors that are fully compatible with the speed controllers.
    2. Design for frequent starting duty equivalent to duty service required by driven equipment.
    3. Design for full voltage starting.
    4. Design bearing life based upon actual operating load conditions imposed by driven equipment.
    5. Size for altitude of Project.

6. Furnish with stainless steel nameplates which include all data required by NEC Article 430.
7. Use of manufacturer's standard motor will be permitted on integrally constructed motor driven equipment specified by model number in which a redesign of the complete unit would be required in order to provide a motor with features specified.
8. AC electric motors less than 1/3 HP:
    a. Single phase, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Permanently lubricated sealed bearings conforming to ABMA standards.
    c. Built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element with stainless steel enclosure.
9. AC electric motors 1/3 to 1 HP:
    a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Permanently lubricated sealed bearings conforming to ABMA standards.
        1) For single phase motors, provide built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element.
10. AC electric motors 1-1/2 to 10 HP:
    a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Permanently lubricated sealed bearings conforming to ABMA standards.
    c. For vertical motors provide 15 year, average-life thrust bearings conforming to ABMA standards.
11. AC electric motors greater than 10 HP:
    a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Oil or grease lubricated antifriction bearings conforming to ABMA standards.
        1) Design bearing life for 90 percent survival rating at 50,000 HRS of operation for motors up to and including 100 HP.
        2) For motors greater than 100 HP, design bearing life for 90 percent survival rating at 100,000 HRS of operation.
    c. For vertical motors provide 15 year, average-life thrust bearings conforming to ABMA standards.
    d. Thermal protection:
        1) For motors 50 HP and above controlled from a variable frequency drive and for all other motors 100 HP and above, provide integral thermal detectors with normally closed contacts that will open on overtemperature or resistance type temperature detector (RTD) complete with monitor and alarm panel having a normally closed contact that will open on overtemperature.
            a) Two (2) thermal sensing devices per phase in each phase hot-spot location.
            b) Monitor and alarm panel:
                (1) For constant speed motors, install panel in and energize from the motor starter equipment.
                (2) For variable speed motors, install panel in and energize from the variable speed drive equipment.
12. Severe duty motor to have the following minimum features:
    a. All cast iron construction.
    b. Gasketed conduit box.
    c. Epoxy finish for corrosion protection.
    d. Hydroscopic varnish on windings for corrosion protection.
    e. Drain plug and breather.

B. NEMA Design Squirrel Cage Induction Motors:
   1. Provide motors designed and applied in compliance with NEMA and IEEE for the specific duty imposed by the driven equipment.
   2. Motors to meet NEMA MG 1 (NEMA Premium) efficiencies.
   3. Do not provide motors having a locked rotor kVA per HP exceeding the NEMA standard for the assigned NEMA code letter.
   4. For use on variable frequency type adjustable speed drives, provide:
      a. Induction motors that are in compliance with NEMA MG 1, Part 31.
      b. Nameplate identification meeting NEMA MG 1 Part 31 requirements.
      c. Insulated drive end bearing on all motors.
      d. Insulated non-drive end bearings, at a minimum, on all motors with horizontal shaft 100 HP and larger.
      e. An insulated bearing carrier on the non-drive end for vertical shaft motors 100 HP and larger.
      f. Shaft grounding ring on all motors:
         1) Factory installed, maintenance free, circumferential, bearing protection ring with conductive microfiber shaft contacting material.
         2) Electro Static Technology AEGIS SGR Bearing Protection Ring or approved equal.
   5. Design motor insulation in accordance with NEMA standards for Class F insulation with Class B temperature rise above a 40 DegC ambient.
   6. Design motors for continuous duty.
   7. Size motors having a 1.0 service factor so that nameplate HP is a minimum of 15 percent greater than the maximum HP requirements of the driven equipment over its entire operating range.
      a. As an alternative, furnish motors with a 1.15 service factor and size so that nameplate HP is at least equal to the maximum HP requirements of the driven equipment over its entire operating range.
   8. Motor enclosure and winding insulation application:
      a. The following shall apply unless modified by specific Specification Sections:

| MOTOR LOCATION | MOTOR ENCLOSURE / WINDING INSULATION |
|---|---|
| Unclassified Indoor Areas | TEFC, Standard Insulation |
| Wet indoor Areas | TEFC, Standard Insulation |
| Wet outdoor Areas | TEFC Encapsulated Windings |
| Corrosive Areas | TEFC, Severe/ Chemical Duty |
| Class I, Division 1 Areas | Explosion Proof, Approved for Class I Division 1 Locations |
| Class II, Division 1 Areas | Explosion Proof, Approved for Class II Division 1 Locations |
| Class I or Class II, Division 2 Areas | Explosion Proof, Approved for Division 1 Locations or TEFC with maximum external frame temperature compatible with the gas or dust in the area |

NOTE: Provide TENV motors in the smaller horsepower ratings where TEFC is not available.

   9. Provide oversize conduit box complete with clamp type grounding terminals inside the conduit box.
   10. Balance motors to ISO G2.5 level.
      a. Submit prior to shipping to OEM or job site.

C. Submersible Motors: Refer to individual narrow-scope Specification Sections for submersible motor requirements.

D. V-Belt Drive:
   1. Provide each V-belt drive with sliding base or other suitable tension adjustment.
   2. Provide V-belt drives with a service factor of at least 1.6 at maximum speed.
   3. Provide staticproof belts.

## 2.3 COMPONENTS

A. Gear Drives and Drive Components:
   1. Size drive equipment capable of supporting full load including losses in speed reducers and power transmission.
   2. Provide nominal input horsepower rating of each gear or speed reducer at least equal to nameplate horsepower of drive motor.
   3. Design drive units for 24 HR continuous service, constructed so oil leakage around shafts is precluded.
   4. Utilize gears, gear lubrication systems, gear drives, speed reducers, speed increasers and flexible couplings meeting applicable standards of AGMA.
   5. Gear reducers:
      a. Provide gear reducer totally enclosed and oil lubricated.
      b. Utilize antifriction bearings throughout.
      c. Provide worm gear reducers having a service factor of at least 1.20.
      d. Furnish other helical, spiral bevel, and combination bevel-helical gear reducers with a service factor of at least 1.50.

## 2.4 ACCESSORIES

A. Guards:
   1. Provide each piece of equipment having exposed moving parts with full length, easily removable guards, meeting OSHA requirements.
   2. Interior applications:
      a. Construct from expanded galvanized steel rolled to conform to shaft or coupling surface.
      b. Utilize non-flattened type 16 GA galvanized steel with nominal 1/2 IN spacing.
      c. Connect to equipment frame with hot-dip galvanized bolts and wing nuts.
   3. Exterior applications:
      a. Construct from 16 GA stainless steel or aluminum.
      b. Construct to preclude entrance of rain, snow, or moisture.
      c. Roll to conform to shaft or coupling surface.
      d. Connect to equipment frame with stainless steel bolts and wing nuts.

B. Data Plate:
   1. Attach a stainless steel data plate to each piece of rotary or reciprocating equipment.
   2. Permanently stamp information on data plate including manufacturer's name, equipment operating parameters, serial number and speed.

C. Lifting Eye Bolts or Lugs:
   1. Provide on all equipment 50 LBS or greater.
   2. Provide on other equipment or products as specified in the narrow-scope Specification Sections.

## 2.5 FABRICATION

A. Design, fabricate, and assemble equipment in accordance with modern engineering and shop practices.
B. Manufacture individual parts to standard sizes and gages so that repair parts, furnished at any time, can be installed in field.
C. Furnish like parts of duplicate units to be interchangeable.
D. Ensure that equipment has not been in service at any time prior to delivery, except as required by tests.
E. Furnish equipment which requires periodic internal inspection or adjustment with access panels which will not require disassembly of guards, dismantling of piping or equipment or similar major efforts.
   1. Quick opening but sound, securable access ports or windows shall be provided for inspection of chains, belts, or similar items.

F. Provide common, lipped base plate mounting for equipment and equipment motor where said mounting is a manufacturer's standard option.
   1. Provide drain connection for 3/4 IN PVC tubing.
G. Machine the mounting feet of rotating equipment.
H. Fabricate equipment which will be subject to Corrosive Environment in such a way as to avoid back to back placement of surfaces that can not be properly prepared and painted.
   1. When such back to back fabrication can not be avoided, provide continuous welds to seal such surfaces from contact with corrosive environment.
I. Natural frequency/critical Speed:
   1. All rotating parts accurately machined and in as near perfect rotational balance as practicable.
   2. Excessive vibration is sufficient cause for equipment rejection.
   3. Ratio of all rotative speeds to natural frequency/critical speed of a unit or components: Greater than 1.2.
J. Control Panels Engineered and Provided with the Equipment by the Manufacturer:
   1. Manufacturer’s standard design for components and control logic unless specific requirements are specified in the specific equipment Specification Section.
   2. NEMA or IEC rated components are acceptable, whichever is used in the manufacturer’s standard engineered design, unless specific requirements are required in the specific equipment Specification Section.
   3. Affix entire assembly with a UL 508A label "Listed Enclosed Industrial Control Panel" prior to delivery.
      a. Control panels without an affixed UL 508A label shall be rejected.

## 2.6 SHOP OR FACTORY PAINT FINISHES

A. Electrical Equipment:
   1. Provide factory-applied paint coating system(s) for all electrical equipment components.

## 2.7 SOURCE QUALITY CONTROL

A. Motor Tests:
   1. Test motors in accordance with NEMA and IEEE standards.
   2. Provide routine test for all motors.
   3. The Owner reserves the right to select and have tested, either routine or complete, any motor included in the project.

a. The Owner will pay all costs, including shipping and handling, for all motors successfully passing the tests.
b. The Contractor shall pay all costs, including shipping and handling, for all motors failing the tests.
c. If two (2) successive motors of the same manufacturer fail testing, the Owner has the right to reject all motors from that manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION CHECKS

A. For all equipment specifically required in detailed specifications, secure services of experienced, competent, and authorized representative(s) of equipment manufacturer to visit site of work and inspect, check, adjust and approve equipment installation.
   1. In each case, representative(s) shall be present during placement and start-up of equipment and as often as necessary to resolve any operational issues which may arise.

B. Secure from equipment manufacturer's representative(s) a written report certifying that equipment:
   1. Has been properly installed and lubricated.
   2. Is in accurate alignment.
   3. Is free from any undue stress imposed by connecting piping or anchor bolts.
   4. Has been operated under full load conditions and that it operated satisfactorily.
      a. Secure and deliver a field written report to Owner immediately prior to leaving jobsite.

C. No separate payment shall be made for installation checks.
   1. All or any time expended during installation check does not qualify as Operation and Maintenance training or instruction time when specified.

### 3.2 IDENTIFICATION OF EQUIPMENT AND HAZARD WARNING SIGNS

A. Identify equipment and install hazard warning signs in accordance with manufacturer's standards.

### 3.3 WIRING CONNECTIONS AND TERMINATION

A. Clean wires before installing lugs and connectors.
B. Coat connection with oxidation eliminating compound for aluminum wire.
C. Terminate motor circuit conductors with copper lugs bolted to motor leads.
D. Tape stripped ends of conductors and associated connectors with electrical tape.
   1. Wrapping thickness shall be 150 percent of the conductor insulation thickness.
E. Connections to carry full ampacity of conductors without temperature rise.
F. Terminate spare conductors with electrical tape.

### 3.4 FIELD QUALITY CONTROL

A. General:
   1. Furnish equipment manufacturer's field quality control services and testing as specified in the individual equipment Specification Sections.
   2. Execute pre-demonstration requirements in accordance with Specification Section 46 76 27.

3. Perform and report on all tests required by the equipment manufacturer's Operation and Maintenance Manual.
4. Provide testing of electrical equipment and connections in accordance with the Electrical specifications.
5. Equip testing and analysis personnel with all appropriate project related reference material required to perform tests, analyze results, and provide documentation including, but not limited to:
   a. Contract Drawings and Specifications.
   b. Related construction change documentation.
   c. Approved Shop Drawings.
   d. Approved Operation and Maintenance Manuals.
   e. Other pertinent information as required.

B. Equipment Monitoring and Testing Plans:
   1. Approved in accordance with Shop Drawing submittal schedule.
   2. Included as a minimum:
      a. Qualifications of firm, field personnel, and analysis personnel doing the Work.
      b. List and description of testing and analysis equipment to be utilized.
      c. List of all equipment to be testing, including:
         1) Name and tag numbers identified in the Contract Documents.
         2) Manufacturer's serial numbers.
         3) Other pertinent manufacturer identification,

C. Instruments Used in Equipment and Connections Quality Control Testing:
   1. Minimum calibration frequency:
      a. Field analog instruments: Not more than 6 months.
      b. Field digital instruments: Not more than 12 months.
      c. Laboratory instruments: Not more than 12 months.
      d. If instrument manufacturer's calibration requirements are more stringent, those requirements shall govern.
   2. Carry current calibration status and labels on all testing instruments.
   3. See individual testing programs for additional instrumentation compliance requirements.

D. Testing and Monitoring Program Documentation:
   1. Provide reports with tabbed sections for each piece of equipment tested.
   2. Include all testing results associated with each piece of equipment under that equipment's tabbed section.
      a. Include legible copies of all forms used to record field test information.
   3. Prior to start of testing, submit one (1) copy of preliminary report format for Engineer review and comment
      a. Include data gathering and sample test report forms that will be utilized.
   4. In the final report, include as a minimum, the following information for all equipment tested:
      a. Equipment identification, including:
         1) Name and tag numbers identified in the Contract Documents.
         2) Manufacturer's serial numbers.
         3) Other pertinent manufacturer identification,
      b. Date and time of each test.
      c. Ambient conditions including temperature, humidity, and precipitation.

d. Visual inspection report.
e. Description of test and referenced standards, if any, followed while conducting tests.
f. Results of initial and all retesting.
g. Acceptance criteria.
h. "As found" and "as left" conditions.
i. Corrective action, if required, taken to meet acceptance.
j. Verification of corrective action signed by the Contractor, equipment supplier, and Owner's representative.
k. Instrument calibration dates of all instruments used in testing.

5. Provide three (3) bound final reports prior to Project final completion.

E. Electrical Equipment and Connections Testing Program:
1. Perform testing on Electrical equipment and connections in accordance with the Electrical specification requirements.
2. Testing of motors:
   a. After installation and prior to energizing the motor, perform inspections and tests per NETA ATS 7.15 for all motors.
   b. Ensure motor has been lubricated.
   c. Bump motor to check for correct rotation.
3. Repair or replace equipment shown to be out of range of the acceptable tolerance until the equipment meets or exceeds acceptability standards.

F. Other Testing:
1. Perform tests and inspections not specifically listed but required to assure equipment is safe to energize and operate.
2. Subbase that supports the equipment base and that is made in the form of a cast iron or steel structure that has supporting beams, legs, and cross members that are cast, welded, or bolted shall be tested for a natural frequency of vibration after equipment is mounted.
   a. The ratio of the natural frequency of the structure to the frequency of the disturbing force shall not be between 0.5 and 1.5.

## 3.5 DEMONSTRATION

A. Demonstrate equipment in accordance with Specification Section 46 76 27.

**END OF SECTION**

**SECTION 05 50 00**
METAL FABRICATIONS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Custom fabricated metal items and certain manufactured units not otherwise indicated to be supplied under work of other Specification Sections.
   2. Metal components of Manufacturers provided equipment.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 46 76 27 - Screw Press System.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Aluminum Association (AA):
      a. ADM 1, Aluminum Design Manual.
   2. American Association of State Highway and Transportation Officials (AASHTO):
      a. HB, Standard Specifications for Highway Bridges.
   3. American Institute of Steel Construction (AISC):
      a. 325, Manual of Steel Construction.
      b. 360, Specifications for Structural Steel Buildings (referred to herein as AISC Specification).
   4. American National Standards Institute (ANSI):
      a. A14.3, Ladders - Fixed - Safety Requirements.
   5. American Society of Civil Engineers (ASCE):
      a. 7, Minimum Design Loads for Buildings and Other Structures.
   6. ASTM International (ASTM):
      a. A6, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
      b. A36, Standard Specification for Carbon Structural Steel.
      c. A47, Standard Specification for Ferritic Malleable Iron Castings.
      d. A48, Standard Specification for Gray Iron Castings.
      e. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
      f. A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.
      g. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
      h. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
      i. A197, Standard Specification for Cupola Malleable Iron.
      j. A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
      k. A276, Standard Specification for Stainless Steel Bars and Shapes.

l. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
m. A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
n. A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
o. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
p. A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
q. A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
r. A536, Standard Specification for Ductile Iron Castings.
s. A554, Standard Specification for Welded Stainless Steel Mechanical Tubing.
t. A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
u. A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
v. A668, Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
w. A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
x. A786, Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
y. A992, Standard Specification for Steel for Structural Shapes.
z. A1064, Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
aa. A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
bb. B26, Standard Specification for Aluminum-Alloy Sand Castings.
cc. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
dd. B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
ee. B308, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
ff. B429, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
gg. B632, Standard Specification for Aluminum-Alloy Rolled Tread Plate.
hh. F467, Standard Specification for Nonferrous Nuts for General Use.
ii. F468, Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
jj. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
kk. F835, Standard Specification for Alloy Steel Socket Button and Flat Countersunk Head Cap Screws.
ll. F879, Standard Specification for Stainless Steel Socket Button and Flat Countersunk Head Cap Screws.

mm. F1789, Standard Terminology for F16 Mechanical Fasteners.

7. American Welding Society (AWS):
   a. A5.1/A5.1M, Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding.
   b. D1.1, Structural Welding Code - Steel.
   c. D1.2, Structural Welding Code - Aluminum.
   d. D1.6/D1.6M, Structural Welding Code - Stainless Steel.
8. National Association of Architectural Metal Manufacturers (NAAMM):
   a. AMP 510, Metal Stairs Manual.
   b. AMP 555, Code of Standard Practice for the Architectural Metal Industry (Including Miscellaneous Iron).
   c. MBG 531, Metal Bar Grating Manual.
9. NACE International (NACE).
10. Nickel Development Institute (NiDI):
    a. Publication 11 007, Guidelines for the welded fabrication of nickel-containing stainless steels for corrosion resistant services.
11. Occupational Safety and Health Administration (OSHA):
    a. 29 CFR 1910, Occupational Safety and Health Standards, referred to herein as OSHA Standards.
12. Building code:
    a. International Code Council (ICC):
       1) International Building Code and associated standards, 2016 Edition including all amendments, referred to herein as Building Code.
    b. A117.1, Accessible and Usable Buildings and Facilities.

B. Qualifications:
   1. Qualify welding procedures and welding operators in accordance with AWS.
   2. Fabricator shall have minimum of 10 years experience in fabrication of metal items specified.
   3. Engineer for manufacturer-designed systems and components: Professional structural engineer licensed in the State of Washington.
   4. NACE certified inspector shall have minimum of two (2) years experience performing inspections as indicated.
      a. Have a current Level III coating inspector certification.

## 1.3 DEFINITIONS

A. Fasteners: As defined in ASTM F1789.
B. Galvanizing: Hot-dip galvanizing per ASTM A123/A123M or ASTM A153/A153M with minimum coating of 2.0 OZ of zinc per square foot of metal (average of specimens) unless noted otherwise or dictated by standard.
C. Hardware: As defined in ASTM A153/A153M.
D. Installer or Applicator:
   1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
   2. Installer and applicator are synonymous.

## 1.4 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

2. Qualifications:
   a. NACE inspector qualifications.
3. Fabrication and/or layout drawings and details:
   a. Submit drawings for all fabrications and assemblies.
      1) Include erection drawings, plans, sections, details and connection details.
   b. Identify materials of construction, shop coatings and third party accessories.
4. Product technical data including:
   a. Acknowledgement that products submitted meet requirements of standards referenced.
   b. Manufacturer's installation instructions.

B. Informational Submittals:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Certification of welders and welding processes.
      a. Indicate compliance with AWS.
   3. NACE certification of surface preparation.
   4. NACE certification of paint application.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle fabrications to avoid damage.
B. Store above ground on skids or other supports to keep items free of dirt and other foreign debris and to protect against corrosion.

# PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Galvanizing repair paint:
      a. Clearco Products Co., Inc.
      b. ZRC Products.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

## 2.2 MATERIALS

A. Steel:
   1. Structural:
      a. W-shapes and WT-shapes: ASTM A992, Grade 50.
      b. All other plates and rolled sections: ASTM A36.
   2. Pipe: ASTM A53, Types E or S, Grade B or ASTM A501.
   3. Structural tubing:
      a. ASTM A500, Grade B (46 ksi minimum yield).
   4. Bolts, nuts and washers, high strength:
      a. ASTM A325.
      b. Provide two (2) washers with all bolts.

5. Bolts and nuts:
    a. ASTM A307, Grade A.
6. Welding electrodes: AWS D1.1, E70 Series.
7. Steel forgings: ASTM A668.

B. Iron:
1. Ductile iron: ASTM A536.
2. Gray cast iron: ASTM A48 (minimum 30,000 psi tensile strength).
3. Malleable iron: ASTM A47, ASTM A197.

C. Stainless Steel:
1. Stainless steel in welded applications: Low carbon 'L' type.
2. Minimum yield strength of 30,000 psi and minimum tensile strength of 75,000 psi.
    a. Bars, shapes: ASTM A276, Type 304.
    b. Tubing and pipe: ASTM A269, ASTM A312 or ASTM A554, Type 304 or 316.
    c. Strip, plate and flat bars: ASTM A666, Type 304 or 316.
    d. Bolts and nuts: ASTM F593, Type 304 or 316.
3. Minimum yield strength of 25,000 psi and minimum tensile strength of 70,000 psi.
    a. Strip, plate and flat bar for welded connections, ASTM A666, Type 304L or 316L.
4. Welding electrodes: In accordance with AWS for metal alloy being welded.

D. Aluminum:
1. Alloy 6061-T6, 32,000 psi tensile yield strength minimum.
    a. ASTM B221 and ASTM B308 for shapes including beams, channels, angles, tees and zees.
    b. Weir plates, baffles and deflector plates, ASTM B209.
2. Alloy 6063-T5 or T6, 15,000 psi tensile yield strength minimum.
    a. ASTM B221 and ASTM B429 for bars, rods, wires, pipes and tubes.
3. ASTM B26 for castings.
4. ASTM F468, alloy 2024 T4 for bolts.
5. ASTM F467, alloy 2024 T4 for nuts.
6. Electrodes for welding aluminum: AWS D1.2, filler alloy 4043 or 5356.

E. Washers: Same material and alloy as found in accompanying bolts and nuts.

F. Iron and Steel Hardware: Galvanized in accordance with ASTM A153/A153M when required to be galvanized.

G. Galvanizing Repair Paint:
1. High zinc dust content paint for regalvanizing welds and abrasions.
2. ASTM A780.
3. Zinc content: Minimum 92 percent in dry film.
4. ZRC "ZRC Cold Galvanizing" or Clearco "High Performance Zinc Spray."

H. Dissimilar Materials Protection: See Article 2.4 of this Specification Section.

## 2.3 FABRICATION

A. Verify field conditions and dimensions prior to fabrication.

B. Form materials to shapes indicated with straight lines, true angles, and smooth curves.
   1. Grind smooth all rough welds and sharp edges.
      a. Round all corners to approximately 1/16 IN nominal radius.

C. Provide drilled or punched holes with smooth edges.
   1. Punch or drill for field connections and for attachment of work by other trades.

D. Weld Shop Connections:
   1. Welds to be continuous fillet type unless indicated otherwise.
   2. Full penetration butt weld at bends in stair stringers and ladder side rails.
   3. Weld structural steel in accordance with AWS D1.1 using Series E70 electrodes conforming to AWS A5.1/A5.1M.
   4. Weld aluminum in accordance with AWS D1.2.
   5. Weld stainless steel in accordance with AWS D1.6 and NiDI 11 007.
      a. Treat all welded areas in accordance with ASTM A380.
   6. All headed studs to be welded using automatically timed stud welding equipment.
   7. Grind smooth welds that will be exposed.

E. Passivate stainless steel items and stainless steel welds after they have been ground smooth.
   1. ASTM A380.

F. Conceal fastenings where practicable.

G. Fabricate work in shop in as large assemblies as is practicable.

H. Tolerances:
   1. Rolling:
      a. ASTM A6.
      b. When material received from the mill does not satisfy ASTM A6 tolerances for camber, profile, flatness, or sweep, the Manufacturer is permitted to perform corrective work by the use of controlled heating and mechanical straightening, subject to the limitations of the AISC Specification.
   2. Fabrication tolerance:
      a. Member length:
         1) Both ends finished for contact bearing: 1/32 IN.
         2) Framed members:
            a) 30 FT or less: 1/16 IN.
            b) Over 30 FT: 1/8 IN.
      b. Member straightness:
         1) Compression members: 1/1000 of axial length between points laterally supported.

2) Non-compression members: ASTM A6 tolerance for wide flange shapes.

c. Specified member camber (except compression members):
   1) 50 FT or less: Minus 0/plus 1/2 IN.
   2) Over 50 FT: Minus 0/plus 1/2 IN (plus 1/8 IN per 10 FT over 50 FT).
   3) Members received from mill with 75 percent of specified camber require no further cambering.
   4) Beams/trusses without specified camber shall be fabricated so after erection, camber is upward.
   5) Camber shall be measured in fabrication shop in unstressed condition.

d. At bolted splices, depth deviation shall be taken up by filler plates.
   1) At welded joints, adjust weld profile to conform to variation in depth.
   2) Slope weld surface per AWS requirements.

e. Finished members shall be free from twists, bends and open joints.
   1) Sharp kinks, bends and deviation from above tolerances are cause for rejection of material.

I. Fabricate grating, checkered plate, stairs, ladders and accessories using aluminum } unless shown otherwise on Drawings.
   1. Finish:
      a. Mill, unless noted otherwise.
      b. Coat surfaces in contact with dissimilar materials.

J. Fabricate grating in accordance with NAAMM MBG 531.
   1. Maximum tolerance for difference in depth between grating depth and seat or support angle depth: 1/8 IN.
   2. Distance between edge of grating and face of embedded seat angle or face of wall or other structural member: 1/4 IN.
      a. Tolerance: NAAMM MBG 531.
   3. Removable sections: Not wider than 3 FT and not heavier than 100 LBS.
   4. Ends and perimeter edges: Banded, with alternate bearing bars welded to band.
      a. Provide full depth banding unless noted otherwise.
      b. Banding at trenches and sumps to be 1/4 IN less than grating depth to allow for drainage.
   5. Openings through grating: Reinforced to provide required load carrying capacity and banded with 4 IN high toe plate.
   6. Provide joints at openings between individual grating sections.
   7. Fabricate grating so that bearing bars and cross bars in adjacent sections are aligned.

K. Fabricate checkered plate and miscellaneous metals in accordance with NAAMM AMP 555.
   1. Workmanship: Class 2 unless noted otherwise.

L. Coat surfaces in contact with dissimilar material.
   1. Tnemec Series L69.
   2. 5 mils DFT.

## 2.4 SOURCE QUALITY CONTROL

A. Surface Preparation:
   1. All miscellaneous metal fabrication item surfaces shall be inspected and approved by NACE certified coatings inspector prior to application of shop-applied coatings.
      a. Inspection shall be performed to determine depth of blast profile and cleanliness of surface.
      b. Fabricator shall reblast and or re-clean surfaces as required until acceptable.

B. Shop Applied Coating Application:
   1. After surface has been accepted in writing by NACE certified coatings inspector, fabricator may proceed with application of coatings.
   2. Application of coatings shall be observed and certified by NACE certified coatings inspector.

C. Shop Inspection and Testing:
   1. Employ and pay for the services of a qualified independent testing agency to inspect and test all structural steel work for compliance with Contract Documents.
   2. Manufacturer responsible for testing to qualify shop and field welders and as needed for Manufacturer's own quality control to ensure compliance with Contract Documents.
   3. Independent testing agency shall have a minimum of five (5) years performing similar work and shall be subject to Owner's approval.

D. Responsibilities of Testing Agency:
   1. Inspect shop and field welding in accordance with AWS Code including the following non-destructive testing:
      a. Visually inspect all welds.
      b. In addition to visual inspection, test 50 percent of full penetration welds and 20 percent of fillet welds with liquid dye penetrant or mag particle.
   2. Inspect high-strength bolting in accordance with the RCSC Specification for Structural Joints Using High-Strength Bolts, Section 9.
      a. Verify direct tension indicator gaps, if applicable.
   3. Inspect structural steel which has been erected.
   4. Inspect stud welding in accordance with AWS Code.
   5. Prepare and submit inspection and test reports to Engineer.
      a. Assist Engineer to determine corrective measures necessary for defective work.

# PART 3 - EXECUTION

## 3.1 PREPARATION

A. Provide items to be built into other construction in time to allow their installation.
   1. If such items are not provided in time for installation, cut in and install.

B. Prior to installation, inspect and verify condition of substrate.

C. Correct surface defects or conditions which may interfere with or prevent a satisfactory installation.
   1. Field welding aluminum is not permitted unless approved in writing by Engineer.

## 3.2 CLEANING

A. After fabrication, erection, installation or application, clean all miscellaneous metal fabrication surfaces of all dirt, weld slag and other foreign matter.

B. All stainless steel products in addition to Paragraph A. above:
   1. Remove all heat tint, rusting, discoloration by passivation, ASTM A380, or other acceptable means as listed in NiDI 11 007 as approved by the Engineer.

**END OF SECTION**

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**SECTION 10 14 00**
IDENTIFICATION DEVICES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Tag, tape and stenciling systems for equipment, piping, valves, pumps, ductwork and similar items, and hazard and safety signs.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society of Mechanical Engineers (ASME):
      a. A13.1, Scheme for the Identification of Piping Systems.
   2. The International Society of Automation (ISA).
   3. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
      a. Z535.1, Safety Color Code.
      b. Z535.2, Environmental and Facility Safety Signs.
      c. Z535.3, Criteria for Safety Symbols.
      d. Z535.4, Product Safety Signs and Labels.
   4. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).
   5. Occupational Safety and Health Administration (OSHA):
      a. 29 CFR 1910.145, Specification for Accident Prevention Signs and Tags.

### 1.3 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

   2. Product technical data including:
      a. Catalog information for all identification systems.
      b. Acknowledgement that products submitted meet requirements of standards referenced.

   3. Identification register, listing all items in PART 3 of this Specification Section to be identified, type of identification system to be used, lettering, location and color.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. W.H. Brady Co.
   2. Panduit.
   3. Seton.
   4. National Band and Tag Co.
   5. Carlton Industries, Inc.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

### 2.2 MANUFACTURED UNITS

A. Type A1 - Round Metal Tags:
   1. Materials:
      a. Aluminum or stainless steel.
      b. Stainless steel shall be used in corrosive environments.
   2. Size:
      a. Diameter: 1-1/2 IN minimum.
      b. Thickness: 0.035 IN (20 GA) minimum.
   3. Fabrication:
      a. 3/16 IN minimum mounting hole.
      b. Legend: Stamped and filled with black coloring.
   4. Color: Natural.

B. Type A2 - Rectangle Metal Tags:
   1. Materials: Stainless steel.
   2. Size:
      a. 3-1/2 IN x 1-1/2 IN minimum.
      b. Thickness: 0.036 IN (20 GA) minimum.
   3. Fabrication:
      a. 3/16 IN minimum mounting hole.
      b. Legend: Stamped and filled with black coloring.
   4. Color: Natural.

C. Type A3 - Metal Tape Tags:
   1. Materials: Aluminum or stainless steel.
   2. Size:
      a. Width 1/2 IN minimum.
      b. Length as required by text.
   3. Fabrication:
      a. 3/16 IN minimum mounting hole.
      b. Legend: Embossed.
   4. Color: Natural.

D. Type B1- Square Nonmetallic Tags:
   1. Materials: Fiberglass reinforced plastic.
   2. Size:
      a. Surface: 2 x 2 IN minimum.
      b. Thickness: 100 mils.

3. Fabrication:
    a. 3/16 IN mounting hole with metal eyelet.
    b. Legend: Preprinted and permanently embedded and fade resistant.
4. Color:
    a. Background: Manufacturer standard or as specified.
    b. Lettering: Black.

E. Type B2 - Nonmetallic Signs:
1. Materials: Fiberglass reinforced or durable plastic.
2. Size:
    a. Surface: As required by text.
    b. Thickness: 60 mils minimum.
3. Fabrication:
    a. Rounded corners.
    b. Drilled holes in corners with grommets.
    c. Legend: Preprinted, permanently embedded and fade resistant for a 10 year minimum outdoor durability.
4. Color:
    a. Background: Manufacturer standard or as specified.
    b. Lettering: Black.
5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.

F. Type C - Laminated Name Plates:
1. Materials: Phenolic or DR (high impact) acrylic.
2. Size:
    a. Surface: As required by text.
    b. Thickness: 1/16 IN.
3. Fabrication:
    a. Outdoor rated and UV resistant when installed outdoors.
    b. Two (2) layers laminated.
    c. Legend: Engraved through top lamination into bottom lamination.
    d. Two (2) drilled side holes, for screw mounting.
4. Color: Black top surface, white core, unless otherwise indicated.

G. Type D - Self-Adhesive Tape Tags and Signs:
1. Materials: Vinyl tape or vinyl cloth.
2. Size:
    a. Surface: As required by text.
    b. Thickness: 5 mils minimum.
3. Fabrication:
    a. Indoor/Outdoor grade.
    b. Weather and UV resistant inks.
    c. Permanent adhesive.
    d. Legend: Preprinted.
    e. Wire markers to be self-laminating.
4. Color: White with black lettering or as specified.
5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.

H. Type E - Heat Shrinkable Tape Tags:
   1. Materials: Polyolefin.
   2. Size: As required by text.
   3. Fabrication:
      a. Legend: Preprinted.
   4. Color: White background, black printing.

I. Type F - Underground Warning Tape:
   1. Materials: Polyethylene.
   2. Size:
      a. 6 IN wide (minimum).
      b. Thickness: 3.5 mils.
   3. Fabrication:
      a. Legend: Preprinted and permanently imbedded.
      b. Message continuous printed.
      c. Tensile strength: 1750 psi.
   4. Color: As specified.

J. Type G - Stenciling System:
   1. Materials:
      a. Exterior type stenciling enamel.
      b. Either brushing grade or pressurized spray can form and grade.
   2. Size: As required.
   3. Fabrication:
      a. Legend: As required.
   4. Color: Black or white for best contrast.
   5.

K. Underground Tracer Wire:
   1. Materials:
      a. Wire:
         1) 12 GA AWG.
         2) Solid.
      b. Wire nuts: Waterproof type.
      c. Split bolts: Brass.

## 2.3 ACCESSORIES

A. Fasteners:
   1. Bead chain: #6 brass, aluminum or stainless steel.
   2. Plastic strap: Nylon, urethane or polypropylene.
   3. Screws: Self-tapping, stainless steel.
   4. Adhesive, solvent activated.

## 2.4 MAINTENANCE MATERIALS

A. Where stenciled markers are provided, clean and retain stencils after completion and include in extra stock, along with required stock of paints and applicators.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION

A. Install identification devices at specified locations.
B. All identification devices to be printed by mechanical process, hand printing is not acceptable.
C. Attach tags to equipment with sufficient surface or body area with solvent activated adhesive applied to back of each tag.
D. Attach tags with 1/8 IN round or flat head screws to equipment without sufficient surface or body area, or porous surfaces.
   1. Where attachment with screws should not or cannot penetrate substrate, attach with plastic strap.
E. Single items of equipment enclosed in a housing or compartment to be tagged on outside of housing.
   1. Several items of equipment mounted in housing to be individually tagged inside the compartment.

### 3.2 SCHEDULES

A. Process Systems:
   1. General:
      a. Provide arrows and markers on piping.
         1) At 20 FT maximum centers along continuous lines.
         2) At changes in direction (route) or obstructions.
         3) At valves, risers, "T" joints, machinery or equipment.
         4) Where pipes pass through floors, walls, ceilings, cladding assemblies and like obstructions provide markers on both sides.
      b. Position markers on both sides of pipe with arrow markers pointing in flow direction.
         1) If flow is in both directions use double headed arrow markers.
      c. Apply tapes and stenciling in uniform manner parallel to piping.

   2. Valves and slide gates:
      a. Tag type:
         1) Outdoor locations: Type B1 - Square Nonmetallic Tags.
         2) Indoor noncorrosive:
            a) Type A1 - Round Metal Tags.
            b) Type B1 - Square Nonmetallic Tags.
         3) Indoor corrosive:
            a) Stainless steel Type A1 - Round Metal Tags.
            b) Type B1 - Square Nonmetallic Tags.
      b. Fastener:
         1) Type A1: Chain of the same material.
         2) Type B1: Stainless steel chain.
      c. Color: Per ASME A13.1 corresponding to the piping system.
      d. Legend:
         1) Letter height: 1/4 IN minimum.
         2) Valve designation as indicated on the Drawings (e.g., “V-xxx”).

3. Process equipment (e.g., pumps, pump motors, blowers, air compressors, bar screens, clarifier drive mechanism, screw press, flocculation tanks, mixers, etc.):
   a. Tag type:
      1) Type B2 - Nonmetallic Signs.
      2) Type D - Self-Adhesive Tape Tags and Signs.
      3) Type G - Stenciling System.
   b. Fastener:
      1) Self.
      2) Screws.
      3) Adhesive.
   c. Legend:
      1) Letter height: 1/2 IN minimum.
      2) Equipment designation as indicated on the Drawings (e.g., “Primary Sludge Pump P-xxx”).

4. Piping systems:
   a. Tag type:
      1) Outdoor locations: Type G - Stenciling System.
      2) Indoor locations:
         a) Type D - Self-Adhesive Tape Tags and Signs.
         b) Type G - Stenciling System.
   b. Fastener: Self.
   c. Color: Per ASME A13.1.
   d. Legend:
      1) Letter height: Manufacturers standard for the pipe diameter.
      2) Mark piping in accordance with ASME A13.1.
      3) Use piping designation as indicated on the Drawings.
      4) Arrow: Single arrow.

5. Process tanks (over 1000 GAL) and basins, (e.g., chemical storage, clarifiers, trickling filters, digesters, etc):
   a. Tag type:
      1) Type B2 - Nonmetallic Signs.
      2) Type G - Stenciling System.
   b. Fastener:
      1) Screw.
      2) Self.
   c. Location as directed by Owner.
   d. Legend:
      1) Letter height: 4 IN minimum.
      2) Equipment designation as indicated on the Drawings (e.g., “Clarifier CL-xxx”).

6. Tanks (less than 1000 GAL) (e.g., break tanks, chemical tanks, hydro-pneumatic tanks, air receivers, etc.):
   a. Tag type:
      1) Type D - Self-Adhesive Tape Tags and Signs.
      2) Type G - Stenciling System.
   b. Fastener: Self.

c. Legend:
    1) Letter height: 2 IN minimum.
    2) Equipment designation as indicated on the Drawings (e.g., “Polymer Storage Tank Txxx”)

7. Equipment that starts automatically:
    a. Tag type:
        1) Type B2 - Nonmetallic Signs.
        2) Type D - Self-Adhesive Tape Tags and Signs.
    b. Fastener:
        1) Type B2 - Screw or adhesive.
        2) Type D - Self.
    c. Size: 5 IN x 7 IN
    d. Location: Equipment name.
    e. Legend:
        1) OSHA Warning Sign.
        2) Description of Warning: “THIS MACHINE STARTS AUTOMATICALLY”.

B. Instrumentation Systems:
1. Instrumentation Equipment (e.g., flow control valves, primary elements, etc.):
    a. Tag type:
        1) Outdoor locations: Type B1 - Square Nonmetallic Tags.
        2) Indoor noncorrosive:
            a) Type A1 - Round Metal Tags.
            b) Type B1 - Square Nonmetallic Tags.
        3) Indoor corrosive:
            a) Stainless steel Type A1 - Round Metal Tags.
            b) Type B1 - Square Nonmetallic Tags.
    b. Fastener:
        1) Type A1: Chain of the same material.
        2) Type B1: Stainless steel chain.
    c. Legend:
        1) Letter height: 1/4 IN minimum.
        2) Equipment ISA designation as indicated on the Drawings (e.g., “FIT-xxx”).

2. Enclosure for instrumentation and control equipment, (e.g., PLC control panels, etc.):
    a. Tag type: Type C - Phenolic Name Plates.
    b. Fastener: Screws.
    c. Legend:
        1) Letter height: 1/2 IN minimum.
        2) Equipment name (e.g., "PLC CONTROL PANEL PCP-xxx").

3. Components inside equipment enclosure, (e.g., PLC’s, control relays, contactors, and timers):
    a. Tag type: Type D - Self-Adhesive Tape Tags.
    b. Fastener: Self.

c. Legend:
    1) Letter height: 3/16 IN minimum.
    2) Description or function of component (e.g., "PLC-xxx" or "CR-xxx").

4. Through enclosure door mounted components (e.g., selector switches, controller digital displays, etc.):
    a. Tag type: Type C - Phenolic Name Plates.
    b. Fastener: Screws.
    c. Legend:
        1) Letter height: 1/4 IN minimum.
        2) Component ISA tag number as indicated on the Drawings (e.g., "HS-xxx").

C. Electrical Systems:
1. Trenches with ductbanks, direct-buried conduit, or direct-buried wire and cable.
    a. Tag type: Type F - Underground Warning Tape.
    b. Letter height: 1-1/4 IN minimum.
    c. Location:
        1) Where trench is 12 IN or more below finished grade: In trench 6 IN below finished grade.
        2) Where trench is less than 12 IN below finished grade: In trench 3 IN below finished grade.
    d. Electrical power (e.g., low and medium voltage):
        1) Color: Red with black letters.
        2) Legend:
            a) First line: "CAUTION CAUTION CAUTION".
            b) Second line: "BURIED ELECTRIC LINE BELOW".
    e. Communications (e.g., telephone, instrumentation, LAN, SCADA):
        1) Color: Orange with black letters.
        2) Legend:
            a) First line: "CAUTION CAUTION CAUTION".
            b) Second line: "BURIED COMMUNICATION LINE BELOW".

2. Safety switches, separately mounted circuit breakers and motor starters, VFD's, etc.:
    a. Tag type: Type C - Phenolic Name Plates.
    b. Fastener: Screws.
    c. Legend:
        1) Letter height: 1/4 IN minimum.
        2) First line: Description of load equipment is connected to (e.g., "PUMP Pxxx").

3. Enclosure for instrumentation and control equipment, (e.g., lighting control panels, etc.):
    a. Tag type: Type C - Phenolic Name Plates.
    b. Fastener: Screws.
    c. Legend:
        1) Letter height: 1/2 IN minimum.
        2) Equipment name (e.g., "LIGHTING CONTROL PANEL LCPxxx").

4. Components inside equipment enclosures (e.g., circuit breakers, fuses, control power transformers, control relays, contactors, timers, etc.):
   a. Tag type: Type D - Self-Adhesive Tape Tags and Signs.
   b. Fastener: Self.
   c. Legend:
      1) Letter height: 3/16 IN minimum.
      2) Description or function of component (e.g., "M-xxx", “CR-xxx” or “TR-xxx").

5. Through enclosure door mounted equipment (e.g., selector switches, controller digital displays, etc.):
   a. Tag type: Type C - Phenolic Name Plates.
   b. Fastener: Screws.
   c. Legend:
      1) Letter height: 1/4 IN minimum.
      2) Component tag number as indicated on the Drawings or as defined by contractor (e.g., “HS-xxx”).

6. Conductors in control panels and in pull or junction boxes where multiple circuits exist.
   a. Tag type: Type D - Self-Adhesive Tape Tags.
   b. Fastener: Self.
   c. Tag conductor at both ends.
   d. Legend:
      1) Letter height: 1/8 IN minimum.
      2) Circuit number or wire number as scheduled on the Drawings or as furnished with the equipment.

7. Grounding conductors associated with grounding electrode system in accordance with the following:
   a. Tag type: Type D - Self-Adhesive Tape Tags.
   b. Fastener: Self.
   c. Legend:
      1) Letter height: 1/8 IN minimum.
      2) Function of conductor (e.g., "MAIN BONDING JUMPER", "TO GROUND RING", "TO MAIN WATER PIPE").

8. Flash protection for switchboards, panelboards, industrial control panels and motor control centers:
   a. Tag type: Type D - Self-Adhesive Tape Signs.
   b. Fastener: Self.
   c. Legend: Per NFPA 70.

9. Equipment where more than one (1) voltage source is present:
   a. Tag type:
      1) Type B2 - Nonmetallic Signs.
      2) Type D - Self-Adhesive Tape Signs.
   b. Fastener:
      1) Screw or adhesive.
      2) Self.

c. Size: 1-3/4 IN x 2-1/2 IN.
d. Location: Exterior face of enclosure or cubical.
e. Legend:
    1) OSHA Danger Sign.
    2) Description of Danger: “MULTIPLE VOLTAGE SOURCES”.

**END OF SECTION**

**SECTION 26 05 00**
ELECTRICAL: BASIC REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Basic requirements for electrical systems.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 01 61 03 - Equipment: Basic Requirements.
   4. Section 05 50 00 - Metal Fabrications.
   5. Section 10 14 00 - Identification Devices.
   6. Section 26 05 19 - Wire and Cable - 600 Volt and Below.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Aluminum Association (AA).
   2. American Iron and Steel Institute (AISI).
   3. ASTM International (ASTM):
      a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
      b. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. ETL Testing Laboratories (ETL).
   5. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
      a. C2, National Electrical Safety Code (NESC).
   6. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
   7. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).
   8. Underwriters Laboratories, Inc. (UL).

B. Where UL test procedures have been established for the product type, use UL or ETL approved electrical equipment and provide with the UL or ETL label.

### 1.3 DEFINITIONS

A. For the purposes of providing materials and installing electrical work the following definitions shall be used.
   1. Outdoor area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
   2. Architecturally finished interior area: Offices, laboratories, conference rooms, restrooms, corridors and other similar occupied spaces.
   3. Non-architecturally finished interior area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms, including Screw Press control panel located not directly adjacent to or attached to screw press equipment.
   4. Highly corrosive and corrosive area: Areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures, including equipment attached to the Screw Press.

5. Hazardous areas: Class I, II or III areas as defined in NFPA 70.
6. Shop fabricated: Manufactured or assembled equipment for which a UL test procedure has not been established.

## 1.4 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of submittal process.
   2. See Specification Section 01 61 03 and individual specification sections for submittal requirements for products defined as equipment.
   3. General requirements:
      a. Provide manufacturer's technical information on products to be used, including product descriptive bulletin.
      b. Include data sheets that include manufacturer's name and product model number.
         1) Clearly identify all optional accessories.
      c. Acknowledgement that products are UL or ETL listed or are constructed utilizing UL or ETL recognized components.
      d. Manufacturer's delivery, storage, handling and installation instructions.
      e. Product installation details.
      f. See individual specification sections for any additional requirements.

B. Operation and Maintenance Manuals:
   1. See Specification Section 01 33 04 for requirements for:
      a. The mechanics and administration of the submittal process.
      b. The content process of Operation and Maintenance Manuals.

C. When a Specification Section includes products specified in another Specification Section, each Specification Section shall have the required Shop Drawing transmittal form per Specification Section 01 33 00 and all Specification Sections shall be submitted simultaneously.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect nameplates on electrical equipment to prevent defacing.

## 1.6 AREA DESIGNATIONS

A. Designation of an area will determine the NEMA rating of the electrical equipment enclosures, types of conduits and installation methods to be used in that area.
   1. Outdoor areas:
      a. Wet.
      b. Also, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.
   2. Indoor areas:
      a. Dry.
      b. Also, wet, corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.

# PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, refer to specific Electrical Specification Sections and specific material paragraphs below for acceptable manufacturers.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

C. Provide all components of a similar type by one (1) manufacturer.

## 2.2 MATERIALS

A. Electrical Equipment Support Pedestals and/or Racks:
   1. Approved manufacturers:
      a. Modular strut:
         1) Unistrut Building Systems.
         2) Eaton B-Line.
         3) Globe Strut.
         4) Thomas & Betts Superstrut.
   2. Material requirements:
      a. Modular strut:
         1) Galvanized steel: ASTM A123/123M or ASTM A153/A153M.
         2) Stainless steel: AISI Type 316.
         3) PVC coated galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 mil PVC coating.
         4) Aluminum: AA Type 6063-T6.
      b. Mounting hardware:
         1) Galvanized steel.
         2) Stainless steel.
      c. Anchorage per Specification Section 05 50 00.

B. Field touch-up of galvanized surfaces.
   1. Zinc-rich primer.
      a. One (1) coat, 3.0 mils, ZRC by ZRC Products.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install and wire all equipment, including prepurchased equipment, and perform all tests necessary to assure conformance to the Drawings and Specification Sections and ensure that equipment is ready and safe for energization.

B. Install equipment in accordance with the requirements of:
   1. NFPA 70.
   2. IEEE C2.
   3. The manufacturer's instructions.

C. In general, conduit routing is not shown on the Drawings.
   1. The Contractor is responsible for routing all conduits including those shown on one-line and control block diagrams and home runs shown on floor plans.
   2. Conduit routings and stub-up locations that are shown are approximate; exact routing to be as required for equipment furnished and field conditions.

D. When complete branch circuiting is not shown on the Drawings:
   1. A homerun indicating panelboard name and circuit number will be shown and the circuit number will be shown adjacent to the additional devices (e.g., light fixture and receptacles) on the same circuit.
   2. The Contractor is to furnish and install all conduit and conductors required for proper operation of the circuit.
   3. The indicated home run conduit and conductor size shall be used for the entire branch circuit.

4. See Specification Section 26 05 19 for combining multiple branch circuits in a common conduit.

E. Do not use equipment that exceed dimensions or reduce clearances indicated on the Drawings or as required by the NFPA 70.

F. Install equipment plumb, square and true with construction features and securely fastened.

G. Install electrical equipment, including pull and junction boxes, minimum of 6 IN from process, gas, air and water piping and equipment.

H. Install equipment so it is readily accessible for operation and maintenance, is not blocked or concealed and does not interfere with normal operation and maintenance requirements of other equipment.

I. Provide electrical equipment support system per the following area designations:
   1. Dry areas:
      a. Galvanized system consisting of galvanized steel channels and fittings, nuts and hardware.
      b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation, before rust appears.
   2. Wet areas:
      a. Stainless steel system consisting of stainless steel channels and fittings, nuts and hardware.
      b. Field touch-up cut ends and scratches of galvanized components with the specified primer during the installation, before rust appears.
   3. Corrosive areas:
      a. Aluminum or stainless steel system consisting of aluminum or stainless steel channels and fittings with stainless steel nuts and hardware.
   4. Highly corrosive areas:
      a. PVC coated steel or stainless steel system consisting of PVC coated steel or stainless steel channels and fittings with stainless steel nuts and hardware.

J. Provide all necessary anchoring devices and supports rated for the equipment load based on dimensions and weights verified from approved submittals, or as recommended by the manufacturer.
   1. See Specification Section 05 50 00.
   2. Do not cut, or weld to, building structural members.
   3. Do not mount safety switches or other equipment to equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.

K. Provide corrosion resistant spacers to maintain 1/4 IN separation between metallic equipment and/or metallic equipment supports and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas such as Basins, Clarifiers, Digesters, Reservoirs, etc.

L. Do not place equipment fabricated from aluminum in direct contact with earth or concrete.

M. Screen or seal all openings into equipment mounted outdoors to prevent the entrance of rodents and insects.

N. Do not use materials that may cause the walls or roof of a building to discolor or rust.

O. Identify electrical equipment and components in accordance with Specification Section 10 14 00.

## 3.2 FIELD QUALITY CONTROL

A. Replace equipment and systems found inoperative or defective and re-test.

B. The protective coating integrity of support structures and equipment enclosures shall be maintained.
   1. Repair galvanized components utilizing a zinc rich paint.
   2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
   3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the component.
   4. Repair surfaces which will be inaccessible after installation prior to installation.
   5. See Specification Section 26 05 33 for requirements for conduits and associated accessories.

C. Replace nameplates damaged during installation.

**END OF SECTION**

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**SECTION 26 05 19**
WIRE AND CABLE: 600 VOLT AND BELOW

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Material and installation requirements for:
      a. Building wire.
      b. Power cable.
      c. Control cable.
      d. Instrumentation cable.
      e. Wire connectors.
      f. Insulating tape.
      g. Pulling lubricant.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 26 05 00 - Electrical: Basic Requirements.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
      a. 1202, Standard for Flame-Propagation Testing of Wire and Cable.
   2. Insulated Cable Engineers Association (ICEA):
      a. S-58-679, Standard for Control Cable Conductor Identification.
   3. National Electrical Manufacturers Association (NEMA):
      a. ICS 4, Industrial Control and Systems: Terminal Blocks.
   4. National Electrical Manufacturers Association/Insulated Cable Engineers Association (NEMA/ICEA):
      a. WC 57/S-73-532, Standard for Control Cables.
      b. WC 70/S-95-658, Non-Shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
   5. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).
      b. 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
   6. Telecommunications Industry Association/Electronic Industries Alliance/American National Standards Institute (TIA/EIA/ANSI):
      a. 568, Commercial Building Telecommunications Cabling Standard.
   7. Underwriters Laboratories, Inc. (UL):
      a. 44, Standard for Safety Thermoset-Insulated Wires and Cables.
      b. 83, Standard for Safety Thermoplastic-Insulated Wires and Cables.
      c. 467, Standard for Safety Grounding and Bonding Equipment.
      d. 486A, Standard for Safety Wire Connectors and Soldering Lugs for use with Copper Conductors.
      e. 486C, Standard for Safety Splicing Wire Connections.

f. 510, Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
g. 1277, Standard for Safety Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
h. 1581, Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords.
i. 2250, Standard for Safety Instrumentation Tray Cable.

## 1.3 DEFINITIONS

A. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.
B. Instrumentation Cable:
   1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.
   2. The following are specific types of instrumentation cables:
      a. Analog signal cable:
         1) Used for the transmission of low current (e.g., 4-20mA DC) or low voltage (e.g., 0-10 Vdc) signals, using No. 16 AWG and smaller conductors.
         2) Commonly used types are defined in the following:
            a) TSP: Twisted shielded pair.
            b) TST: Twisted shielded triad.
      b. Digital signal cable: Used for the transmission of digital signals between computers, PLC's, RTU's, etc.
C. Power Cable: Multi-conductor, insulated, with outer sheath containing building wire, No. 8 AWG and larger.
D. Control Cable: Multi-conductor, insulated, with outer sheath containing building wires, No. 14, No. 12 or No. 10 AWG.
E. Building Wire: Single conductor, insulated, with or without outer jacket depending upon type.

## 1.4 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data:
      a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
         1) Wire connectors.
         2) Insulating tape.
         3) Cable lubricant.
      b. See Specification Section 26 05 00 for additional requirements.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. See Specification Section 26 05 00.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Building wire, power and control cable.
      a. Aetna Insulated Wire.
      b. Alphawire.
      c. Cerrowire.
      d. Encore Wire Corporation.
      e. General Cable.
      f. Okonite Company.
      g. Southwire Company.
   2. Instrumentation cable:
      a. Analog cable:
         1) Alphawire.
         2) Belden Inc.
         3) General Cable.
   3. Wire connectors:
      a. Burndy Corporation.
      b. Buchanan.
      c. Ideal.
      d. Ilsco.
      e. 3M Co.
      f. Teledyne Penn Union.
      g. Thomas and Betts.
      h. Phoenix Contact.
   4. Insulating and color coding tape:
      a. 3M Co.
      b. Plymouth Bishop Tapes.
      c. Red Seal Electric Co.
B. Submit request for substitution in accordance with Specification Section 01 25 13.

### 2.2 MANUFACTURED UNITS

A. Building Wire:
   1. Conductor shall be copper with 600 V rated insulation.
   2. Conductors shall be stranded, except for conductors used in lighting and receptacle circuits which may be stranded or solid.
   3. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
   4. Conform to NEMA/ICEA WC 70/S-95-658 and UL 83 for type THHN/THWN and THHN/THWN-2 insulation.
   5. Conform to NEMA/ICEA WC 70/S-95-658 and UL 44 for type XHHW-2 insulation.

B. Power Cable:
   1. Conductor shall be copper with 600 V rated insulation.

2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
3. Conform to NEMA/ICEA WC 70/S-95-658 and UL 83 and UL 1277 for type THHN/THWN insulation with an overall PVC jacket.
4. Number of conductors as required, including a bare ground conductor.
5. Individual conductor color coding:
   a. ICEA S-58-679, Method 4.
   b. See PART 3 of this Specification Section for additional requirements.
6. Conform to NFPA 70 Type TC.

C. Control Cable:
1. Conductor shall be copper with 600 V rated insulation.
2. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
3. Conform to NEMA/ICEA WC 57/S-73-532 and UL 83 and UL 1277 for type THHN/THWN insulation with an overall PVC jacket.
4. Number of conductors as required, provided with or without bare ground conductor of the same AWG size.
   a. When a bare ground conductor is not provided, an additional insulated conductor shall be provided and used as the ground conductor (e.g., 6/c No. 14 w/g and 7/c No. 14 are equal).
5. Individual conductor color coding:
   a. ICEA S-58-679, Method 1, Table E-2.
   b. See PART 3 of this Specification Section for additional requirements.
6. Conform to NFPA 70 Type TC.

D. Electrical Equipment Control Wire:
1. Conductor shall be copper with 600 V rated insulation.
2. Conductors shall be stranded.
3. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
4. Conform to UL 44 for Type SIS insulation.
5. Conform to UL 83 for Type MTW insulation.

E. Instrumentation Cable:
1. Surface mark with manufacturer's name or trademark, conductor size, insulation type and UL label.
2. Analog cable:
   a. Tinned copper conductors.
   b. 300 V or 600 V PVC insulation with PVC jacket.
   c. Twisted with 100 percent foil shield coverage with drain wire.
   d. Six (6) twists per foot minimum.
   e. Individual conductor color coding: ICEA S-58-679, Method 1, Table E-2.
   f. Conform to UL 2250, UL 1581 and NFPA 70 Type ITC.
3. Digital cable:
   a. As recommended by equipment (e.g., PLC, RTU) manufacturer.
   b. Horizontal voice and data cable:
      1) Category 6 per TIA/EIA/ANSI 568.
      2) Cable shall be label-verified.

3) Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level.
4) Conductors: No. 24 AWG solid untinned copper.
5) Rated CMP per NFPA 70.

c. Conform to NFPA 262 and NFPA 70 Type ITC.

F. Wire Connectors:
1. Twist/screw on type:
a. Insulated pressure or spring type solderless connector.
b. 600 V rated.
c. Ground conductors: Conform to UL 486C and/or UL 467 when required by local codes.
d. Phase and neutral conductors: Conform to UL 486C.
2. Compression and mechanical screw type:
a. 600 V rated.
b. Ground conductors: Conform to UL 467.
c. Phase and neutral conductors: Conform to UL 486A.
3. Terminal block type:
a. High density, screw-post barrier-type with white center marker strip.
b. 600 V and ampere rating as required, for power circuits.
c. 600 V, 20 ampere rated for control circuits.
d. 300 V, 15 ampere rated for instrumentation circuits.
e. Conform to NEMA ICS 4 and UL 486A.

G. Insulating and Color Coding Tape:
1. Pressure sensitive vinyl.
2. Premium grade.
3. Heat, cold, moisture, and sunlight resistant.
4. Thickness, depending on use conditions: 7, 8.5, or 10 mil.
5. For cold weather or outdoor location, tape must also be all-weather.
6. Color:
a. Insulating tape: Black.
b. Color coding tape: Fade-resistant color as specified herein.
7. Comply with UL 510.

H. Pulling Lubricant: Cable manufacturer's standard containing no petroleum or other products which will deteriorate insulation.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Permitted Usage of Insulation Types:
1. Type XHHW-2:
a. Building wire and power and control cable in architectural and non-architectural finished areas.
b. Building wire and power and control cable in conduit below grade.
2. Type THHN/THWN and THHN/THWN-2:
a. Building wire and power and control cable No. 8 AWG and smaller in architectural and non-architectural finished areas.

3. Type SIS and MTW:
   a. For the wiring of control equipment within control panels and field wiring of control equipment within switchgear, switchboards, motor control centers.

B. Conductor Size Limitations:
   1. Feeder and branch power conductors shall not be smaller than No. 12 AWG unless otherwise indicated on the Drawings.
   2. Control conductors shall not be smaller than No. 14 AWG unless otherwise indicated on the Drawings.
   3. Instrumentation conductors shall not be smaller than No. 18 AWG unless otherwise indicated on the Drawings.

C. Color Code All Wiring as Follows:
   1. Building wire:

| | 240 V, 208 V, 240/120 V, 208/120 V | 480 V, 480/277 V |
|---|---|---|
| Phase 1 | Black | Brown |
| Phase 2 | Red * | Orange |
| Phase 3 | Blue | Yellow |
| Neutral | White | White or Gray |
| Ground | Green | Green |

* Orange when it is a high leg of a 120/240 V Delta system.

   a. Conductors No. 6 AWG and smaller: Insulated phase, neutral and ground conductors shall be identified by a continuous colored outer finish along its entire length.
   b. Conductors larger than No. 6 AWG:
      1) Insulated phase and neutral conductors shall be identified by one (1) of the following methods:
         a) Continuous colored outer finish along its entire length.
         b) 3 IN of colored tape applied at the termination.
      2) Insulated grounding conductor shall be identified by one (1) of the following methods:
         a) Continuous green outer finish along its entire length.
         b) Stripping the insulation from the entire exposed length.
         c) Using green tape to cover the entire exposed length.
      3) The color coding shall be applied at all accessible locations, including but not limited to: Junction and pull boxes, wireways, manholes and handholes.

   2. Power cables ICEA S-58-679, Method 4 with:
      a. Phase and neutral conductors identified with 3 IN of colored tape, per the Table herein, applied at the terminations.
      b. Ground conductor: Bare.

3. Control cables ICEA S-58-679, Method 1, Table E-2:
    a. When a bare ground is not provided, one (1) of the colored insulated conductors shall be re-identified by stripping the insulation from the entire exposed length or using green tape to cover the entire exposed length.
    b. When used in power applications the colored insulated conductors used as phase and neutral conductors may have to be re-identified with 3 IN of colored tape, per the Table herein, applied at the terminations.

D. Install all wiring in raceway unless otherwise indicated on the Drawings.

E. Feeder, branch, control and instrumentation circuits shall not be combined in a raceway, cable tray, junction or pull box, except as permitted in the following:
    1. Where specifically indicated on the Drawings.
    2. Where field conditions dictate and written permission is obtained from the Engineer.
    3. Control circuits shall be isolated from feeder and branch power and instrumentation circuits but combining of control circuits is permitted.
        a. The combinations shall comply with the following:
            1) 12 Vdc, 24 Vdc and 48 Vdc may be combined.
            2) 125 Vdc shall be isolated from all other AC and DC circuits.
            3) AC control circuits shall be isolated from all DC circuits.
    4. Instrumentation circuits shall be isolated from feeder and branch power and control circuits but combining of instrumentation circuits is permitted.
        a. The combinations shall comply with the following:
            1) Analog signal circuits may be combined.
            2) Digital signal circuits may be combined but isolated from analog signal circuits.
    5. Multiple branch circuits for lighting, receptacle and other 120 Vac circuits are allowed to be combined into a common raceway.
        a. Contractor is responsible for making the required adjustments in conductor and raceway size, in accordance with all requirements of the NFPA 70, including but not limited to:
            1) Up sizing conductor size for required ampacity de-ratings for the number of current carrying conductors in the raceway.
            2) Up sizing raceway size for the size and quantity of conductors.

F. Ground the drain wire of shielded instrumentation cables at one (1) end only.
    1. The preferred grounding location is at the load (e.g., control panel), not at the source (e.g., field mounted instrument).

G. Splices and terminations for the following circuit types shall be made in the indicated enclosure type using the indicated method.
    1. Feeder and branch power circuits:
        a. Device outlet boxes:
            1) Twist/screw on type connectors.
        b. Junction and pull boxes and wireways:
            1) Twist/screw on type connectors for use on No. 8 and smaller wire.
            2) Compression, mechanical screw or terminal block or terminal strip type connectors for use on No. 6 AWG and larger wire.

c. Motor terminal boxes:
   1) Twist/screw on type connectors for use on No. 10 AWG and smaller wire.
   2) Insulated mechanical screw type connectors for use on No. 8 AWG and larger wire.
d. Manholes or handholes:
   1) Twist/screw on type connectors pre-filled with epoxy for use on No. 8 AWG and smaller wire.
   2) Watertight compression or mechanical screw type connectors for use on No. 6 AWG and larger wire.

2. Control circuits:
   a. Junction and pull boxes: Terminal block type connector.
   b. Manholes or handholes: Twist/screw on type connectors pre-filled with epoxy.
   c. Control panels and motor control centers: Terminal block or strips provided within the equipment or field installed within the equipment by the Contractor.

3. Instrumentation circuits can be spliced where field conditions dictate and written permission is obtained from the Engineer.
   a. Maintain electrical continuity of the shield when splicing twisted shielded conductors.
   b. Junction and pull boxes: Terminal block type connector.
   c. Control panels and motor control centers: Terminal block or strip provided within the equipment or field installed within the equipment by the Contractor.

4. Non-insulated compression and mechanical screw type connectors shall be insulated with tape or hot or cold shrink type insulation to the insulation level of the conductors.

H. Insulating Tape Usage:
   1. For insulating connections of No. 8 AWG wire and smaller: 7 mil vinyl tape.
   2. For insulating splices and taps of No. 6 AWG wire or larger: 10 mil vinyl tape.
   3. For insulating connections made in cold weather or in outdoor locations: 8.5 mil, all weather vinyl tape.

I. Color Coding Tape Usage: For color coding of conductors.

**END OF SECTION**

**SECTION 26 05 26**
GROUNDING AND BONDING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Material and installation requirements for grounding and bonding system(s).
B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 10 14 00 - Identification Devices.
   4. Section 26 05 00 - Electrical: Basic Requirements.
   5. Section 26 05 19 - Wire and Cable - 600 Volt and Below.
   6. Section 26 05 33 - Raceways and Boxes.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. ASTM International (ASTM):
      a. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
   2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
      a. 837, Standard for Qualifying Permanent Connections Used in Substation Grounding.
   3. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).
   4. Underwriters Laboratories, Inc. (UL):
      a. 467, Grounding and Bonding Equipment.
B. Assure ground continuity is continuous throughout the entire Project.

### 1.3 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data.
      a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
         1) Grounding clamps, terminals and connectors.
         2) Exothermic welding system.
      b. See Specification Section 26 05 00 for additional requirements.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Ground rods and bars and grounding clamps, connectors and terminals:
      a. Erico Products, Inc.

b. Harger Lightning & Grounding.
c. Heary Brothers.
d. Hubbell - Burndy.
e. Robbins Lightning Protection.
f. Thomas & Betts - Blackburn.
g. Thompson Lightning Protection.

2. Exothermic weld connections:
   a. Erico Products Inc., Cadweld.
   b. Harger Lightning & Grounding - Ultraweld.
   c. Hubbell - Burndy (Thermoweld).
   d. Thomas & Betts - Furseweld.

## 2.2 COMPONENTS

A. Wire and Cable:
   1. Bare conductors: Soft drawn stranded copper meeting ASTM B8.
   2. Insulated conductors: Color coded green, per Specification Section 26 05 19.
B. Conduit: As specified in Specification Section 26 05 33.
C. Ground Bars:
   1. Solid copper:
      a. 1/4 IN thick.
      b. 2 or 4 IN wide.
      c. 24 IN long minimum in main service entrance electrical rooms, 12 IN long elsewhere.
   2. Predrilled grounding lug mounting holes.
   3. Stainless steel or galvanized steel mounting brackets.
   4. Insulated standoffs.
D. Ground Rods:
   1. 3/4 IN x 10 FT.
   2. Copper-clad:
      a. 10 mil minimum uniform coating of electrolytic copper molecularly bonded to a rigid steel core.
      b. Corrosion resistant bond between the copper and steel.
      c. Hard drawn for a scar-resistant surface.
E. Grounding Clamps, Connectors and Terminals:
   1. Mechanical type:
      a. Standards: UL 467.
      b. High copper alloy content.
   2. Compression type for interior locations:
      a. Standards: UL 467.
      b. High copper alloy content.
      c. Non-reversible.
      d. Terminals for connection to bus bars shall have two bolt holes.
   3. Compression type suitable for direct burial in earth or concrete:
      a. Standards: UL 467, IEEE 837.
      b. High copper alloy content.
      c. Non-reversible.
      d. Factory filled with oxide inhibiting compound.

F. Exothermic Weld Connections:
   1. Copper oxide reduction by aluminum process.
   2. Molds properly sized for each application.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. General:
   1. Install products in accordance with manufacturer's instructions.
   2. Size grounding conductors and bonding jumpers in accordance with NFPA 70, Article 250, except where larger sizes are indicated on the Drawings.
   3. Remove paint, rust, or other non-conducting material from contact surfaces before making ground connections.
   4. Do not splice grounding conductors except at ground rods.
   5. Install ground rods and grounding conductors in undisturbed, firm soil.
      a. Provide excavation required for installation of ground rods and ground conductors.
      b. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
      c. Unless otherwise specified, connect conductors to ground rods with compressor type connectors or exothermic weld.
      d. Provide sufficient slack in grounding conductor to prevent conductor breakage during backfill or due to ground movement.
      e. Backfill excavation completely, thoroughly tamping to provide good contact between backfill materials and ground rods and conductors.
   6. Do not use exothermic welding if it will damage the structure the grounding conductor is being welded to.

B. Grounding Electrode System:
   1. Provide a grounding electrode system in accordance with NFPA 70, Article 250 and as indicated on the Drawings.
   2. Grounding conductor terminations:
      a. Ground bars mounted on wall, use compression type terminal and bolt it to the ground bar with two bolts.
      b. Ground bars in electrical equipment, use compression type terminal and bolt it to the ground bar.
      c. Piping systems use mechanical type connections.
      d. Building steel, below grade and encased in concrete, use compression type connector or exothermic weld.
      e. At all above grade terminations, the conductors shall be labeled per Specification Section 10 14 00.
   3. Ground ring grounding system:
      a. Ground ring consists of ground rods and a grounding conductor looped around the structure.
      b. Placed at a minimum of 10 FT from the structure foundation and 2 FT-6 IN below grade.
      c. Provide a minimum of four (4) ground rods placed at the corners of the structure and additional rods so that the maximum distance between ground rods does not exceed 50 FT.
      d. Building/Structure grounding:

1) Bond building/structure metal support columns to the ground ring at all corners of the structure.

e. Grounding conductor: Bare conductor, size as indicated on the Drawings.

C. Supplemental Grounding Electrode:
1. Provide the following grounding in addition to the equipment ground conductor supplied with the feeder conductors whether or not shown on the Drawings.
2. Metal light poles:
   a. Connect metal pole to a ground rod.
   b. Grounding conductor: Bare #6 AWG minimum.
3. Equipment support rack and pedestals mounted outdoors:
   a. Connect metallic structure to a ground rod.
   b. Grounding conductor: #6 AWG minimum.

D. Low Voltage Transformer Separately Derived Grounding System:
1. Ground separately mounted step-down transformers XO terminal to one of the following:
   a. Closest building steel using mechanical type terminal bolted to the steel, compression type connection or exothermic weld.
   b. Closest water pipe using a mechanical type connection.
2. Ground step-down transformer integrally mounted in motor control center to motor control center ground bus.

E. Raceway Bonding/Grounding:
1. All metallic conduit shall be installed so that it is electrically continuous.
2. All conduits to contain a grounding conductor with insulation identical to the phase conductors, unless otherwise indicated on the Drawings.
3. NFPA 70 required grounding bushings shall be of the insulating type.
4. Provide double locknuts at all panels.
5. Bond all conduit, at entrance and exit of equipment, to the equipment ground bus or lug.
6. Provide bonding jumpers if conduits are installed in concentric knockouts.
7. Make all metallic raceway fittings and grounding clamps tight to ensure equipment grounding system will operate continuously at ground potential to provide low impedance current path for proper operation of overcurrent devices during possible ground fault conditions.

F. Equipment Grounding:
1. All utilization equipment shall be grounded with an equipment ground conductor.

G. Manhole and Handhole Grounding:
1. Provide a ground rod and ground bar, when indicated or as needed, in each manhole and handhole with exposed metal parts.
   a. Expose a minimum of 4 IN of the rod above the floor for field connections to the rod.
2. Connect all exposed metal parts (e.g., conduits and cable racks) to the ground rod.

**END OF SECTION**

**SECTION 26 05 33**
RACEWAYS AND BOXES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Material and installation requirements for:
      a. Conduits.
      b. Conduit fittings.
      c. Conduit supports.
      d. Wireways.
      e. Outlet boxes.
      f. Pull and junction boxes.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 26 05 00 - Electrical: Basic Requirements.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Iron and Steel Institute (AISI).

   2. ASTM International (ASTM):
      a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
      b. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
      c. D2564, Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

   3. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
      b. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit (IMC).
      c. TC 2, Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
      d. TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
      e. TC 14.AG, Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
      f. TC 14.BG, Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.

   4. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
      a. C80.1, Electric Rigid Steel Conduit (ERSC).
      b. C80.3, Steel Electrical Metallic Tubing (EMT).
      c. OS 1, Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

5. National Fire Protection Association (NFPA):
   a. 70, National Electrical Code (NEC).

6. Underwriters Laboratories, Inc. (UL):
   a. 1, Standard for Flexible Metal Conduit.
   b. 6, Standard for Electrical Rigid Metal Conduit - Steel.
   c. 50, Enclosures for Electrical Equipment, Non-Environmental Considerations.
   d. 360, Standard for Liquid-Tight Flexible Steel Conduit.
   e. 467, Grounding and Bonding Equipment.
   f. 514A, Metallic Outlet Boxes.
   g. 514B, Conduit, Tubing, and Cable Fittings.
   h. 651, Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings.
   i. 797, Electrical Metallic Tubing - Steel.
   j. 870, Standard for Wireways, Auxiliary Gutters, and Associated Fittings.
   k. 886, Standard for Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.
   l. 2420, Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
   m. 2515, Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.

## 1.3 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data:
      a. Provide submittal data for all products specified in PART 2 of this Specification Section except:
         1) Conduit fittings.
         2) Support systems.
      b. See Specification Section 26 05 00 for additional requirements.
   3. Fabrication and/or layout drawings:
      a. Identify dimensional size of pull and junction boxes to be used.

## 1.4 DELIVERY, STORAGE, AND HANDLING

See Specification Section 26 05 00.

# PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

   1. Rigid metallic conduits:
      a. Allied Tube and Conduit Corporation.
      b. Triangle PWC Inc.
      c. Western Tube and Conduit Corporation.
      d. Wheatland Tube Company.
      e. LTV Steel Company.

2. PVC coated rigid metallic conduits:
   a. Thomas & Betts Ocal.
   b. Rob-Roy Ind.

3. Rigid nonmetallic conduit:
   a. Prime Conduit (Carlon).
   b. Cantex.
   c. Osburn Associates.
   d. Champion Fiberglass.
   e. United Fiberglass of America, Inc.

4. Flexible conduit:
   a. AFC Cable Systems.
   b. Anamet, Inc.
   c. Electri-Flex.
   d. Flexible Metal Hose Company.
   e. International Metal Hose Company.
   f. Triangle PWC Inc.
   g. LTV Steel Company.

5. Wireway:
   a. Hoffman Engineering Company.
   b. Wiegmann.
   c. Square D.

6. Conduit fittings and accessories:
   a. Appleton Electric Co.
   b. Carlon.
   c. Cantex.
   d. Crouse-Hinds.
   e. Killark.
   f. Osburn Associates.
   g. OZ Gedney Company.
   h. RACO.
   i. Steel City.
   j. Thomas & Betts.

7. Support systems:
   a. Unistrut Building Systems.
   b. Eaton B-Line.
   c. Kindorf.
   d. Minerallac Fastening Systems.
   e. Caddy.
   f. Thomas & Betts Superstrut.

8. Outlet, pull and junction boxes:
   a. Appleton Electric Co.
   b. Eaton Crouse-Hinds.
   c. Killark.
   d. O-Z/Gedney.

e. Thomas & Betts Steel City.
f. Raco.
g. Bell.
h. Hoffman Engineering Co.
i. Wiegmann.
j. Eaton B-Line.
k. Adalet.
l. Rittal.
m. Stahlin.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

## 2.2 RIGID METALLIC CONDUITS

A. Rigid Galvanized Steel Conduit (RGS):
1. Mild steel with continuous welded seam.
2. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing.
3. Threads galvanized after cutting.
4. Internal coating: Baked lacquer, varnish or enamel for a smooth surface.
5. Standards: NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6.

B. PVC-Coated Rigid Steel Conduit (PVC-RGS):
1. Nominal 40 mil Polyvinyl Chloride Exterior Coating:
   a. Coating: Bonded to hot-dipped galvanized rigid steel conduit conforming to NEMA/ANSI C80.1.
   b. The bond between the PVC coating and the conduit surface: Greater than the tensile strength of the coating.
2. Nominal 2 mil, minimum, urethane interior coating.
3. Urethane coating on threads.
4. Conduit: Epoxy prime coated prior to application of PVC and urethane coatings.
5. Female Ends:
   a. Have a plastic sleeve extending a minimum of 1 pipe diameter or 2 IN, whichever is less beyond the opening.
   b. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used with it.
6. Standards: NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6, NEMA RN 1.

## 2.3 FLEXIBLE CONDUIT

A. Flexible Galvanized Steel Conduit (FLEX):
1. Formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked.
2. Standard: NFPA 70 Type FMC, UL 1.

B. PVC-Coated Flexible Galvanized Steel (liquid-tight) Conduit (FLEX-LT):
1. Core formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked.
2. Extruded PVC outer jacket positively locked to the steel core.
3. Liquid and vaportight.
4. Standard: NFPA 70 Type LFMC, UL 360.

## 2.4 WIREWAY

A. General:
   1. Suitable for lay-in conductors.
   2. Designed for continuous grounding.
   3. Covers:
      a. Hinged or removable in accessible areas.
      b. Non-removable when passing through partitions.
   4. Finish: Rust inhibiting primer and manufacturers standard paint inside and out except for stainless steel type.
   5. Standards: UL 870, NEMA 250.

B. Raintight (NEMA 3R) Wiring Trough:
   1. 14 or 16 GA galvanized steel without knockouts.
   2. Cover: Non-gasketed and held in place by captive screws.

C. Watertight (NEMA 4X rated) Wireway:
   1. 14 GA Type 304 or 316 stainless steel bodies and covers without knockouts and 10 GA stainless steel flanges.
   2. Cover: Fully gasketed and held in place with captive clamp type latches.
   3. Flanges: Fully gasketed and bolted.

D. Dusttight (NEMA 12 rated) Wireway:
   1. 14 GA steel bodies and covers without knockouts and 10 GA steel flanges.
   2. Cover: Fully gasketed and held in place with captive clamp type latches.
   3. Flanges: Fully gasketed and bolted.

## 2.5 CONDUIT FITTINGS AND ACCESSORIES

A. Fittings for Use with RGS:
   1. General:
      a. In hazardous locations listed for use in Class I, Groups C and D locations.

   2. Locknuts:
      a. Threaded steel or malleable iron.
      b. Gasketed or non-gasketed.
      c. Grounding or non-grounding type.

   3. Bushings:
      a. Threaded, insulated metallic.
      b. Grounding or non-grounding type.

   4. Hubs: Threaded, insulated and gasketed metallic for raintight connection.

   5. Couplings:
      a. Threaded straight type: Same material and finish as the conduit with which they are used on.
      b. Threadless type: Gland compression or self-threading type, concrete tight.

   6. Unions: Threaded galvanized steel or zinc plated malleable iron.

7. Conduit bodies (ells and tees):
    a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
    b. Standard and mogul size.
    c. Cover:
        1) Clip-on type with stainless steel screws.
        2) Gasketed or non-gasketed galvanized steel, zinc plated cast iron or cast copper free aluminum.

8. Conduit bodies (round):
    a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
    b. Cover: Threaded screw on type, gasketed, galvanized steel, zinc plated cast iron or cast copper free aluminum.

9. Sealing fittings:
    a. Body: Zinc plated cast iron or cast copper free aluminum with threaded hubs.
    b. Standard and mogul size.
    c. With or without drain and breather.
    d. Fiber and sealing compound: UL listed for use with the sealing fitting.

10. Hazardous location flexible coupling (HAZ-FLEX):
    a. Liquid tight and arc resistant.
    b. Electrically conductive so no bonding jumper is required.
    c. Dry and wet areas:
        1) Bronze braided covering over flexible brass core.
        2) Bronze end fittings.
        3) Zinc-plated steel or malleable iron unions and nipples.
    d. Corrosive areas:
        1) Stainless steel braided covering over flexible stainless steel core.
        2) Stainless steel end fittings.
        3) Aluminum unions and nipples.

11. Expansion couplings:
    a. 2 IN nominal straight-line conduit movement in either direction.
    b. Galvanized steel with insulated bushing.
    c. Gasketed for wet locations.
    d. Internally or externally grounded.

12. Expansion/deflection couplings:
    a. 3/4 IN nominal straight-line conduit movement in either direction.
    b. 30-degree nominal deflection from the normal in all directions.
    c. Metallic hubs, neoprene outer jacket and stainless steel jacket clamps.
    d. Internally or externally grounded.
    e. Watertight, raintight and concrete tight.

13. Standards: UL 467, UL 514B, UL 886.

B. Fittings for Use with PVC-RGS:
   1. The same material and construction as those fittings listed under paragraph "Fittings for Use with RGS" and coated as defined under paragraph "PVC Coated Rigid Steel Conduit (PVC-RGS)."

C. Fittings for Use with FLEX:
   1. Connector:
      a. Zinc plated malleable iron.
      b. Squeeze or clamp-type.
   2. Standard: UL 514B.

D. Fittings for Use with FLEX-LT:
   1. Connector:
      a. Straight or angle type.
      b. Metal construction, insulated and gasketed.
      c. Composed of locknut, grounding ferrule and gland compression nut.
      d. Liquid tight.
   2. Standards: UL 467, UL 514B.

E. Weather and Corrosion Protection Tape:
   1. PVC based tape, 10 mils thick.
   2. Protection against moisture, acids, alkalis, salts and sewage and suitable for direct bury.
   3. Used with appropriate pipe primer.

## 2.6 ALL RACEWAY AND FITTINGS

A. Mark Products:
   1. Identify the nominal trade size on the product.
   2. Stamp with the name or trademark of the manufacturer.

## 2.7 OUTLET BOXES

A. Metallic Outlet Boxes:
   1. Hot-dip galvanized steel.

   2. Conduit knockouts and grounding pigtail.

   3. Styles:
      a. 2 IN x 3 IN rectangle.
      b. 4 IN square.
      c. 4 IN octagon.
      d. Masonry/tile.

   4. Accessories:
      a. Flat blank cover plates.
      b. Barriers.
      c. Extension, plaster or tile rings.
      d. Box supporting brackets in stud walls.
      e. Adjustable bar hangers.

   5. Standards: NEMA/ANSI OS 1, UL 514A.

B. Cast Outlet Boxes:
   1. Zinc plated cast iron or die-cast copper free aluminum with manufacturers standard finish.
   2. Threaded hubs and grounding screw.
   3. Styles:
      a. "FS" or "FD".
      b. "Bell".
      c. Single or multiple gang and tandem.
      d. "EDS" or "EFS" for hazardous locations.
   4. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.
   5. Standards: UL 514A, UL 886.

C. See Specification Section 26 27 26 for wiring devices, wallplates and coverplates.

## 2.8 PULL AND JUNCTION BOXES

A. NEMA 1 Rated:
   1. Body and cover: 14 GA minimum, galvanized steel or 14 GA minimum, steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
   2. With or without concentric knockouts on four (4) sides.
   3. Flat cover fastened with screws.

B. NEMA 4 Rated:
   1. Body and cover: 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
   2. Seams continuously welded and ground smooth.
   3. No knockouts.
   4. External mounting flanges.
   5. Hinged or non-hinged cover held closed with stainless steel screws and clamps.
   6. Cover with oil resistant gasket.

C. NEMA 4X Rated (metallic):
   1. Body and cover: 14 GA Type 304 or 316 stainless steel.
   2. Seams continuously welded and ground smooth.
   3. No knockouts.
   4. External mounting flanges.
   5. Hinged door and stainless steel screws and clamps.
   6. Door with oil-resistant gasket.

D. NEMA 4X Rated (Nonmetallic):
   1. Body and cover: Ultraviolet light protected fiberglass-reinforced polyester boxes.
   2. No knockouts.
   3. External mounting flanges.
   4. Hinged door with quick release latches and padlocking hasp.
   5. Door with oil resistant gasket.

E. NEMA 7 and NEMA 9 Rated:
   1. Cast gray iron alloy or copper-free aluminum with manufacturers standard finish.
   2. Drilled and tapped openings or tapered threaded hub.
   3. Cover bolted-down with stainless steel bolts or threaded cover with neoprene gasket.
   4. External mounting flanges.
   5. Grounding lug.
   6. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.

F. NEMA 12 Rated:
   1. Body and cover:
      a. 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
      b. Type 5052 H-32 aluminum, unpainted.
   2. Seams continuously welded and ground smooth.
   3. No knockouts.
   4. External mounting flanges.
   5. Non-hinged cover held closed with captivated cover screws threaded into sealed wells or hinged cover held closed with stainless steel screws and clamps.
   6. Flat door with oil resistant gasket.

G. Miscellaneous Accessories:
   1. Rigid handles for covers larger than 9 SF or heavier than 25 LBS.
   2. Split covers when heavier than 25 LBS.
   3. Weldnuts for mounting optional panels and terminal kits.
   4. Terminal blocks: Screw-post barrier-type, rated 600 volt and 20 ampere minimum.

H. Standards: NEMA 250, UL 50.

## 2.9 SUPPORT SYSTEMS

A. Multi-conduit Surface or Trapeze Type Support and Pull or Junction Box Supports:
   1. Material requirements.
      a. Galvanized steel: ASTM A123/A123M or ASTM A153/A153M.
      b. Stainless steel: AISI Type 316.
      c. PVC coat galvanized steel: ASTM A123/A123M or ASTM A153/A153M and 20 mil PVC coating.

B. Single Conduit and Outlet Box Support Fasteners:
   1. Material requirements:
      a. Zinc plated steel.
      b. Stainless steel.
      c. Malleable iron.
      d. PVC coat malleable iron or steel: 20 mil PVC coating.
      e. Steel protected with zinc phosphate and oil finish.

## PART 3 - EXECUTION

### 3.1 RACEWAY INSTALLATION - GENERAL

A. Shall be in accordance with the requirements of:
   1. NFPA 70.
   2. Manufacturer instructions.

B. Size of Raceways:
   1. Raceway sizes are shown on the Drawings, if not shown on the Drawings, then size in accordance with NFPA 70.

   2. Unless specifically indicated otherwise, the minimum raceway size shall be:
      a. Conduit: 3/4 IN.
      b. Wireway: 2-1/2 IN x 2-1/2 IN.

C. Field Bending and Cutting of Conduits:
   1. Utilize tools and equipment recommended by the manufacturer of the conduit, designed for the purpose and the conduit material to make all field bends and cuts.
   2. Do not reduce the internal diameter of the conduit when making conduit bends.
   3. Prepare tools and equipment to prevent damage to the PVC coating.
   4. Degrease threads after threading and apply a zinc rich paint.
   5. Debur interior and exterior after cutting..

D. Male threads of conduit systems shall be coated with an electrically conductive anti-seize compound.

E. The protective coating integrity of conduits, fittings, outlet, pull and junction boxes and accessories shall be maintained.
   1. Repair galvanized components utilizing a zinc rich paint.
   2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
   3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the conduit; or a self-adhesive, highly conformable, cross-linked silicone composition strip, followed by a protective coating of vinyl tape.
      a. Total nominal thickness: 40 mil.
   4. Repair surfaces which will be inaccessible after installation prior to installation.

F. Remove moisture and debris from conduit before wire is pulled into place.
   1. Pull mandrel with diameter nominally 1/4 IN smaller than the interior of the conduit, to remove obstructions.
   2. Swab conduit by pulling a clean, tight-fitting rag through the conduit.
   3. Tightly plug ends of conduit with tapered wood plugs or plastic inserts until wire is pulled.

## 3.2 RACEWAY ROUTING

A. Raceways shall be routed in the field unless otherwise indicated.
   1. Conduit and fittings shall be installed, as required, for a complete system that has a neat appearance and is in compliance with all applicable codes.
   2. Run in straight lines parallel to or at right angles to building lines.
   3. Conduit shall not interfere with, or prevent access to, piping, valves, ductwork, or other equipment for operation, maintenance and repair.
   4. Provide pull boxes or conduit bodies as needed so that there is a maximum of 360 degrees of bends in the conduit run or in long straight runs to limit pulling tensions.

B. Maintain minimum spacing between parallel conduit and piping runs in accordance with the following when the runs are greater than 30 FT:
   1. Between instrumentation and telecommunication: 1 IN.
   2. Between instrumentation and 125 V, 48 V and 24 Vdc, 2 IN.
   3. Between instrumentation and 600 V and less AC power or control: 6 IN.
   4. Between instrumentation and greater than 600 Vac power: 12 IN.
   5. Between telecommunication and 125 V, 48 V and 24 Vdc, 2 IN.
   6. Between telecommunication and 600 V and less AC power or control: 6 IN.
   7. Between telecommunication and greater than 600 Vac power: 12 IN.
   8. Between 125 V, 48 V and 24 Vdc and 600 V and less AC power or control: 2 IN.
   9. Between 125 V, 48 V and 24 Vdc and greater than 600 Vac power: 2 IN.
   10. Between 600 V and less AC and greater than 600 Vac: 2 IN.
   11. Between process, gas, air and water pipes: 6 IN.

C. Conduits shall be installed to eliminate moisture pockets.
   1. Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.

D. Conduit shall not be routed on the exterior of structures except as specifically indicated on the Drawings.

## 3.3 RACEWAY APPLICATIONS

A. Permitted Raceway Types Per Wire or Cable Types:
   1. Power wire or cables: All raceway types.
   2. Control wire or cables: All raceway types.
   3. Instrumentation cables: Metallic raceway except nonmetallic may be used underground.
   4. Motor leads from a VFD: RGS, RAC or shielded VFD cables in all other raceways.
   5. Telecommunication cables: All raceway types.

B. Permitted Raceway Types Per Area Designations:
   1. Dry areas:
      a. RGS.
   2. Wet areas:
      a. RGS.

3. Corrosive areas:
    a. PVC-RGS.
4. Highly corrosive areas:
    a. PVC-RGS.
5. NFPA 70 hazardous areas:
    a. RGS.

C. HAZ-FLEX coupling shall be installed as the final conduit to motors, electrically operated valves, instrumentation primary elements and electrical equipment that is liable to vibrate.
    1. The maximum length shall not exceed:
        a. 3 FT to motors.
        b. 2 FT to all other equipment.

D. NEMA 4X Rated Wireway:
    1. Surface mounted in areas designated as wet and or corrosive.

E. NEMA 12 Rated Wireway:
    1. Surface mounted in areas designated as dry in architecturally and non-architecturally finished areas.

## 3.4 CONDUIT FITTINGS AND ACCESSORIES

A. Conduit Seals:
    1. Installed in conduit systems located in hazardous areas as required by the NFPA 70.
    2. Filler plug and drain shall be accessible.
    3. Pour the conduit seals in a two-step process.
        a. Pour the seal and leave cover off.
        b. After seal is dry, inspect for proper sealing, install cover and mark (for example, paint or permanent marker) as complete.

B. Threaded connections shall be made wrench-tight.

C. Conduit joints shall be watertight:
    1. Where subjected to possible submersion.
    2. In areas classified as wet.

D. Terminate Conduits:
    1. In metallic outlet boxes:
        a. RGS:
            1) Conduit hub and locknut.
            2) Insulated bushing and two (2) locknuts.
            3) Use grounding type locknut or bushing when required by NFPA 70.

    2. In NEMA 1 rated enclosures:
        a. RGS:
            1) Conduit hub and locknut.
            2) Insulated bushing and two (2) locknuts.
            3) Use grounding type locknut or bushing when required by NFPA 70.

3. In NEMA 12 rated enclosures:
    a. Watertight, insulated and gasketed hub and locknut.
    b. Use grounding type locknut or bushing when required by NFPA 70.

4. In NEMA 4 and NEMA 4X rated enclosures:
    a. Watertight, insulated and gasketed hub and locknut.

## 3.5 CONDUIT SUPPORT

A. Permitted single and multi-conduit surface or trapeze type support system:
    1. All areas:
        a. Stainless steel system: Stainless steel channels and fittings, nuts and hardware and conduit clamps.

B. Conduit Support General Requirements:
    1. Maximum spacing between conduit supports per NFPA 70.
    2. Do not support conduit from process, gas, air or water piping; or from other conduits.
    3. Provide hangers and brackets to limit the maximum uniform load on a single support to 25 LBS or to the maximum uniform load recommended by the manufacturer if the support is rated less than 25 LBS.
        a. Do not exceed maximum concentrated load recommended by the manufacturer on any support.
        b. Conduit hangers:
            1) Continuous threaded rods combined with struts or conduit clamps: Do not use perforated strap hangers and iron bailing wire.

## 3.6 OUTLET, PULL AND JUNCTION BOX INSTALLATION

A. General:
    1. Install products in accordance with manufacturer's instructions.
    2. See Specification Section 26 05 00 and the Drawings for area classifications.
    3. Fill unused punched-out, tapped, or threaded hub openings with insert plugs.
    4. Size boxes to accommodate quantity of conductors enclosed and quantity of conduits connected to the box.

B. Outlet Boxes:
    1. Permitted uses of cast outlet boxes:
        a. Housing of wiring devices surface mounted in non-architecturally finished dry, wet, corrosive, highly corrosive and hazardous areas.
        b. Pull and junction box surface mounted in non-architecturally finished dry, wet, corrosive and highly corrosive areas.

C. Pull and Junction Boxes:
    1. Install pull or junction boxes in conduit runs where required to facilitate pulling of wires or making connections.
        a. Make covers of boxes accessible.

    2. Permitted uses of NEMA 4 enclosure:
        a. Pull or junction box surface mounted in areas designated as wet.

3. Permitted uses of NEMA 4X metallic enclosure:
   a. Pull or junction box surface mounted in areas designated as wet and/or corrosive.

4. Permitted uses of NEMA 7 enclosure:
   a. Pull or junction box surface mounted in areas designated as Class I hazardous.
      1) Provide PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.

5. Permitted uses of NEMA 12 enclosure:
   a. Pull or junction box surface mounted in areas designated as dry.

**END OF SECTION**

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**SECTION 26 09 16**
CONTROL EQUIPMENT ACCESSORIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Operator control devices (selector switches, pushbuttons, indicator lights, etc.).
   2. Control devices (timers, relays, contactors, etc.).
   3. Industrial Control Panels.
   4. Operator Control Stations.

B. Related Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 26 05 00 - Electrical: Basic Requirements.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
      b. ICS 2, Industrial Control and System Controllers, Contactors and Overload Relays Rated 600 Volts.
      c. ICS 5, Control Circuit and Pilot Devices.

   2. Underwriters Laboratories, Inc. (UL):
      a. 508, Standard for Safety Industrial Control Equipment.
      b. 508A, Standard for Safety Industrial Control Panels.

### 1.3 SYSTEM DESCRIPTION

A. This Specification specifies components used within other equipment as referenced in other technical specifications.
B. This Specification is used to specify the components and construction of Operator Control Stations:

### 1.4 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

   2. Product technical data:
      a. Provide submittal data for all products specified in PART 2 of this Specification:
         1) When components are used within equipment specified in another Section, submittal data for components specified herein shall be included with the submittal for the equipment the components are used in.
      b. Industrial Control Panel bill of material.

c. Control Station bill of material.
d. See Specification Section 26 05 00 for additional requirements.

3. Fabrication and/or layout drawings.
   a. Industrial Control Panel:
      1) Interior and exterior layout.
      2) Wiring/connection diagrams.
      3) Short circuit rating.
      4) Copy of the UL 508A label.
   b. Operator Control Station:
      1) Interior (if applicable) and exterior layout.
      2) Wiring/connection diagrams.
   c. Associate Industrial Control Panel and Operator Control Stations with associated equipment name and tagging.

B. Informational Submittals:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Functional Test Plan.

C. Contract Closeout Information:
   1. Operation and Maintenance Data:
      a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
      b. Content of Operation and Maintenance Manual:
         1) Product technical data of components used within Industrial Control Panels and Operator Control Stations.
         2) As-constructed wiring/connection diagrams for Industrial Control Panels and Operator Control Stations.
         3) Functional Test Report.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Pilot devices, relays, contactors, and termination equipment:
      a. Allen-Bradley.
      b. ATC Diversified Electronics.
      c. Automatic Switch Company (ASCO).
      d. c3controls.
      e. Eaton.
      f. General Electric Company.
      g. Idec.
      h. Phoenix Contact.
      i. Potter & Brumsfield.
      j. Schneider Electric.

k. Siemens.
l. Time Mark.

2. Photocells and time clocks:
   a. Grasslin.
   b. Tork.
   c. Intermatic.
   d. Paragon.

3. Alarm devices:
   a. Edwards Signaling.
   b. Federal Signal Corp.

4. Enclosures:
   a. Hoffman Engineering Co.
   b. Wiegmann.
   c. Eaton B-Line.
   d. Adalet.
   e. Stahlin.

## 2.2 PILOT DEVICES

A. General Requirements:
   1. Standards: NEMA ICS 5, UL 508.
   2. Heavy-duty NEMA 4/13 watertight/oiltight.
   3. Heavy-duty NEMA 4/4X corrosion resistant.
   4. Heavy-duty factory sealed, explosion-proof and dust ignition-proof (Class I and II).
   5. Mounting hole: 30.5 mm.
   6. Contact blocks: 10 amp, NEMA A600 rated, number as required to fulfill functions shown or specified.
   7. Legend plate marked as indicated on Drawings or specified.

B. Selector Switches:
   1. Two, three- or four-position rotary switch as required to fulfill functions shown or specified.
   2. Maintained contact type.
   3. Knob or lever type operators.

C. Pushbuttons:
   1. Non-illuminated type:
      a. Protective boot.
      b. Momentary contact.
      c. Standard flush and mushroom operators.
      d. Red colored buttons for START or ON and green color for STOP or OFF.
      e. Emergency stop pushbuttons: Mushroom head operator and maintained contact.
   2. Illuminating type:
      a. Protective boot.
      b. Momentary contact.

c. Standard flush operator.
d. Serves as both pushbutton control and indicating light.
e. Red colored lenses: START or ON.
f. Green colored lense: STOP or OFF.
g. Resistor-type full voltage light unit with lens and panel gasket.

D. Indicating Lights:
1. Allowing replacement of bulb without removal from control panel.
2. Lamp: LED, 120 V or 24 V as required.
3. Full voltage type.
4. Push-to-test indicating lights.
5. Glass lens.
6. Color code lights as follows:
a. Green: OFF or stopped; valve closed.
b. Amber: Standby; auto mode; ready.
c. Red: ON or running; valve open.

## 2.3 RELAYS

A. General Requirements:
1. Standards: NEMA ICS 5, UL 508.

B. Control Relays:
1. General purpose (ice cube) type:
a. Plug-in housing.
b. Clear polycarbonate dust cover with clip fastener.
c. Coil voltage: 120 Vac or as required.
d. Contacts:
1) 10 amp continuous.
2) Silver cadmium oxide.
3) Minimum of 3 SPDT contacts.
e. Sockets: DIN rail mounted.
f. Internal neon or LED indicator is lit when coil is energized.
g. Manual operator switch.

2. Industrial type:
a. Coil voltage: 120 Vac or as required.
b. Contacts:
1) 10 amp, NEMA A600 rated.
2) Double break, silver alloy.
3) Convertible from normally open to normally closed or vice versa, without removing any wiring.
4) Expandable from 2 poles to 12 poles.
c. Provide contacts for all required control plus two spares.

C. Time Delay Relays:
1. General purpose type:
a. Timing modes: On and Off delay, interval, one shot and repeat cycle.
b. Plug-in housing.
c. Polycarbonate dust cover with clip fastener.
d. Coil voltage: 120 Vac or as required.

e. Contacts:
   1) 10 amp continuous.
   2) Silver cadmium oxide.
   3) Two normally open and two normally closed DPDT contacts.
f. Sockets: DIN rail mounted.
g. External timing adjustment knob.
h. Timing ranges: 0.05 seconds to 16.65 HRS.
i. Repeat accuracy: +1 percent.

2. Solid State industrial type:
   a. Timing modes: On and Off delay and repeat cycle.
   b. Industrial housing.
   c. Coil voltage: 120 Vac or as required.
   d. Contacts:
      1) 5 amp, NEMA B150 rated.
      2) Silver alloy.
      3) Convertible On Delay and Off Delay contacts.
      4) One normally open and one normally closed timed contacts.
      5) One normally open and one normally closed instantaneous contacts.
   e. Furnish with "on" and "timing out" indicators.
   f. External timing adjustment knob.
   g. Timing ranges: 0.05 seconds to 10 HRS.
   h. Repeat accuracy: +1 percent.

3. Mechanical industrial type:
   a. Timing modes: On and Off delay.
   b. Coil voltage: 120 Vac or as required.
   c. Contacts:
      1) 10 amp, NEMA A600 rated.
      2) Double break, silver alloy.
      3) Convertible On Delay and Off Delay contacts.
      4) Convertible normally open and normally closed timed contacts.
      5) Convertible normally open instantaneous contacts.
   d. External timing adjustment knob.
   e. Timing ranges: 0.2 - 60 sec or 5 - 180 sec.
   f. Repeat accuracy: Greater than +10 percent.

## 2.4 CONTACTORS

A. General Requirements:
   1. Standards: NEMA ICS 2, UL 508.

B. Lighting and Remote Control Switches:
   1. Electrically operated, electrically held.
   2. Coil voltage: 120 Vac or as required.
   3. Contacts: Totally enclosed, double-break silver-cadmium-oxide.
   4. Rated for ballasted lighting, tungsten and general use loads.
   5. Number of poles, continuous ampere rating and voltage, as indicated on Drawings or as specified.
   6. Auxiliary control relays, as indicated on Drawings or as specified.
   7. Auxiliary contacts, as indicated on Drawings or as specified.

C. Definite Purpose:
   1. Coil voltage: 120 Vac or as required.
   2. Contacts: Totally enclosed, double-break silver-cadmium-oxide.
   3. Resistive load and horsepower rated.
   4. Number of poles, continuous ampere rating and voltage, as indicated on Drawings or as specified.
   5. Auxiliary contacts, as indicated on Drawings or as specified.

## 2.5 PHOTOCELLS AND TIME CLOCKS

A. Photocells:
   1. Weatherproof enclosure.
   2. Adjustable turn-on range, initially set at 1.0 footcandles.
      a. Turn-off level approximately three times turn-on.
   3. Provide time delay device to eliminate nuisance switching.
   4. Voltage, amperage and/or wattage ratings as required for the application.

B. General Requirements for Time Clocks:
   1. Separate manual on-off operation without disturbing automatic settings.
   2. Enclosure:
      a. NEMA 1 for indoor locations.
      b. Stand alone or DIN rail for mounting in control panel.
      c. NEMA 3R or 4 for exterior locations.
   3. Voltage, amperage and/or wattage ratings as required for the application.

C. Electromechanical:
   1. 24 HR dial powered by a self-starting synchronous motor.
   2. Minimum of 16 HR carryover power utilizing a spring-driven reserve with automatic rewind or rechargeable battery.
   3. Minimum of 12 pairs of on-off trippers and a skip-a-day device.

D. Electromechanical:
   1. Seven (7) day dial powered by a self-starting synchronous motor.
   2. Minimum of 24 HR carryover power utilizing a spring-driven reserve with automatic rewind or rechargeable battery.
   3. Minimum of one (1) pair of on-off trippers per day.

E. Electronic:
   1. 24 HR and seven (7) day programmable using solid state technology.
   2. Minimum of 72 HR carryover power utilizing rechargeable battery or capacitor.
   3. Minimum of seven (7) on and seven (7) off set points.

F. Electronic:
   1. 365 day programmable using solid state technology with block programming.
   2. Minimum of 72 HR carryover power utilizing rechargeable battery or capacitor.
   3. Minimum of 48 events per week, 16 individual holiday overrides, daylight savings or standard time selectable, automatic leap year correction.

G. Astronomical Clocks:
   1. Adjustable for the installed latitude.
      a. Settings for astro on/astro off, astro on/time off or time on/astro off.
   2. 365 day programmable using solid state technology with block programming.
   3. Minimum of 72 HR carryover power utilizing rechargeable battery or capacitor.
   4. Minimum of 48 events per week, 16 individual holiday overrides daylight savings or standard time selectable, automatic leap year correction.

## 2.6 ALARM DEVICES

A. Alarm Horns:
   1. Vibrating horn type.
   2. PLC compatible as required.
   3. Heavy-duty die cast housing with corrosion resistant finish.
   4. Adjustable volume: 78 to 103 dB at 10 FT.
   5. Voltage: 120 Vac or as required.
   6. Enclosures/mountings:
      a. Flush wall or panel mounting in dry areas.
      b. NEMA 4X panel mounting in wet areas.
      c. Surface mounting in dry areas.
      d. NEMA 4X surface mounting in wet areas.
      e. NEMA 4X, hazardous location surface mounting in wet and hazardous areas.
         1) Fixed volume: 97 dB at 10 FT.

B. Alarm Lights:
   1. Panel mounted:
      a. Strobe type.
      b. Shatter resistant polycarbonate lens and base.
      c. Lens color as indicated on Drawings.
      d. NEMA 4X enclosure.
      e. PLC compatible.
      f. Voltage: 120 Vac.

   2. Wall mounted:
      a. Heavy-duty strobe type.
      b. Weatherproof shatter resistant polycarbonate lens and cast base.
      c. Optically designed fresnel lens with color as indicated on Drawings.
      d. Immune to shock and vibration, no moving parts.
      e. Xenon flash tube providing a minimum of 65 single flashes per minute.
      f. Mounting: Wall or corner wall brackets.

   3. Hazardous and corrosive locations:
      a. Heavy-duty strobe type.
      b. Weatherproof and rated for the indicated hazardous location.
      c. Body: Zinc plated cast iron or cast copper free aluminum and/or coated with 20 mils of PVC.
      d. High impact glass dome with guard.

e. Shatter resistant polycarbonate lens with color as indicated on Drawings.
f. Immune to shock and vibration, no moving parts.
g. Xenon flash tube providing a minimum of 65 single flashes per minute.
h. Mounting: Wall bracket or pendant.

## 2.7 MISCELLANEOUS DEVICES

A. Run Time Meters:
1. Six-digit wheels including a 1/10 digit.
2. Non-reset type.
3. Time range in hours.
4. Automatic recycle at zero.
5. Accuracy: 1 percent.
6. Sealed against dirt and moisture.
7. Tamperproof.

## 2.8 TERMINATION EQUIPMENT

A. General Requirements:
1. Modular type with screw compression clamp.
2. Screws: Stainless steel.
3. Current bar: Nickel-plated copper alloy.
4. Thermoplastic insulation rated for -40 to +90 DegC.
5. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
6. End sections and end stops at each end of terminal strip.
7. Machine-printed terminal markers on both sides of block.
8. Spacing: 6 mm.
9. Wire size: 22-12 AWG.
10. Rated voltage: 600 V.
11. DIN rail mounting.

B. Standard-type block:
1. Rated current: 30 A.
2. Color: Gray body.

C. Bladed-type disconnect block:
1. Terminal block with knife blade disconnect which connects or isolated the two sides of the block.
2. Rated current: 10 A.
3. Color:
a. Panel control voltage leaves enclosure - normal: Gray body, orange switch.
b. Foreign voltage entering enclosure: Orange body, orange switch.

D. Grounded-type block:
1. Electrically grounded to mounting rail.
2. Terminal ground wires and analog cable shields.
3. Color: Green and yellow body.

E. Fuse Holders:
   1. Blocks can be ganged for multi-pole operation.
   2. Spacing: 9.1 mm.
   3. Wire size: 30-12 AWG.
   4. Rated voltage: 300 V.
   5. Rated current: 12 A.
   6. Fuse size: 1/4 x 1-1/4.
   7. Blown fuse indication.
   8. DIN rail mounting.

## 2.9 ENCLOSURES

A. Industrial Control Panels:
   1. NEMA 4 rated:
      a. Seams continuously welded and ground smooth.
      b. No knockouts.
      c. External mounting flanges.
      d. Hinged or non-hinged cover held closed with stainless steel screws and clamps.
      e. Cover with oil resistant gasket.

   2. NEMA 4X rated:
      a. Body and cover: 14 GA Type 304 or 316 stainless steel.
      b. Seams continuously welded and ground smooth.
      c. No knockouts.
      d. External mounting flanges.
      e. Hinged door and stainless steel screws and clamps.
      f. Door with oil-resistant gasket.

   3. NEMA 7 and 9 rated:
      a. Cast gray iron alloy or copper-free aluminum.
      b. Drilled and tapped openings or tapered threaded hub.
      c. Cover bolted-down with stainless steel bolts or threaded cover with neoprene gasket.
      d. External mounting flanges.
      e. Grounding lug.
      f. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.

   4. NEMA 12 enclosure:
      a. Body and cover: 14 GA steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
      b. No knockouts.
      c. External mounting flanges.
      d. Non-hinged stainless steel cover held closed with captivated cover screws threaded into sealed wells or hinged cover held closed with stainless steel screws and clamps.
      e. Flat door with oil resistant gasket.

5. Control panel miscellaneous accessories:
    a. Back plane mounting panels: Steel with white enamel finish or Type 304 stainless steel.
    b. Interiors shall be white or light gray in color.
    c. Wire management duct:
        1) Bodies: PVC with side holes.
        2) Cover: PVC snap-on.
        3) Size as required.
    d. Rigid handles for covers larger than 9 SF or heavier than 25 LBS.
    e. Split covers when heavier than 25 LBS.
    f. Floor stand kits made of same material as the enclosure.
    g. Weldnuts for mounting optional panels and terminal kits.
    h. Ground bonding jumper from door, across hinge, to enclosure body.

6. Standards: NEMA 250, UL 508.

B. Operator Control Stations:
1. NEMA 4/13 rated:
    a. Die cast aluminum body with manufacturers standard finish.
    b. Gasketed die cast aluminum cover with manufacturers standard finish.
    c. Number of device mounting holes as required.

2. NEMA 4X rated:
    a. Type 304 or 316 stainless steel body.
    b. Gasketed Type 304 or 316 stainless steel cover.
    c. Number of device mounting holes as required.

3. NEMA 7 and 9 rated:
    a. Zinc plated cast iron or die-cast copper free aluminum, with threaded hubs, grounding screw and with manufacturers standard finish.
    b. "EDS" or "EFS" style.
    c. Single or multiple gang or tandem.
    d. Accessories: 40 mil PVC exterior coating and two (2) mil urethane interior coating.

## 2.10 FABRICATION

A. Supplier of Industrial Control Panels shall build control panel under the provisions of UL 508A.
1. Entire assembly shall be affixed with a UL 508A label "Listed Enclosed Industrial Control Panel" prior to shipment to the jobsite.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install as indicated and in accordance with manufacturer's recommendations and instructions.

B. Control Panels:
   1. Size as required to mount the equipment.
   2. Permitted uses of NEMA 4 enclosure:
      a. Surface mounted in areas designated as wet.
   3. Permitted uses of NEMA 4X enclosure:
      a. Surface mounted in areas designated as wet and/or corrosive or highly corrosive.
   4. Permitted uses of NEMA 7 enclosure:
      a. Surface mounted in areas designated as Class I hazardous.
   5. Permitted uses of NEMA 12 enclosure:
      a. Surface mounted in areas designated as dry and/or dusty architecturally or non-architecturally finished areas.

C. Operator Control Stations:
   1. Permitted uses of NEMA 4/13 enclosure:
      a. Surface mounted in areas designated as dry and/or dusty architecturally or non-architecturally finished areas and wet.
   2. Permitted uses of NEMA 4X enclosure:
      a. Surface mounted in areas designated as wet and/or corrosive or highly corrosive.
   3. Permitted uses of NEMA 7 enclosure:
      a. Surface mounted in areas designated as Class I hazardous with PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.

## 3.2 FIELD QUALITY CONTROL

A. See Section 26 05 00.

B. Industrial Control Panel(s) and Operator Control Station Functional Test:
   1. The test is to prove the correct interaction of all sensing, processing and action devices.
   2. Develop a test plan and parameters for the purpose of evaluating the performance of the system.
      a. Plan shall have witness signature lines for the contractor and owner and submitted when system pass the test.
   3. Perform the following tests:
      a. Verify functionality of all control states.
      b. Verify the correct operation of all interlock safety devices for fail-safe functions
      c. Verify the correct operation of all sensing devices, alarms and indicating devices.

## 3.3 TRAINING

A. A qualified supplier representative shall provide the Owner with on-site training in the operation and maintenance of the Industrial Control Panel(s) and its components.

**END OF SECTION**

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**SECTION 26 28 00**
OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Low voltage circuit breakers.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 26 05 00 - Electrical: Basic Requirements.

### 1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
      a. C37.13, Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures.
      b. C37.16, Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors - Preferred Ratings, Related Requirements, and Application Recommendations.
      c. C37.17, Trip Devices for AC and General Purpose DC Low Voltage Power Circuit Breakers.

   2. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).

   3. Underwriters Laboratories, Inc. (UL):
      a. 489, Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
      b. 943, Standard for Safety for Ground-Fault Circuit-Interrupters.
      c. 1066, Standard for Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures.

### 1.3 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Provide submittal data for all products specified in PART 2 of this Specification Section.
      b. See Specification Section 26 05 00 for additional requirements.

B. Contract Closeout Information:
   1. Operation and Maintenance Data:
      a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

C. Informational Submittals:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Reports:
      a. As-left condition of all circuit breakers that have adjustable settings.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Circuit breakers:
      a. Eaton.
      b. General Electric Company.
      c. Square D Company.
      d. Siemens.

B. Submit request for substitution in accordance with Specification Section 01 25 13.

### 2.2 CIRCUIT BREAKERS

A. Molded Case Type:
   1. General:
      a. Standards: UL 489.
      b. Unit construction.
      c. Over-center, toggle handle operated.
      d. Quick-make, quick-break, independent of toggle handle operation.
      e. Manual and automatic operation.
      f. All poles open and close simultaneously.
      g. Three (3) position handle: On, off and tripped.
      h. Molded-in ON and OFF markings on breaker cover.
      i. One-, two- or three-pole as indicated on the Drawings.
      j. Current and interrupting ratings as indicated on the Drawings.
      k. Bolt on type.

   2. Thermal magnetic type:
      a. Inverse time overload and instantaneous short circuit protection by means of a thermal magnetic element.
      b. Frame size 150 amp and below:
         1) Non-interchangeable, non-adjustable thermal magnetic trip units.
      c. Frame sizes 225 to 400 amp (trip settings less than 400A):
         1) Interchangeable and adjustable instantaneous thermal magnetic trip units.
      d. Ground Fault Circuit Interrupter (GFCI) Listed:
         1) Standard: UL 943.
         2) One- or two-pole as indicated on the Drawings.
         3) Class A ground fault circuit.
         4) Trip on 5 mA ground fault (4-6 mA range).

3. Solid state trip type:
    a. Inverse time overload, instantaneous short circuit and ground fault protection by means of a solid state trip element, associated current monitors and flux shunt trip mechanism.
    b. Frame size 400 amp to 1200 amp (trip settings between 400 and 1200A):
        1) Standard rating.
        2) Interchangeable current sensor or rating plug.
        3) Adjustable long time pick-up setting.
            a) Adjustable from 50 to 100 percent of the current sensor or rating plug.
        4) Adjustable short time pick-up setting.
        5) Adjustable instantaneous pick-up.
        6) Fixed ground fault pick-up, when indicated on the Drawings.
    c. Frame size 1600 amp and above:
        1) 100 percent rated.
        2) Interchangeable current sensor or rating plug.
        3) Adjustable long time pick-up setting.
            a) Adjustable from 50 to 100 percent of the current sensor or rating plug.
        4) Adjustable long time delay setting.
        5) Adjustable short time pick-up setting.
        6) Adjustable instantaneous pick-up setting.
        7) Adjustable ground fault pick-up setting, when indicated on the Drawings.
        8) Adjustable ground fault delay setting, when indicated on the Drawings.

4. Motor circuit protector:
    a. Adjustable instantaneous short circuit protection by means of a magnetic or solid state trip element.
    b. Sized for the connected motor.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Current and interrupting ratings as required.
B. Series rated systems not acceptable.
C. Devices shall be ambient temperature compensated.

### 3.2 FIELD QUALITY CONTROL

A. Adjustable Circuit Breakers:
    1. Set all circuit breaker adjustable taps adjust motor circuit protectors per the motor nameplate and NFPA 70 requirements.

**END OF SECTION**

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**SECTION 46 76 27**
SCREW PRESS SYSTEM

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Scope: Furnish all the equipment necessary for the operation of one screw press:
   1. The screw press will be used to dewater primary and waste activated sludge.
   2. Screw press to be specifically designed to maximize solids content of dewatered sludge.

B. Provide one screw press complete with:
   1. Drive motors and gear reducers.
   2. Engineered support system with proper anchorages.
   3. Flocculation tank and mixer.
   4. Electrical and local control panels with measuring and control devices.
   5. Special tools and accessories.
   6. Spare parts.
   7. Sellers field services.
   8. Performance guarantee.
   9. Any other features/equipment required to make a complete system.

C. Related Sections include but are not necessarily limited to:
   1. Special Provisions
   2. Division 1 – General Requirements.
   3. Division 10 – Technical Special Provisions.

### 1.2 QUALITY ASSURANCE

A. Requirements of regulatory agencies and reference standards:
   1. Comply with all local and federal regulations.
      a. Standard Methods for Examination of Water and Wastewater
      b. EPA Sampling Procedures and Protocols for the National Sewage Sludge Survey
      c. EPA POTW Sludge Sampling and Analysis Guidance Documents.

   2. Comply with all necessary local and federal codes including:
      a. American Gear Manufacturers Association.
      b. American Institute Steel Construction.
      c. American Iron and Steel Institute.
      d. American National Standards Institute.
      e. American Society of Mechanical Engineers.
      f. American Society for Testing and Materials.
      g. American Welding Society.
      h. Institute of Electrical and Electronics Engineers.
      i. Instrument Society of America.
      j. National Electrical Code.
      k. National Electrical Manufacturers Association.

l. Steel Structure Painting Council.
m. Underwriter's Laboratories.
n. Uniform Building Code
o. Standard Methods

## 1.3 QUALIFICATIONS

A. Screw press support system shall be designed and Shop Drawings prepared and sealed by a Registered Professional Engineer in the state of Washington.

## 1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 61 03- Equipment Basic Requirements for the required content of the shop drawings.

B. Engineered Submittals:
   1. Equipment supplier shall design and stamp the screw press support system. The design shall include supporting structural calculations and fabrication drawings, both of which are to be prepared and sealed by professional engineer registered in the State of Washington.

C. Performance Guarantee Statement:
   1. On seller's letterhead.
      a. Signed by officer of company.
      b. State ability to meet specified operating parameters for maximum polymer dose, minimum cake solids, and pressate recovery as listed herein.
      c. Performance Guarantee Statement shall be established on the basis of a 60 gpm sludge feed rate.
      d. Maximum polymer dose shall be based on the Owner's existing polymer.

D. Detailed Bill of Shipped Materials:
   1. Complete list of all materials shipped to the Wastewater Treatment Plant.

E. Operation and Maintenance Manuals:
   1. See Section 01 61 03- Equipment Basic Requirements for:
      a. The content of Operation and Maintenance Manuals.
   2. Equipment shall not be started until a manufacturer Operation and Maintenance manual has been submitted and approved.

F. Submittal Milestones:
   1. Submittals shall be provided according to the following schedule:
      a. Performance Guarantee Statement: Submit at time of bid.
      b. Shop Drawings, including electronic AutoCAD files: Submit within 30 days after Notice to Proceed.
         1) Owner review period shall be 10 working days.
      c. Engineered Submittals: Submit within 30 days after Notice to Proceed.
         1) Owner review period shall be 10 working days.
      d. Detailed Bill of Shipped Materials:
         1) Submit on date of shipment.

e. Draft Operations and Maintenance Manual: Submit within 10 days after bid opening.
f. Final Operations and Maintenance Manual:
   1) Final approval in electronic format (PDF) must be obtained 45 days prior to equipment start-up.
   2) Provide paper copies and CD-ROMs of approved final Operation and Maintenance Manuals in electronic format (PDF), a minimum of 30 days prior to equipment start-up.

## 1.5 PROJECT CONDITIONS

A. The screw press and supporting equipment shall be:
   1. Class B Operation:
      a. Furnished equipment shall be capable of dewatering biosolids from anaerobically digested primary and waste activated sludge (WAS).
      b. The flocculation and dewatering systems shall be capable of working in tandem to providing a minimum output capacity of 560 dry tons of solids per year and produce a minimum cake dry weight solids concentration as stated below.
         1) The system shall operate on average 50 hours per week.
   2. Figures 1-2 provide the location and size constraints for the new screw press.

B. Ambient Conditions

| | |
|---|---|
| 1. Average High Temperature: | 74 Degrees F |
| 2. Maximum High Temperature: | 93 Degrees F |
| 3. Maximum Relative Humidity: | 100% |
| 4. Elevation: | 20 ± FT, MSL |

## 1.6 PAYMENT

A. BUYER shall make progress payments on account of the Contract Price on the basis of SELLER's applications for Payment as recommended by ENGINEER, as provided below and in the General Conditions:

| Event<br>Event | Percentage of Payment at each |
|---|---|
| 1. Approval of Shop Drawings | 10 |
| 2. Delivery of Goods | 50 |
| 3. Delivery of Final O&M Manuals | 5 |
| 4. Satisfactory completion of Performance Testing | 30 |
| 5. Satisfactory completion of Personnel Training | 5 |

## 1.7 WARRANTY

A. Equipment Warranty
   1. Seller to warrant the equipment specified herein to be free of defects in workmanship and materials for a period of:
      a. One hundred and twenty (120) months from date that equipment is fully started, commissioned and ready for Buyer's utilization.
      b. Specified test periods are not included for determining start date.
      c. Seller to provide written guarantee to replace defective workmanship and/or materials as defined per the "Warranty" sub-section.

2. Seller to replace any parts that fail due to defects in workmanship and material and shall deliver the parts to the project site at no cost to the Buyer, Engineer and Seller.
   a. Seller or Seller's trained representative to be on site within 48 hours of receiving written notice (via FAX or e-mail) or equipment failure.
   b. Seller or Seller's trained representative to perform diagnostic work.
   c. Seller or Seller's trained representative to order required replacement part(s) immediately.

B. Replace defective parts within 30 calendar days, after written notification.

## 1.8 BASIS FOR DESIGN FOR CLASS B BIOSOLIDS PRODUCTION

| Parameter | Value | Units |
|---|---|---|
| Number of Screw Press Units | 1 | Quantity |
| Dry Tons per Year | 560 | Bone Dry Standard Tons/yr |
| Average Gallons per Day | 24,000[1] | gpd |
| Gallons per Minute | 16.7 | gpm |
| Average Inlet Consistency Percent Total Solids (dry weight basis) | 2.3% to 2.6% | % TS |
| Raw Sludge Volatile Solids | 78 to 82% | %VS |
| Average Raw Sludge Percent Primary Sludge | ±39% | |
| Average Raw Sludge Percent WAS | ±61% | |
| Raw Sludge pH | ±7.3 | |
| Raw Sludge Temperature | ±65 | Degrees Fahrenheit |
| Average Screw Press Operating Flow | 60 | gpm |
| Maximum Screw Press Hydraulic Capacity | 75 | gpm |
| Minimum Screw Press Outlet Consistency Percent Total Solids (at average flow of 60 gpm) | 18.5% | % TS |
| Minimum Screw Press Recovery Efficiency (at average flow of 60 gpm) | 95% | As calculated in 3.6E |
| Maximum Screw Press Polymer Dosage (at average flow of 60 gpm) | 40 | lbs active/ton dry weight solids |

[1] THIS VALUE IS THE AVERAGE DAILY SLUDGE PRODUCTION OF THE TREATMENT PLANT.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE SELLERS

A. Acceptable Manufacturers are defined as Manufacturers capable of meeting the requirements set forth in these contract documents.

### 2.2 MANUFACTURED UNITS

A. Products:

| Item | Description |
|---|---|
| **Screw Press** | |
| Number of Units | 1 |
| Description of Biosolids (Feed) | Anaerobically Digested Municipal Primary and Waste Activated Sludge (WAS). |
| Materials of Construction | 304 stainless steel (L Grade for welded components) |
| Screw design | 304 stainless steel, 100 psi, American Society of Mechanical Engineers (ASME) rated, Teflon coated. |
| Screens | 304 Stainless Steel, wedge wire type. |
| Motor | Horsepower as required , 1800 rpm, National Electrical manufacturers Association (NEMA) B, 480 VAC, 3 Phase (PH, 60 Hertz (Hz), Suitable for variable speed operation with Pulse-width Modulation (PWM) constant torque inverter. |
| Discharge Height for Dewatered Cake | As shown in Figures 1 and 2. |
| Other | 1 set standard tools for screw press.<br>2 sets of brushes with mounting hardware (clips) - (brushes are wear parts).<br>2 bearing assemblies for shaft.<br>2 solenoid valves 110V, Cl.1/ Div.2 for spray bar washing system.<br>20 nozzles for spray bar washing system.<br>2 spare part kits for neat polymer pump. |
| **Flocculation Tank Mixer** | |
| Number | 1 |
| Description | Flocculation Tank and mixer system shall be designed to operate in tandem with the screw press for the range of operating conditions described. Flocculation Tank shall have a hinged cover for accessibility. |
| Mixer | Removable. |
| Pipe Size and Connection | 6" Flanged. |

### 2.3 CONTROLS AND INSTRUMENTATION

A. The control system shall be furnished by the seller of the screw press and shall be fully automatic including the following controls:
   1. Screw Press Control Panels:
      a. Quantity: 1.
   2. Automatic control for the pneumatic pressure cone.

B. Screw Press Control Panels:
   1. Provide one Screw Press Control Panel:
      a. Stainless steel enclosure with NEMA 4X rating:
         1) Continuous seam welded.
         2) Single front door with continuous hinge, neoprene gasket.
         3) Mechanism designed for securing enclosure with padlock.
         4) Mounted on a support frame, pedestal mounting.
         5) Condensation protection shall be provided with a space heater.
         6) Air conditioner attached to panel exterior. Size as required based on ambient room conditions to prevent overheating of the enclosure components.
      b. Incoming power: 480 VAC, 3-phase.
      c. Main circuit breaker with external disconnect handle, pad-lockable.
      d. Surge arrester.
      e. Control power transformer with line and load fuses.
      f. Variable Frequency Controller (VFD):
         1) Screw press main drive.
      g. Ethernet switch.
      h. Programmable Logic Controller (PLC):
         1) Acceptable manufacturers:
            a) Allen-Bradley, CompactLogix.
            b) Or equal.
         2) Design and fabrication:
            a) On-board Ethernet.
            b) PLC Programming by Screw Press manufacturer.
      i. Operator Interface Unit (OIU):
         1) Acceptable manufacturers:
            a) Allen-Bradley PanelView 600.
            b) Or equal.
         2) Design and fabrication:
            a) Color, touch screen.
            b) Display size: 6 IN diagonal, minimum.
            c) Ethernet communications to PLC.
            d) OIU Programming by Screw Press manufacturer.
      j. Operator controls and indicators (pilot devices) located on panel exterior:
         1) Control power ON light, white lens.
         2) Dewatering system in operation, green lens.
         3) System Disturbance light, amber lens.
         4) Emergency Stop pushbutton with mushroom-head.
         5) System reset pushbutton.
         6) Alarm silence pushbutton.
         7) HAND/OFF/AUTO selector switch for spray wash.
      k. Pilot device requirements:
         1) Heavy-duty type.
         2) Oiltight, NEMA 4X rating.
         3) Mounting hole: 30.5 mm.
         4) Knob type operators.
         5) Push-to-test pilot lights, lens color as indicated.
         6) Legend plates:
            a) Laminated, phenolic plastic with white field and black letters.

b) 2 IN x 2 IN.

l. Running time meter, NEMA 4X rated:
   1) Screw Press.
   2) Sludge Pump.

m. Alarm horn.

n. Alarm beacon.

o. Laminated plastic nametags shall be provided for the name of the control panel and all disconnects, switches, lights, and meters.

p. Plant Control System interface requirements:
   1) Each discrete interface point shall be in the form of a dry, relay contact wired to terminal blocks.
   2) The following is a list of interface points required between the Screw Press Control Panels and the Plant Control System.
      a) Discrete Signals:
         (1) E-Stop activated.
         (2) System in Auto.
         (3) Dewatering mode.
         (4) System Disturbance.
         (5) Common Alarm.
         (6) Screw Press running.
         (7) Screw Press fault.
         (8) Sludge Pump running.
         (9) Sludge Pump fault.
         (10) Polymer System running.
         (11) Low Polymer flow.
         (12) Low Water pressure.
      b) Analog Signals:
         (1) Screw Press VFD speed feedback signal.
         (2) Sludge Pump VFD speed feedback signal.
         (3) Sludge Flow signal.
         (4) Polymer Speed feedback signal.
   3) Controls from Plant Control System:
      a) Discrete Signals:
         (1) System Enable
      b) Analog Signals: None.

q. Control interface requirements to the Sludge Feed Pump VFD:
   1) VFD in Auto mode (discrete input, dry contact).
   2) VFD Running (discrete input, dry contact).
   3) VFD Fault (discrete input, dry contact).
   4) VFD Run command (discrete output, dry contact).
   5) VFD Speed command signal (analog, 4-20ma DC).
   6) VFD Speed feedback signal (analog, 4-20ma DC).

r. Spare terminals (control and power voltage) shall be provided to accommodate for remote control operation and to interface with other equipment components such as the polymer dosing system, thin sludge pumps etc.

s. All internal wiring shall be neat and color coded. Each wire shall be labeled at both ends with a heat-shrinkable wire label. All incoming wires shall terminate into a box clamp type terminal block. All control wires shall be 14 Ga. Type TEW, tinned copper, rated for 105 DegC.

t. A schematic diagram (showing wire color) shall be permanently fastened to the inside of the enclosure. An Installation and Service Manual shall also be included with each control panel.
u. Apply corrosion inhibitors inside the panel after fabrication and prior to shipment to the jobsite. Inhibitor shall consist of agents that vaporize and then condenses on all internal surfaces of the enclosure.
v. Panel shall be factory wired and tested.
w. The control panel shall be U.L. listed as an assembly.

## 2.4 PAINTING

A. Painting:
1. Shop clean and prime coat all iron and steel surfaces, except stainless steel, motors and gear reducers with standard manufacturer coatings suitable for corrosive environment.

# PART 3 - EXECUTION

## 3.1 SHIPPING

A. The screw presses are to be shipped to the site with the following components unassembled from the main equipment:
1. Gearbox and motor
2. Screw and basket
3. Support legs
4. Flocculation Tank
5. Flocculation Tank Mixer

## 3.2 MEETINGS

A. Seller's Representative shall attend the preconstruction meeting.

## 3.3 INSTALLATION

A. Dewatering system to be installed by the Contractor in accordance with the seller's approved written instruction.
1. The screw press are to be moved into the existing building with the following components unassembled from the main equipment:
a. Gearbox and motor
b. Screw and basket
c. Support legs
d. Flocculation Tank
e. Flocculation Tank Mixer
2. The Contractor will reassemble the screw press inside the building. The Seller shall have a representative onsite to provide oversight and guidance to the Contractor's staff during reassembly and to observe that the screw press has been properly reassembled.

B. The following field service shall be provided to support installation and performance testing.
1. Seller's Representative to inspect, check, and adjust equipment as required and verify that equipment has been installed in accordance with the seller's written instruction immediately prior to Performance Testing.

2. Seller to be present when equipment is placed in operation.
3. Seller to revisit the Project Site as often as required to correct problems related to Seller's product performance or quality, at no cost to Buyer, until equipment installation and operation are acceptable to the Buyer.
4. Seller to include in the Contract Price a minimum of four (4) separate trips to the Project Site
   a. To provide oversight to Contractor while contractor is reassembling screw press.
   b. To inspect the installation after Contractor has given written notice the unit is completely installed and all control and power wiring is complete.
   c. To start the system and place system in operation.
   d. To conduct performance testing.

## 3.4 SCHEDULE OF FIELD SERVICE BY SELLER

A. Maximum of three 8-hour days on-site for oversight of reassembly after Contractor has given Seller a minimum of 2 weeks prior written notice that Contractor will be ready for reassembly.
B. Maximum of three 8-hour days to inspect installation for conformity to the Seller's written installation instructions including piping connections, anchorage, power and control wiring connections after Contractor has given Seller a minimum of 2 weeks prior written notice that Contractor is ready for installation inspection.
C. Startup of system after Buyer/Contractor has given Seller a minimum of 2 weeks written notice that system is ready for startup and all punch list items from installation inspection have been satisfactorily completed.
D. Performance testing may start at any time after startup once Seller certifies in writing to Buyer that the equipment is installed correctly, is ready for testing and after the required training has been completed.
   1. It is desired to have the performance testing take place in the March to April time period; however, if the Construction Contractor has not completed the installation and all the checks have not been completed, the performance test can be completed after April or before March.
      a. Upon satisfactory completion of the performance test, Seller will be due the percentage of payment as schedule in the payment article.
      b. If the test is not conducted in the month of April, the Seller shall inform its Bonding Company that the Buyer requires the performance bond to remain in effect until the results of the Buyer's performance test in the month of April.
         1) Seller will have the opportunity to observe, assist, and split samples of Buyer's performance test.
         2) Should the performance test results obtained by Buyer in his testing during the month of April not meet the corrections or reimburse Buyer pursuant to the provisions of the contract.
      c. Upon successful completion of performance test in April, Buyer will issue a notice of Final Completion and release of Seller's Performance Bond.

## 3.5 PREOPERATING CHECKS

A. Per seller's installation checklist:
   1. Performed by factory authorized representative.
   2. Supervise unloading and storage of units.

3. Inspect installation and make mechanical check of screw press system.
4. Seller to submit Installation Inspection Report for completed installation:
   a. Report to be submitted within five calendar days of the inspection.
   b. Report to include list of all deficiencies and recommended corrective actions.
5. After correcting all deficiencies, whether by Construction Contractor or Seller to:
   a. Certify in writing that screw press system properly installed and adjusted.
   b. Ready for start-up and mechanical testing.
6. Seller to submit qualifications of factory representative to Engineer for approval.

## 3.6 FIELD TESTING AND ADJUSTING

A. It is required that start-up and testing of screw press be started as soon as possible after installation.

B. After installation and after all components operable.

C. Submit unit to complete normal start, normal stop, and emergency stop cycles.

D. Submit screw press to an 8-hr minimum running test:
   1. At beginning and end of test, and at one-hour intervals between, check:
      a. All thermometers.
      b. Pressure gauges.
      c. Flow indicators.
      d. All safety devices.
      e. Differential speed control.
      f. Bearing temperatures.
      g. Belt tension.
      h. All instruments and controls.
   2. Check no load amperage of motor.
   3. Tests run by seller's authorized representative with assistance from Seller.
   4. All readings to be recorded and submitted to Engineer in written form.

E. Correct all malfunctions and retest as directed by Engineer, until equipment is operating properly:
   1. Each retest shall be for the specified eight-hour period.
   2. Supplier/Seller to certify in writing that screw press is ready for performance testing.

## 3.7 PERFORMANCE TESTING

A. After operational testing and adjusting described above is completed.

B. Submit each screw press to a performance test to:
   1. Performance tests shall commence following the screw press installation complete and ready for startup.
   2. Demonstrate each screw press can perform as guaranteed in the Performance Guarantee Statement.
   3. Run a minimum of two (2) tests
   4. Tests will be made in five (5)-hour runs.

5. Days between tests will vary from 3-4 days due to Buyer's solids production.
6. Tests to be witnessed by Engineer.
7. Tests to be scheduled by Engineer in conjunction with Buyer and Seller.
8. After the two performance tests have been completed, the Buyer will continue to operate the screw presses for 30 days based on the final set points to verify long term performance.
   a. Buyer will continue to collect samples 3-4 times a week during the extended performance operation to confirm that the equipment continues to meet the guaranteed performance.
   b. Buyer will split the samples collected for analysis with the Seller at the request of the Seller, however the Seller shall pay for all analysis of the Seller's samples.
   c. Seller shall be available to the Buyer on call in the event that technical assistance is required from the Seller.

C. Collect samples at the following locations:
   1. Solids discharge.
   2. Pressate discharge.
   3. Screw press feed pipe.
   4. Samples collected at start and end of each test run and at 45 minute max intervals in between. Sample volume shall be at least 500 ml for each sample taken at the three sample points at each sample time.
   5. Each days samples will be combined for a composite sample for testing.
   6. Each days composite will be split with the Buyer.
   7. Test results will be averaged over the test period.

D. Suitably label and split samples and deliver promptly Buyer's split sample for his analysis.

E. Seller shall have the following tests performed by an independent EPA accredited laboratory to determine solids concentration and suspended solid recovery. Testing shall conform to standards referenced in Part 1 of these specifications. Laboratory shall also collect samples:
   1. Screw press solids: Total solids.
   2. Pressate: Suspended solids.
   3. Screw press feed: Suspended solids and volatile solids.
   4. Computation to determine solids recovery efficiency to be determined from following formula:

$$\% \text{ recovery} = \frac{C(F-E)}{F(C-E)} \times 100$$

Where C = % solids (total solids)
F = % feed solids (suspended solids)
E = % pressate solids (suspended solids)
All values expressed as a decimal

F. Buyer will order and inventory performance polymer. Record polymer usage by weight during each performance run.
   1. Determine polymer concentrations from Buyer's weight record.
   2. Compute lbs polymer per dry ton solids.

G. If performance fails to meet the specifications:

1. Seller will be allowed to make corrections and one retest.
2. All adjustments and retests to be made within 90 days of first test at Seller's cost.
3. Seller will be allowed one retest for the full scale performance tests. If after the second test the equipment does not meet the required performance, the Seller will reimburse the Buyer a lump sum, payable in a cashier's check to the City of Mount Vernon, Washington, in the amount as determined by the following formula:

H. Reimbursement will be calculated as follows with the significant figures as indicated.

| | | | |
|---|---|---|---|
| Where | C = | Guaranteed % pressate recovery *(95%)* | |
| | c = | Performance test % pressate recovery *(Expressed as XX.X)* | |
| | S = | Guaranteed % solids cake *(18.5%)* | |
| | s = | Performance test % solids cake *(Expressed as XX.X)* | |
| | P = | Guaranteed Maximum pounds of polymer/dry ton *(40 lbs/dry ton)* | |
| | p = | Performance test pounds of polymer required per dry ton *(Expressed as XX.X)* | |
| | Q = | Dry tons of solids per year | 560 |
| | $P = | Cost per pound of polymer | $ 1.70 |
| | $S = | Cost to haul each % of additional water each year | $ 9,500 |
| | $C = | Cost to process each additional % of pressate each year | $ 3,800 |
| | R = | Present Worth Factor at 4% for 20 years | 13.59 |

| | | | |
|---|---|---|---|
| Polymer Cost | (p-P) * $P * Q | if less than Zero, enter zero | $_____ |
| Pressate Quality | (C-c) * $C | if less than Zero, enter zero | $_____ |
| Cake Quality | (S-s) * $S | if less than Zero, enter zero | $_____ |
| | | Total Yearly Cost (TYC) | $_____ |
| Reimbursement will equal | | TYC * R = | $_____ |

I. After successful completion of acceptance tests, screw press seller shall prepare written report:
1. Summarize details of tests.
2. Provide test results.
3. Compare test results with acceptance criteria.
4. Present data in tabular and graphical form.

## 3.8 FIELD QUALITY CONTROL

A. General:
1. Seller to prepare a log showing each equipment item that includes a listing of what shall be accomplished during Equipment Startup. A completed log along with a certificate indicating that startup and training is complete shall be submitted to the Buyer through the Engineer for review. Upon successful completion of operator startup and training, Buyer will endorse certificate, attesting to the successful completion of the startup and training.
2. Provide sellers field services.

3. Qualified factory representative to supervise:
   a. Start-up screw press.
   b. Instruction of Buyer's personnel in operation and maintenance of screw press.
4. These services in addition to all other specified services.
5. Provide at least 2 days of training and all related expenses.
6. Two additional follow-up Inspections and training as requested by Buyer with 14 days advance notice to Seller during the one-year warranty period.
7. Provide per diem salary and expenses for additional or fewer days of training.

B. Training
1. Training to be scheduled through the construction Contractor and Engineer.
2. Training sessions to be in classroom and on-site.
3. To occur after completion of installation, testing and start-up of all installed equipment.
4. Training for operations personnel to be separate from maintenance personnel.
5. Training session times to be defined by Buyer.
   a. To coincide with shift schedules.
   b. To be in maximum 7-hour intervals.
   c. Acceptable times for training are Tuesday through Thursday, 7am – 3pm PST, except holidays.

6. Seller to submit course outline at least two weeks before training starts.
7. Seller to submit examples of class materials for operations and maintenance staff separately.
8. Seller to discuss the following topics for operations training;
   a. Theory of operation.
   b. Start-up procedures.
   c. Shutdown procedures.
   d. Troubleshooting.
   e. Selection of proper polymer types and dosages.
   f. Operating adjustments for performance optimization.
   g. Emergency procedures.
   h. Recordkeeping.
   i. Instrumentation and controls.
   j. Other deemed important by the Seller.
9. Discuss the following topics for maintenance training:
   a. Preventative maintenance.
   b. Maintenance procedures.
   c. Other deemed important by the Seller.
10. Training sessions by Seller may be videotaped by Buyer.
11. Seller to include in his bid costs for all presentation materials and handouts for up to ten (10) participants.
12. All costs for training and start-up to be included in the contract Price.

**END OF SECTION**

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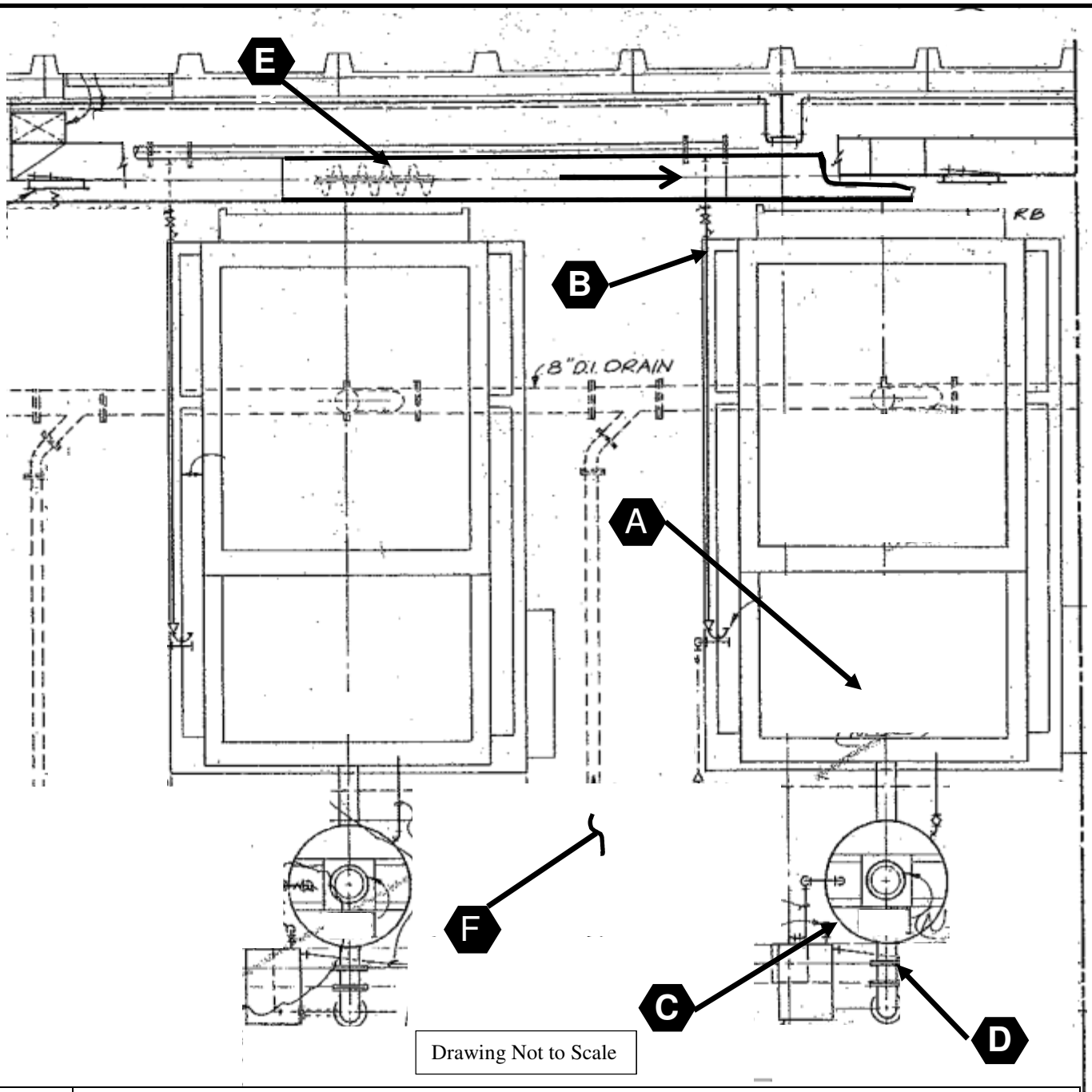
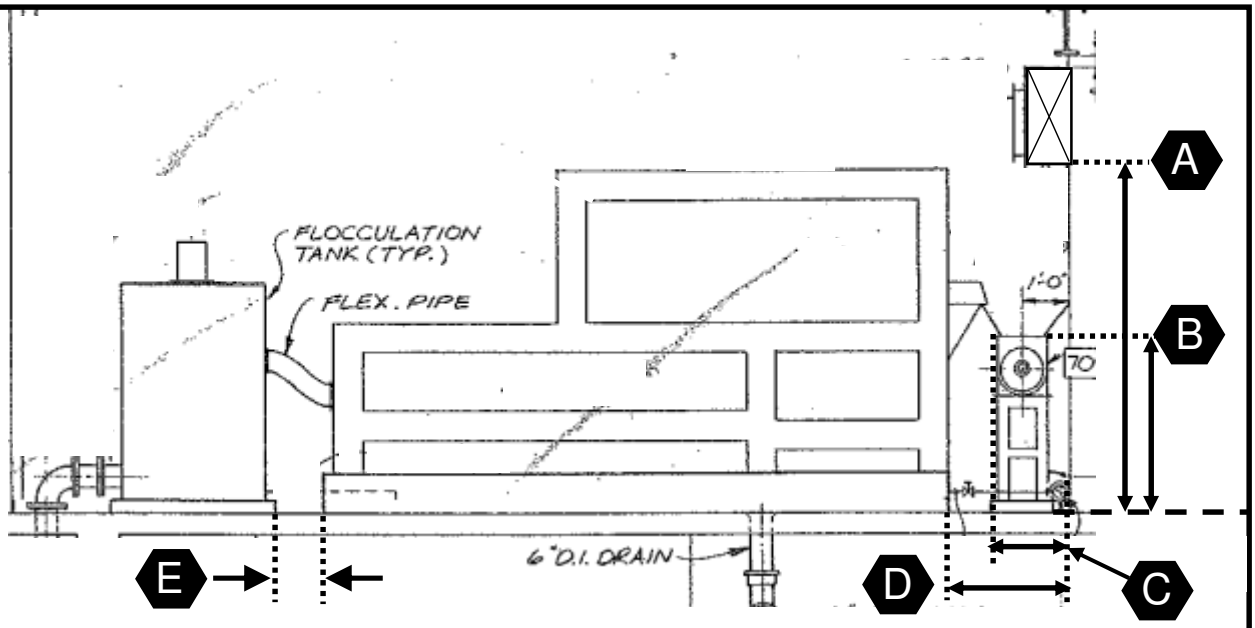



| | |
|---|---|
| A | Existing south belt filter press and flocculation tank to be replaced with screw press and flocculation tank. |
| B | Existing belt filter press base is 14’-4” long by 9’-10” wide by 1’-6” deep. Modifications to equipment base permitted to facilitate equipment installation. |
| C | Existing flocculation tank base is 3’-10” by 3’-10” by 1’-6” tall. Modifications to equipment base permitted to facilitate equipment installation. |
| D | Existing 6” diameter sludge feed pipe centerline approximately 27” above finished floor elevation. |
| E | Existing screw conveyor. |
| F | The area beneath the existing belt filter press and flocculation tank and approximately 5 feet beyond their foot print in all directions are routinely wet. |




Drawing Not to Scale

| | |
|---|---|
| A | Bottom of duct 9’-4” above finished floor elevation. |
| B | Top of existing discharge conveyor 4’-0” above finished floor elevation. |
| C | Distance from existing wall to edge of existing conveyor is approximately 3’-2”. |
| D | Distance from existing wall to equipment base is approximately 3’-6”. |
| E | Distance between existing flocculation tank base and existing belt filter press base is approximately 1’-0”. |

# State of Washington
# Department of Labor & Industries

Prevailing Wage Section - Telephone 360-902-5335
PO Box 44540, Olympia, WA 98504-4540

## Washington State Prevailing Wage

The PREVAILING WAGES listed here include both the hourly wage rate and the hourly rate of fringe benefits. On public works projects, worker's wage and benefit rates must add to not less than this total. A brief description of overtime calculation requirements are provided on the Benefit Code Key.

## Journey Level Prevailing Wage Rates for the Effective Date: 5/19/2017

| County | Trade | Job Classification | Wage | Holiday | Overtime | Note |
|---|---|---|---|---|---|---|
| Skagit | Asbestos Abatement Workers | Journey Level | $45.25 | 5D | 1H | |
| Skagit | Boilermakers | Journey Level | $64.54 | 5N | 1C | |
| Skagit | Brick Mason | Journey Level | $54.32 | 5A | 1M | |
| Skagit | Brick Mason | Pointer-Caulker-Cleaner | $54.32 | 5A | 1M | |
| Skagit | Building Service Employees | Janitor | $11.00 | | 1 | |
| Skagit | Building Service Employees | Shampooer | $11.00 | | 1 | |
| Skagit | Building Service Employees | Waxer | $11.00 | | 1 | |
| Skagit | Building Service Employees | Window Cleaner | $11.00 | | 1 | |
| Skagit | Cabinet Makers (In Shop) | Journey Level | $18.85 | | 1 | |
| Skagit | Carpenters | Acoustical Worker | $55.51 | 5D | 4C | |
| Skagit | Carpenters | Bridge, Dock And Wharf Carpenters | $55.51 | 5D | 4C | |
| Skagit | Carpenters | Carpenter | $55.51 | 5D | 4C | |
| Skagit | Carpenters | Carpenters on Stationary Tools | $55.64 | 5D | 4C | |
| Skagit | Carpenters | Creosoted Material | $55.61 | 5D | 4C | |
| Skagit | Carpenters | Floor Finisher | $55.51 | 5D | 4C | |
| Skagit | Carpenters | Floor Layer | $55.51 | 5D | 4C | |
| Skagit | Carpenters | Scaffold Erector | $55.51 | 5D | 4C | |
| Skagit | Cement Masons | Journey Level | $55.56 | 7A | 1M | |
| Skagit | Divers & Tenders | Diver | $108.77 | 5D | 4C | 8A |
| Skagit | Divers & Tenders | Diver On Standby | $66.05 | 5D | 4C | |
| Skagit | Divers & Tenders | Diver Tender | $59.88 | 5D | 4C | |
| Skagit | Divers & Tenders | Surface Rcv & Rov Operator | $59.88 | 5D | 4C | |
| Skagit | Divers & Tenders | Surface Rcv & Rov Operator Tender | $55.76 | 5A | 4C | |
| Skagit | Dredge Workers | Assistant Engineer | $56.44 | 5D | 3F | |
| Skagit | Dredge Workers | Assistant Mate (Deckhand) | $56.00 | 5D | 3F | |
| Skagit | Dredge Workers | Boatmen | $56.44 | 5D | 3F | |
| Skagit | Dredge Workers | Engineer Welder | $57.51 | 5D | 3F | |
| Skagit | Dredge Workers | Leverman, Hydraulic | $58.67 | 5D | 3F | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Skagit | Dredge Workers | Mates | $56.44 | 5D | 3F | |
| Skagit | Dredge Workers | Oiler | $56.00 | 5D | 3F | |
| Skagit | Drywall Applicator | Journey Level | $55.51 | 5D | 1H | |
| Skagit | Drywall Tapers | Journey Level | $55.66 | 5P | 1E | |
| Skagit | Electrical Fixture Maintenance Workers | Journey Level | $21.48 | | 1 | |
| Skagit | Electricians - Inside | Cable Splicer | $66.04 | 7H | 1E | |
| Skagit | Electricians - Inside | Construction Stock Person | $32.75 | 7H | 1D | |
| Skagit | Electricians - Inside | Journey Level | $61.68 | 7H | 1E | |
| Skagit | Electricians - Motor Shop | Craftsman | $15.37 | | 1 | |
| Skagit | Electricians - Motor Shop | Journey Level | $14.69 | | 1 | |
| Skagit | Electricians - Powerline Construction | Cable Splicer | $73.93 | 5A | 4D | |
| Skagit | Electricians - Powerline Construction | Certified Line Welder | $67.60 | 5A | 4D | |
| Skagit | Electricians - Powerline Construction | Groundperson | $45.49 | 5A | 4D | |
| Skagit | Electricians - Powerline Construction | Heavy Line Equipment Operator | $67.60 | 5A | 4D | |
| Skagit | Electricians - Powerline Construction | Journey Level Lineperson | $67.60 | 5A | 4D | |
| Skagit | Electricians - Powerline Construction | Line Equipment Operator | $57.02 | 5A | 4D | |
| Skagit | Electricians - Powerline Construction | Pole Sprayer | $67.60 | 5A | 4D | |
| Skagit | Electricians - Powerline Construction | Powderperson | $50.76 | 5A | 4D | |
| Skagit | Electronic Technicians | Electronic Technicians Journey Level | $38.81 | 5B | 1B | |
| Skagit | Elevator Constructors | Mechanic | $85.45 | 7D | 4A | |
| Skagit | Elevator Constructors | Mechanic In Charge | $92.35 | 7D | 4A | |
| Skagit | Fabricated Precast Concrete Products | Journey Level - In-Factory Work Only | $13.50 | | 1 | |
| Skagit | Fence Erectors | Fence Erector | $12.00 | | 1 | |
| Skagit | Flaggers | Journey Level | $38.36 | 7A | 3I | |
| Skagit | Glaziers | Journey Level | $59.31 | 7L | 1Y | |
| Skagit | Heat & Frost Insulators And Asbestos Workers | Journeyman | $65.68 | 5J | 4H | |
| Skagit | Heating Equipment Mechanics | Mechanic | $61.20 | 7F | 1E | |
| Skagit | Hod Carriers & Mason Tenders | Journey Level | $46.66 | 7A | 3I | |
| Skagit | Industrial Power Vacuum Cleaner | Journey Level | $11.00 | | 1 | |
| Skagit | Inland Boatmen | Boat Operator | $59.86 | 5B | 1K | |
| Skagit | Inland Boatmen | Cook | $56.18 | 5B | 1K | |
| Skagit | Inland Boatmen | Deckhand | $56.18 | 5B | 1K | |
| Skagit | Inland Boatmen | Deckhand Engineer | $57.26 | 5B | 1K | |
| Skagit | Inland Boatmen | Launch Operator | $58.59 | 5B | 1K | |
| Skagit | Inland Boatmen | Mate | $58.59 | 5B | 1K | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Skagit | Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control | Cleaner Operator, Foamer Operator | $11.00 | | 1 | |
| Skagit | Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control | Grout Truck Operator | $11.48 | | 1 | |
| Skagit | Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control | Head Operator | $12.78 | | 1 | |
| Skagit | Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control | Technician | $11.00 | | 1 | |
| Skagit | Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control | Tv Truck Operator | $11.00 | | 1 | |
| Skagit | Insulation Applicators | Journey Level | $55.51 | 5D | 4C | |
| Skagit | Ironworkers | Journeyman | $65.48 | 7N | 1O | |
| Skagit | Laborers | Air, Gas Or Electric Vibrating Screed | $45.25 | 7A | 3I | |
| Skagit | Laborers | Airtrac Drill Operator | $46.66 | 7A | 3I | |
| Skagit | Laborers | Ballast Regular Machine | $45.25 | 7A | 3I | |
| Skagit | Laborers | Batch Weighman | $38.36 | 7A | 3I | |
| Skagit | Laborers | Brick Pavers | $45.25 | 7A | 3I | |
| Skagit | Laborers | Brush Cutter | $45.25 | 7A | 3I | |
| Skagit | Laborers | Brush Hog Feeder | $45.25 | 7A | 3I | |
| Skagit | Laborers | Burner | $45.25 | 7A | 3I | |
| Skagit | Laborers | Caisson Worker | $46.66 | 7A | 3I | |
| Skagit | Laborers | Carpenter Tender | $45.25 | 7A | 3I | |
| Skagit | Laborers | Caulker | $45.25 | 7A | 3I | |
| Skagit | Laborers | Cement Dumper-paving | $46.09 | 7A | 3I | |
| Skagit | Laborers | Cement Finisher Tender | $45.25 | 7A | 3I | |
| Skagit | Laborers | Change House Or Dry Shack | $45.25 | 7A | 3I | |
| Skagit | Laborers | Chipping Gun (under 30 Lbs.) | $45.25 | 7A | 3I | |
| Skagit | Laborers | Chipping Gun(30 Lbs. And Over) | $46.09 | 7A | 3I | |
| Skagit | Laborers | Choker Setter | $45.25 | 7A | 3I | |
| Skagit | Laborers | Chuck Tender | $45.25 | 7A | 3I | |
| Skagit | Laborers | Clary Power Spreader | $46.09 | 7A | 3I | |
| Skagit | Laborers | Clean-up Laborer | $45.25 | 7A | 3I | |
| Skagit | Laborers | Concrete Dumper/chute Operator | $46.09 | 7A | 3I | |
| Skagit | Laborers | Concrete Form Stripper | $45.25 | 7A | 3I | |
| Skagit | Laborers | Concrete Placement Crew | $46.09 | 7A | 3I | |
| Skagit | Laborers | Concrete Saw Operator/core Driller | $46.09 | 7A | 3I | |
| Skagit | Laborers | Crusher Feeder | $38.36 | 7A | 3I | |
| Skagit | Laborers | Curing Laborer | $45.25 | 7A | 3I | |
| Skagit | Laborers | | $45.25 | 7A | 3I | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Demolition: Wrecking & Moving (incl. Charred Material) | | | | |
| Skagit | Laborers | Ditch Digger | $45.25 | 7A | 3I | |
| Skagit | Laborers | Diver | $46.66 | 7A | 3I | |
| Skagit | Laborers | Drill Operator (hydraulic,diamond) | $46.09 | 7A | 3I | |
| Skagit | Laborers | Dry Stack Walls | $45.25 | 7A | 3I | |
| Skagit | Laborers | Dump Person | $45.25 | 7A | 3I | |
| Skagit | Laborers | Epoxy Technician | $45.25 | 7A | 3I | |
| Skagit | Laborers | Erosion Control Worker | $45.25 | 7A | 3I | |
| Skagit | Laborers | Faller & Bucker Chain Saw | $46.09 | 7A | 3I | |
| Skagit | Laborers | Fine Graders | $45.25 | 7A | 3I | |
| Skagit | Laborers | Firewatch | $38.36 | 7A | 3I | |
| Skagit | Laborers | Form Setter | $45.25 | 7A | 3I | |
| Skagit | Laborers | Gabian Basket Builders | $45.25 | 7A | 3I | |
| Skagit | Laborers | General Laborer | $45.25 | 7A | 3I | |
| Skagit | Laborers | Grade Checker & Transit Person | $46.66 | 7A | 3I | |
| Skagit | Laborers | Grinders | $45.25 | 7A | 3I | |
| Skagit | Laborers | Grout Machine Tender | $45.25 | 7A | 3I | |
| Skagit | Laborers | Groutmen (pressure)including Post Tension Beams | $46.09 | 7A | 3I | |
| Skagit | Laborers | Guardrail Erector | $45.25 | 7A | 3I | |
| Skagit | Laborers | Hazardous Waste Worker (level A) | $46.66 | 7A | 3I | |
| Skagit | Laborers | Hazardous Waste Worker (level B) | $46.09 | 7A | 3I | |
| Skagit | Laborers | Hazardous Waste Worker (level C) | $45.25 | 7A | 3I | |
| Skagit | Laborers | High Scaler | $46.66 | 7A | 3I | |
| Skagit | Laborers | Jackhammer | $46.09 | 7A | 3I | |
| Skagit | Laborers | Laserbeam Operator | $46.09 | 7A | 3I | |
| Skagit | Laborers | Maintenance Person | $45.25 | 7A | 3I | |
| Skagit | Laborers | Manhole Builder-mudman | $46.09 | 7A | 3I | |
| Skagit | Laborers | Material Yard Person | $45.25 | 7A | 3I | |
| Skagit | Laborers | Motorman-dinky Locomotive | $46.09 | 7A | 3I | |
| Skagit | Laborers | Nozzleman (concrete Pump, Green Cutter When Using Combination Of High Pressure Air & Water On Concrete & Rock, Sandblast, Gunite, Shotcrete, Water Bla | $46.09 | 7A | 3I | |
| Skagit | Laborers | Pavement Breaker | $46.09 | 7A | 3I | |
| Skagit | Laborers | Pilot Car | $38.36 | 7A | 3I | |
| Skagit | Laborers | Pipe Layer Lead | $46.66 | 7A | 3I | |
| Skagit | Laborers | Pipe Layer/tailor | $46.09 | 7A | 3I | |
| Skagit | Laborers | Pipe Pot Tender | $46.09 | 7A | 3I | |

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|---|---|---|---|---|---|---|
| Skagit | Laborers | Pipe Reliner | $46.09 | 7A | 3I | |
| Skagit | Laborers | Pipe Wrapper | $46.09 | 7A | 3I | |
| Skagit | Laborers | Pot Tender | $45.25 | 7A | 3I | |
| Skagit | Laborers | Powderman | $46.66 | 7A | 3I | |
| Skagit | Laborers | Powderman's Helper | $45.25 | 7A | 3I | |
| Skagit | Laborers | Power Jacks | $46.09 | 7A | 3I | |
| Skagit | Laborers | Railroad Spike Puller - Power | $46.09 | 7A | 3I | |
| Skagit | Laborers | Raker - Asphalt | $46.66 | 7A | 3I | |
| Skagit | Laborers | Re-timberman | $46.66 | 7A | 3I | |
| Skagit | Laborers | Remote Equipment Operator | $46.09 | 7A | 3I | |
| Skagit | Laborers | Rigger/signal Person | $46.09 | 7A | 3I | |
| Skagit | Laborers | Rip Rap Person | $45.25 | 7A | 3I | |
| Skagit | Laborers | Rivet Buster | $46.09 | 7A | 3I | |
| Skagit | Laborers | Rodder | $46.09 | 7A | 3I | |
| Skagit | Laborers | Scaffold Erector | $45.25 | 7A | 3I | |
| Skagit | Laborers | Scale Person | $45.25 | 7A | 3I | |
| Skagit | Laborers | Sloper (over 20") | $46.09 | 7A | 3I | |
| Skagit | Laborers | Sloper Sprayer | $45.25 | 7A | 3I | |
| Skagit | Laborers | Spreader (concrete) | $46.09 | 7A | 3I | |
| Skagit | Laborers | Stake Hopper | $45.25 | 7A | 3I | |
| Skagit | Laborers | Stock Piler | $45.25 | 7A | 3I | |
| Skagit | Laborers | Tamper & Similar Electric, Air & Gas Operated Tools | $46.09 | 7A | 3I | |
| Skagit | Laborers | Tamper (multiple & Self-propelled) | $46.09 | 7A | 3I | |
| Skagit | Laborers | Timber Person - Sewer (lagger, Shorer & Cribber) | $46.09 | 7A | 3I | |
| Skagit | Laborers | Toolroom Person (at Jobsite) | $45.25 | 7A | 3I | |
| Skagit | Laborers | Topper | $45.25 | 7A | 3I | |
| Skagit | Laborers | Track Laborer | $45.25 | 7A | 3I | |
| Skagit | Laborers | Track Liner (power) | $46.09 | 7A | 3I | |
| Skagit | Laborers | Traffic Control Laborer | $41.02 | 7A | 3I | 8R |
| Skagit | Laborers | Traffic Control Supervisor | $41.02 | 7A | 3I | 8R |
| Skagit | Laborers | Truck Spotter | $45.25 | 7A | 3I | |
| Skagit | Laborers | Tugger Operator | $46.09 | 7A | 3I | |
| Skagit | Laborers | Tunnel Work-Compressed Air Worker 0-30 psi | $83.12 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Compressed Air Worker 30.01-44.00 psi | $88.15 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Compressed Air Worker 44.01-54.00 psi | $91.83 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Compressed Air Worker 54.01-60.00 psi | $97.53 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Compressed Air Worker 60.01-64.00 psi | $99.65 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Compressed Air Worker 64.01-68.00 psi | $104.75 | 7A | 3I | 8Q |

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| Skagit | Laborers | Tunnel Work-Compressed Air Worker 68.01-70.00 psi | $106.65 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Compressed Air Worker 70.01-72.00 psi | $108.65 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Compressed Air Worker 72.01-74.00 psi | $110.65 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Guage and Lock Tender | $46.76 | 7A | 3I | 8Q |
| Skagit | Laborers | Tunnel Work-Miner | $46.76 | 7A | 3I | 8Q |
| Skagit | Laborers | Vibrator | $46.09 | 7A | 3I | |
| Skagit | Laborers | Vinyl Seamer | $45.25 | 7A | 3I | |
| Skagit | Laborers | Watchman | $34.86 | 7A | 3I | |
| Skagit | Laborers | Welder | $46.09 | 7A | 3I | |
| Skagit | Laborers | Well Point Laborer | $46.09 | 7A | 3I | |
| Skagit | Laborers | Window Washer/cleaner | $34.86 | 7A | 3I | |
| Skagit | Laborers - Underground Sewer & Water | General Laborer & Topman | $45.25 | 7A | 3I | |
| Skagit | Laborers - Underground Sewer & Water | Pipe Layer | $46.09 | 7A | 3I | |
| Skagit | Landscape Construction | Irrigation Or Lawn Sprinkler Installers | $14.15 | | 1 | |
| Skagit | Landscape Construction | Landscape Equipment Operators Or Truck Drivers | $14.15 | | 1 | |
| Skagit | Landscape Construction | Landscaping or Planting Laborers | $14.18 | | 1 | |
| Skagit | Lathers | Journey Level | $55.51 | 5D | 1H | |
| Skagit | Marble Setters | Journey Level | $54.32 | 5A | 1M | |
| Skagit | Metal Fabrication (In Shop) | Fitter | $15.16 | | 1 | |
| Skagit | Metal Fabrication (In Shop) | Laborer | $11.13 | | 1 | |
| Skagit | Metal Fabrication (In Shop) | Machine Operator | $11.00 | | 1 | |
| Skagit | Metal Fabrication (In Shop) | Painter | $11.41 | | 1 | |
| Skagit | Metal Fabrication (In Shop) | Welder | $15.16 | | 1 | |
| Skagit | Millwright | Journey Level | $38.36 | | 1 | |
| Skagit | Modular Buildings | Journey Level | $11.00 | | 1 | |
| Skagit | Painters | Journey Level | $40.60 | 6Z | 2B | |
| Skagit | Pile Driver | Journey Level | $55.76 | 5D | 4C | |
| Skagit | Plasterers | Journey Level | $53.20 | 7Q | 1R | |
| Skagit | Playground & Park Equipment Installers | Journey Level | $11.00 | | 1 | |
| Skagit | Plumbers & Pipefitters | Journey Level | $67.47 | 5A | 1G | |
| Skagit | Power Equipment Operators | Asphalt Plant Operators | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Assistant Engineer | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Barrier Machine (zipper) | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Batch Plant Operator, Concrete | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Bobcat | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Brokk - Remote Demolition Equipment | $55.21 | 7A | 3C | 8P |

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|---|---|---|---|---|---|---|
| Skagit | Power Equipment Operators | Brooms | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Bump Cutter | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cableways | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Chipper | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Compressor | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Concrete Pump: Truck Mount With Boom Attachment Over 42 M | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Concrete Finish Machine -laser Screed | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Concrete Pump - Mounted Or Trailer High Pressure Line Pump, Pump High Pressure. | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Concrete Pump: Truck Mount With Boom Attachment Up To 42m | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Conveyors | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes Friction: 200 tons and over | $60.47 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes: 20 Tons Through 44 Tons With Attachments | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes: 100 Tons Through 199 Tons, Or 150' Of Boom (Including Jib With Attachments) | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes: 200 tons- 299 tons, or 250’ of boom including jib with attachments | $59.88 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes: 300 tons and over or 300’ of boom including jib with attachments | $60.47 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes: 45 Tons Through 99 Tons, Under 150' Of Boom (including Jib With Attachments) | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes: A-frame - 10 Tons And Under | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes: Friction cranes through 199 tons | $59.88 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Cranes: Through 19 Tons With Attachments A-frame Over 10 Tons | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Crusher | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Deck Engineer/deck Winches (power) | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Derricks, On Building Work | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Dozers D-9 & Under | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Drill Oilers: Auger Type, Truck Or Crane Mount | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Drilling Machine | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | | $55.21 | 7A | 3C | 8P |

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|---|---|---|---|---|---|---|
| | | Elevator And Man-lift: Permanent And Shaft Type | | | | |
| Skagit | Power Equipment Operators | Finishing Machine, Bidwell And Gamaco & Similar Equipment | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Forklift: 3000 Lbs And Over With Attachments | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Forklifts: Under 3000 Lbs. With Attachments | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Grade Engineer: Using Blue Prints, Cut Sheets, Etc | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Gradechecker/stakeman | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Guardrail Punch | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Hard Tail End Dump Articulating Off- Road Equipment 45 Yards. & Over | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Hard Tail End Dump Articulating Off-road Equipment Under 45 Yards | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Horizontal/directional Drill Locator | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Horizontal/directional Drill Operator | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Hydralifts/boom Trucks Over 10 Tons | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Hydralifts/boom Trucks, 10 Tons And Under | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Loader, Overhead 8 Yards. & Over | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Loader, Overhead, 6 Yards. But Not Including 8 Yards | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Loaders, Overhead Under 6 Yards | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Loaders, Plant Feed | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Loaders: Elevating Type Belt | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Locomotives, All | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Material Transfer Device | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Mechanics, All (leadmen - $0.50 Per Hour Over Mechanic) | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Motor Patrol Graders | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Mucking Machine, Mole, Tunnel Drill, Boring, Road Header And/or Shield | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Oil Distributors, Blower Distribution & Mulch Seeding Operator | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Outside Hoists (elevators And Manlifts), Air Tuggers,strato | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Overhead, Bridge Type Crane: 20 Tons Through 44 Tons | $58.17 | 7A | 3C | 8P |

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| Skagit | Power Equipment Operators | Overhead, Bridge Type: 100 Tons And Over | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Overhead, Bridge Type: 45 Tons Through 99 Tons | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Pavement Breaker | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Pile Driver (other Than Crane Mount) | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Plant Oiler - Asphalt, Crusher | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Posthole Digger, Mechanical | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Power Plant | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Pumps - Water | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Quad 9, Hd 41, D10 And Over | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Quick Tower - No Cab, Under 100 Feet In Height Based To Boom | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Remote Control Operator On Rubber Tired Earth Moving Equipment | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Rigger And Bellman | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Rigger/Signal Person, Bellman (Certified) | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Rollagon | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Roller, Other Than Plant Mix | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Roller, Plant Mix Or Multi-lift Materials | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Roto-mill, Roto-grinder | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Saws - Concrete | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Scraper, Self Propelled Under 45 Yards | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Scrapers - Concrete & Carry All | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Scrapers, Self-propelled: 45 Yards And Over | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Service Engineers - Equipment | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Shotcrete/gunite Equipment | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Shovel , Excavator, Backhoe, Tractors Under 15 Metric Tons. | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Shovel, Excavator, Backhoe: Over 30 Metric Tons To 50 Metric Tons | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Shovel, Excavator, Backhoes, Tractors: 15 To 30 Metric Tons | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Shovel, Excavator, Backhoes: Over 50 Metric Tons To 90 Metric Tons | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Shovel, Excavator, Backhoes: Over 90 Metric Tons | $59.88 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Slipform Pavers | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | | $58.69 | 7A | 3C | 8P |

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| | | Spreader, Topsider & Screedman | | | | |
| Skagit | Power Equipment Operators | Subgrader Trimmer | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Tower Bucket Elevators | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Tower Crane Up To 175' In Height Base To Boom | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Tower Crane: over 175' through 250' in height, base to boom | $59.88 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Tower Cranes: over 250' in height from base to boom | $60.47 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Transporters, All Track Or Truck Type | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Trenching Machines | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Truck Crane Oiler/driver - 100 Tons And Over | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Truck Crane Oiler/driver Under 100 Tons | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Truck Mount Portable Conveyor | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Welder | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Wheel Tractors, Farmall Type | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators | Yo Yo Pay Dozer | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Asphalt Plant Operators | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Assistant Engineer | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Barrier Machine (zipper) | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Batch Plant Operator, Concrete | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Bobcat | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Brokk - Remote Demolition Equipment | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Brooms | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Bump Cutter | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cableways | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Chipper | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Compressor | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Concrete Pump: Truck Mount With Boom Attachment Over 42 M | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Concrete Finish Machine -laser Screed | $55.21 | 7A | 3C | 8P |
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| Skagit | Power Equipment Operators-Underground Sewer & Water | Concrete Pump - Mounted Or Trailer High Pressure Line Pump, Pump High Pressure. | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Concrete Pump: Truck Mount With Boom Attachment Up To 42m | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Conveyors | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes Friction: 200 tons and over | $60.47 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes: 20 Tons Through 44 Tons With Attachments | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes: 100 Tons Through 199 Tons, Or 150' Of Boom (Including Jib With Attachments) | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes: 200 tons- 299 tons, or 250’ of boom including jib with attachments | $59.88 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes: 300 tons and over or 300’ of boom including jib with attachments | $60.47 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes: 45 Tons Through 99 Tons, Under 150' Of Boom (including Jib With Attachments) | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes: A-frame - 10 Tons And Under | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes: Friction cranes through 199 tons | $59.88 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Cranes: Through 19 Tons With Attachments A-frame Over 10 Tons | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Crusher | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Deck Engineer/deck Winches (power) | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Derricks, On Building Work | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Dozers D-9 & Under | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Drill Oilers: Auger Type, Truck Or Crane Mount | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Drilling Machine | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Elevator And Man-lift: Permanent And Shaft Type | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Finishing Machine, Bidwell And Gamaco & Similar Equipment | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Forklift: 3000 Lbs And Over With Attachments | $57.72 | 7A | 3C | 8P |

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|---|---|---|---|---|---|---|
| Skagit | Power Equipment Operators-Underground Sewer & Water | Forklifts: Under 3000 Lbs. With Attachments | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Grade Engineer: Using Blue Prints, Cut Sheets, Etc | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Gradechecker/stakeman | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Guardrail Punch | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Hard Tail End Dump Articulating Off- Road Equipment 45 Yards. & Over | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Hard Tail End Dump Articulating Off-road Equipment Under 45 Yards | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Horizontal/directional Drill Locator | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Horizontal/directional Drill Operator | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Hydralifts/boom Trucks Over 10 Tons | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Hydralifts/boom Trucks, 10 Tons And Under | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Loader, Overhead 8 Yards. & Over | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Loader, Overhead, 6 Yards. But Not Including 8 Yards | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Loaders, Overhead Under 6 Yards | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Loaders, Plant Feed | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Loaders: Elevating Type Belt | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Locomotives, All | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Material Transfer Device | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Mechanics, All (leadmen - $0.50 Per Hour Over Mechanic) | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Motor Patrol Graders | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Mucking Machine, Mole, Tunnel Drill, Boring, Road Header And/or Shield | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Oil Distributors, Blower Distribution & Mulch Seeding Operator | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Outside Hoists (elevators And Manlifts), Air Tuggers,strato | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Overhead, Bridge Type Crane: 20 Tons Through 44 Tons | $58.17 | 7A | 3C | 8P |
| Skagit | | | $59.28 | 7A | 3C | 8P |

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|---|---|---|---|---|---|---|
| | Power Equipment Operators-Underground Sewer & Water | Overhead, Bridge Type: 100 Tons And Over | | | | |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Overhead, Bridge Type: 45 Tons Through 99 Tons | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Pavement Breaker | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Pile Driver (other Than Crane Mount) | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Plant Oiler - Asphalt, Crusher | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Posthole Digger, Mechanical | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Power Plant | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Pumps - Water | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Quad 9, Hd 41, D10 And Over | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Quick Tower - No Cab, Under 100 Feet In Height Based To Boom | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Remote Control Operator On Rubber Tired Earth Moving Equipment | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Rigger And Bellman | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Rigger/Signal Person, Bellman (Certified) | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Rollagon | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Roller, Other Than Plant Mix | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Roller, Plant Mix Or Multi-lift Materials | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Roto-mill, Roto-grinder | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Saws - Concrete | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Scraper, Self Propelled Under 45 Yards | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Scrapers - Concrete & Carry All | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Scrapers, Self-propelled: 45 Yards And Over | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Service Engineers - Equipment | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Shotcrete/gunite Equipment | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Shovel , Excavator, Backhoe, Tractors Under 15 Metric Tons. | $57.72 | 7A | 3C | 8P |

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|---|---|---|---|---|---|---|
| Skagit | Power Equipment Operators-Underground Sewer & Water | Shovel, Excavator, Backhoe: Over 30 Metric Tons To 50 Metric Tons | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Shovel, Excavator, Backhoes, Tractors: 15 To 30 Metric Tons | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Shovel, Excavator, Backhoes: Over 50 Metric Tons To 90 Metric Tons | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Shovel, Excavator, Backhoes: Over 90 Metric Tons | $59.88 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Slipform Pavers | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Spreader, Topsider & Screedman | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Subgrader Trimmer | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Tower Bucket Elevators | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Tower Crane Up To 175' In Height Base To Boom | $59.28 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Tower Crane: over 175’ through 250’ in height, base to boom | $59.88 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Tower Cranes: over 250’ in height from base to boom | $60.47 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Transporters, All Track Or Truck Type | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Trenching Machines | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Truck Crane Oiler/driver - 100 Tons And Over | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Truck Crane Oiler/driver Under 100 Tons | $57.72 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Truck Mount Portable Conveyor | $58.17 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Welder | $58.69 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Wheel Tractors, Farmall Type | $55.21 | 7A | 3C | 8P |
| Skagit | Power Equipment Operators-Underground Sewer & Water | Yo Yo Pay Dozer | $58.17 | 7A | 3C | 8P |
| Skagit | Power Line Clearance Tree Trimmers | Journey Level In Charge | $48.54 | 5A | 4A | |
| Skagit | Power Line Clearance Tree Trimmers | Spray Person | $46.03 | 5A | 4A | |
| Skagit | Power Line Clearance Tree Trimmers | Tree Equipment Operator | $48.54 | 5A | 4A | |
| Skagit | Power Line Clearance Tree Trimmers | Tree Trimmer | $43.32 | 5A | 4A | |
| Skagit | Power Line Clearance Tree Trimmers | Tree Trimmer Groundperson | $32.68 | 5A | 4A | |

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|---|---|---|---|---|---|---|
| Skagit | Refrigeration & Air Conditioning Mechanics | Journey Level | $23.95 | | 1 | |
| Skagit | Residential Brick Mason | Journey Level | $25.00 | | 1 | |
| Skagit | Residential Carpenters | Journey Level | $20.53 | | 1 | |
| Skagit | Residential Cement Masons | Journey Level | $16.00 | | 1 | |
| Skagit | Residential Drywall Applicators | Journey Level | $41.69 | 5D | 4C | |
| Skagit | Residential Drywall Tapers | Journey Level | $30.00 | | 1 | |
| Skagit | Residential Electricians | JOURNEY LEVEL | $28.93 | | 1 | |
| Skagit | Residential Glaziers | Journey Level | $39.40 | 7L | 1H | |
| Skagit | Residential Insulation Applicators | Journey Level | $13.96 | | 1 | |
| Skagit | Residential Laborers | Journey Level | $18.46 | | 1 | |
| Skagit | Residential Marble Setters | Journey Level | $25.00 | | 1 | |
| Skagit | Residential Painters | Journey Level | $15.00 | | 1 | |
| Skagit | Residential Plumbers & Pipefitters | Journey Level | $42.05 | 5A | 1G | |
| Skagit | Residential Refrigeration & Air Conditioning Mechanics | Journey Level | $39.88 | 5A | 1G | |
| Skagit | Residential Sheet Metal Workers | Journey Level (Field or Shop) | $20.91 | | 1 | |
| Skagit | Residential Soft Floor Layers | Journey Level | $23.46 | | 1 | |
| Skagit | Residential Sprinkler Fitters (Fire Protection) | Journey Level | $29.76 | | 1 | |
| Skagit | Residential Stone Masons | Journey Level | $25.00 | | 1 | |
| Skagit | Residential Terrazzo Workers | Journey Level | $25.00 | | 1 | |
| Skagit | Residential Terrazzo/Tile Finishers | Journey Level | $27.75 | | 1 | |
| Skagit | Residential Tile Setters | Journey Level | $25.00 | | 1 | |
| Skagit | Roofers | Journey Level | $31.84 | | 1 | |
| Skagit | Sheet Metal Workers | Journey Level (Field or Shop) | $61.20 | 7F | 1E | |
| Skagit | Shipbuilding & Ship Repair | Carpenter | $21.69 | | 1 | |
| Skagit | Shipbuilding & Ship Repair | Electrician | $18.72 | | 1 | |
| Skagit | Shipbuilding & Ship Repair | Heat & Frost Insulator | $65.68 | 5J | 4H | |
| Skagit | Shipbuilding & Ship Repair | Laborer | $11.71 | | 1 | |
| Skagit | Shipbuilding & Ship Repair | Machinist | $18.72 | | 1 | |
| Skagit | Shipbuilding & Ship Repair | Operator | $18.72 | | 1 | |
| Skagit | Shipbuilding & Ship Repair | Painter | $18.72 | | 1 | |
| Skagit | Shipbuilding & Ship Repair | Pipefitter | $18.72 | | 1 | |
| Skagit | Shipbuilding & Ship Repair | Welder/burner | $18.72 | | 1 | |
| Skagit | Sign Makers & Installers (Electrical) | Journey Level | $16.03 | | 1 | |
| Skagit | Sign Makers & Installers (Non-Electrical) | Journey Level | $13.28 | | 1 | |
| Skagit | Soft Floor Layers | Journey Level | $45.86 | 5A | 3D | |
| Skagit | Solar Controls For Windows | Journey Level | $11.00 | | 1 | |
| Skagit | Sprinkler Fitters (Fire Protection) | Journey Level | $72.89 | 5C | 1X | |

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|---|---|---|---|---|---|---|
| Skagit | Stage Rigging Mechanics (Non Structural) | Journey Level | $13.23 | | 1 | |
| Skagit | Stone Masons | Journey Level | $54.32 | 5A | 1M | |
| Skagit | Street And Parking Lot Sweeper Workers | Journey Level | $15.00 | | 1 | |
| Skagit | Surveyors | Assistant Construction Site Surveyor | $57.72 | 7A | 3C | 8P |
| Skagit | Surveyors | Chainman | $57.17 | 7A | 3C | 8P |
| Skagit | Surveyors | Construction Site Surveyor | $58.69 | 7A | 3C | 8P |
| Skagit | Telecommunication Technicians | Journey Level | $27.65 | | 1 | |
| Skagit | Telephone Line Construction - Outside | Cable Splicer | $38.84 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Hole Digger/Ground Person | $21.45 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Installer (Repairer) | $37.21 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Special Aparatus Installer I | $38.84 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Special Apparatus Installer II | $38.03 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Telephone Equipment Operator (Heavy) | $38.84 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Telephone Equipment Operator (Light) | $36.09 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Telephone Lineperson | $36.09 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Television Groundperson | $20.33 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Television Lineperson/Installer | $27.21 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Television System Technician | $32.55 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Television Technician | $29.18 | 5A | 2B | |
| Skagit | Telephone Line Construction - Outside | Tree Trimmer | $36.09 | 5A | 2B | |
| Skagit | Terrazzo Workers | Journey Level | $50.26 | 5A | 1M | |
| Skagit | Tile Setters | Journey Level | $50.26 | 5A | 1M | |
| Skagit | Tile, Marble & Terrazzo Finishers | Journey Level | $25.00 | | 1 | |
| Skagit | Traffic Control Stripers | Journey Level | $44.85 | 7A | 1K | |
| Skagit | Truck Drivers | Asphalt Mix Over 16 Yards (W. WA-Joint Council 28) | $52.70 | 5D | 3A | 8L |
| Skagit | Truck Drivers | Asphalt Mix To 16 Yards (W. WA-Joint Council 28) | $51.86 | 5D | 3A | 8L |
| Skagit | Truck Drivers | Dump Truck | $16.98 | | 1 | |
| Skagit | Truck Drivers | Dump Truck And Trailer | $16.98 | | 1 | |
| Skagit | Truck Drivers | Other Trucks (W. WA-Joint Council 28) | $52.70 | 5D | 3A | 8L |

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| Skagit | Truck Drivers | Transit Mixer | $32.12 | | 1 | |
| Skagit | Well Drillers & Irrigation Pump Installers | Irrigation Pump Installer | $11.60 | | 1 | |
| Skagit | Well Drillers & Irrigation Pump Installers | Oiler | $11.00 | | 1 | |
| Skagit | Well Drillers & Irrigation Pump Installers | Well Driller | $11.60 | | 1 | |

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## Overtime Codes

**Overtime calculations** are based on the hourly rate actually paid to the worker. On public works projects, the hourly rate must be not less than the prevailing rate of wage minus the hourly rate of the cost of fringe benefits actually provided for the worker.

1. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

B. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

C. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

D. The first two (2) hours before or after a five-eight (8) hour workweek day or a four-ten (10) hour workweek day and the first eight (8) hours worked the next day after either workweek shall be paid at one and one-half times the hourly rate of wage. All additional hours worked and all worked on Sundays and holidays shall be paid at double the hourly rate of wage.

E. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

F. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours worked, except Labor Day, shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.

G. The first ten (10) hours worked on Saturdays and the first ten (10) hours worked on a fifth calendar weekday in a four-ten hour schedule, shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of ten (10) hours per day Monday through Saturday and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

H. All hours worked on Saturdays (except makeup days if work is lost due to inclement weather conditions or equipment breakdown) shall be paid at one and one-half times the hourly rate of wage. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

I. All hours worked on Sundays and holidays shall also be paid at double the hourly rate of wage.

J. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked over ten (10) hours Monday through Saturday, Sundays and holidays shall be paid at double the hourly rate of wage.

K. All hours worked on Saturdays and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

M. All hours worked on Saturdays (except makeup days if work is lost due to inclement weather conditions) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

N. All hours worked on Saturdays (except makeup days) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

## Overtime Codes Continued

1. O. The first ten (10) hours worked on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays, holidays and after twelve (12) hours, Monday through Friday and after ten (10) hours on Saturday shall be paid at double the hourly rate of wage.

P. All hours worked on Saturdays (except makeup days if circumstances warrant) and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

Q. The first two (2) hours after eight (8) regular hours Monday through Friday and up to ten (10) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of ten (10) hours per day Monday through Saturday and all hours worked on Sundays and holidays (except Christmas day) shall be paid at double the hourly rate of wage. All hours worked on Christmas day shall be paid at two and one-half times the hourly rate of wage.

R. All hours worked on Sundays and holidays shall be paid at two times the hourly rate of wage.

S. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays and all other overtime hours worked, except Labor Day, shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.

U. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays (except Labor Day) shall be paid at two times the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.

V. All hours worked on Sundays and holidays (except Thanksgiving Day and Christmas day) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Thanksgiving Day and Christmas day shall be paid at double the hourly rate of wage.

W. All hours worked on Saturdays and Sundays (except make-up days due to conditions beyond the control of the employer)) shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

X. The first four (4) hours after eight (8) regular hours Monday through Friday and the first twelve (12) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked over twelve (12) hours Monday through Saturday, Sundays and holidays shall be paid at double the hourly rate of wage. When holiday falls on Saturday or Sunday, the day before Saturday, Friday, and the day after Sunday, Monday, shall be considered the holiday and all work performed shall be paid at double the hourly rate of wage.

Y. All hours worked outside the hours of 5:00 am and 5:00 pm (or such other hours as may be agreed upon by any employer and the employee) and all hours worked in excess of eight (8) hours per day (10 hours per day for a 4 x 10 workweek) and on Saturdays and holidays (except labor day) shall be paid at one and one-half times the hourly rate of wage. (except for employees who are absent from work without prior approval on a scheduled workday during the workweek shall be paid at the straight-time rate until they have worked 8 hours in a day (10 in a 4 x 10 workweek) or 40 hours during that workweek.) All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and Labor Day shall be paid at double the hourly rate of wage.

Z. All hours worked on Saturdays and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid the straight time rate of pay in addition to holiday pay.

## Overtime Codes Continued

2. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

   B. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage.

   C. All hours worked on Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at two times the hourly rate of wage.

   F. The first eight (8) hours worked on holidays shall be paid at the straight hourly rate of wage in addition to the holiday pay. All hours worked in excess of eight (8) hours on holidays shall be paid at double the hourly rate of wage.

   G. All hours worked on Sunday shall be paid at two times the hourly rate of wage. All hours worked on paid holidays shall be paid at two and one-half times the hourly rate of wage including holiday pay.

   H. All hours worked on Sunday shall be paid at two times the hourly rate of wage. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage.

   O. All hours worked on Sundays and holidays shall be paid at one and one-half times the hourly rate of wage.

   R. All hours worked on Sundays and holidays and all hours worked over sixty (60) in one week shall be paid at double the hourly rate of wage.

   U. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked over 12 hours in a day or on Sundays and holidays shall be paid at double the hourly rate of wage.

   W. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage. On a four-day, ten-hour weekly schedule, either Monday thru Thursday or Tuesday thru Friday schedule, all hours worked after ten shall be paid at double the hourly rate of wage. The first eight (8) hours worked on the fifth day shall be paid at one and one-half times the hourly rate of wage. All other hours worked on the fifth, sixth, and seventh days and on holidays shall be paid at double the hourly rate of wage.

3. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

   A. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal shift, and all work on Saturdays shall be paid at time and one-half the straight time rate. Hours worked over twelve hours (12) in a single shift and all work performed after 6:00 pm Saturday to 6:00 am Monday and holidays shall be paid at double the straight time rate of pay. Any shift starting between the hours of 6:00 pm and midnight shall receive an additional one dollar ($1.00) per hour for all hours worked that shift. The employer shall have the sole discretion to assign overtime work to employees. Primary consideration for overtime work shall be given to employees regularly assigned to the work to be performed on overtime situations. After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

   C. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage. All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays shall be paid at double the hourly rate of wage. After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

## Overtime Codes Continued

3. D. All hours worked between the hours of 6:00 pm and 6:00 am, Monday through Saturday, shall be paid at a premium rate of 15% over the hourly rate of wage. All other hours worked after 6:00 am on Saturdays, shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

E. All hours worked Sundays and holidays shall be paid at double the hourly rate of wage. Each week, once 40 hours of straight time work is achieved, then any hours worked over 10 hours per day Monday through Saturday shall be paid at double the hourly wage rate.

F. All hours worked on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sunday shall be paid at two times the hourly rate of wage. All hours worked on paid holidays shall be paid at two and one-half times the hourly rate of wage including holiday pay.

H. All work performed on Sundays between March 16th and October 14th and all Holidays shall be compensated for at two (2) times the regular rate of pay. Work performed on Sundays between October 15th and March 15th shall be compensated at one and one half (1-1/2) times the regular rate of pay.

I. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. In the event the job is down due to weather conditions during a five day work week (Monday through Friday,) or a four day-ten hour work week (Tuesday through Friday,) then Saturday may be worked as a voluntary make-up day at the straight time rate. However, Saturday shall not be utilized as a make-up day when a holiday falls on Friday. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

4. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

A. All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at double the hourly rate of wage. All hours worked on Saturdays, Sundays and holidays shall be paid at double the hourly rate of wage.

B. All hours worked over twelve (12) hours per day and all hours worked on holidays shall be paid at double the hourly rate of wage.

C. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay. On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay, except that if the job is down on Monday through Friday due to weather conditions or other conditions outside the control of the employer, the first ten (10) hours on Saturday may be worked at the straight time rate of pay. All hours worked over twelve (12) hours in a day and all hours worked on Sunday and Holidays shall be paid at two (2) times the straight time rate of pay.

## Overtime Codes Continued

4. D. All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at double the hourly rate of wage. All hours worked on Saturday, Sundays and holidays shall be paid at double the hourly rate of pay. Rates include all members of the assigned crew.

EXCEPTION:
On all multipole structures and steel transmission lines, switching stations, regulating, capacitor stations, generating plants, industrial plants, associated installations and substations, except those substations whose primary function is to feed a distribution system, will be paid overtime under the following rates:

The first two (2) hours after eight (8) regular hours Monday through Friday of overtime on a regular workday, shall be paid at one and one-half times the hourly rate of wage. All hours in excess of ten (10) hours will be at two (2) times the hourly rate of wage. The first eight (8) hours worked on Saturday will be paid at one and one-half (1-1/2) times the hourly rate of wage. All hours worked in excess of eight (8) hours on Saturday, and all hours worked on Sundays and holidays will be at the double the hourly rate of wage.

All overtime eligible hours performed on the above described work that is energized, shall be paid at the double the hourly rate of wage.

E. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

On a four-day, ten-hour weekly schedule, either Monday thru Thursday or Tuesday thru Friday schedule, all hours worked after ten shall be paid at double the hourly rate of wage. The Monday or Friday not utilized in the normal four-day, ten hour work week, and Saturday shall be paid at one and one half (1½) times the regular shift rate for the first eight (8) hours. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

F. All hours worked between the hours of 6:00 pm and 6:00 am, Monday through Saturday, shall be paid at a premium rate of 20% over the hourly rate of wage. All hours worked on Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

G. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

H. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours worked, except Labor Day, and all hours on Sunday shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.

## Holiday Codes

5. A. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, and Christmas Day (7).

B. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, the day before Christmas, and Christmas Day (8).

C. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).

D. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and

Saturday after Thanksgiving Day, And Christmas Day (8).

H. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Day after Thanksgiving Day, And Christmas (6).

## Holiday Codes Continued

5. I. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6).

J. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, Friday after Thanksgiving Day, Christmas Eve Day, And Christmas Day (7).

K. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, The Day Before Christmas, And Christmas Day (9).

L. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (8).

N. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, The Friday After Thanksgiving Day, And Christmas Day (9).

P. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday And Saturday After Thanksgiving Day, The Day Before Christmas, And Christmas Day (9). If A Holiday Falls On Sunday, The Following Monday Shall Be Considered As A Holiday.

Q. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6).

R. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Day After Thanksgiving Day, One-Half Day Before Christmas Day, And Christmas Day. (7 1/2).

S. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, And Christmas Day (7).

T. Paid Holidays: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, Christmas Day, And The Day Before Or After Christmas (9).

Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).

6. A. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).

E. Paid Holidays: New Year's Day, Day Before Or After New Year's Day, Presidents Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and a Half-Day On Christmas Eve Day. (9 1/2).

G. Paid Holidays: New Year's Day, Martin Luther King Jr. Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and Christmas Eve Day (11).

H. Paid Holidays: New Year's Day, New Year's Eve Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, Christmas Day, The Day After Christmas, And A Floating

Holiday (10).

I. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, And Christmas Day (7).

## Holiday Codes Continued

6. T. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Last Working Day Before Christmas Day, And Christmas Day (9).

Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (7). If a holiday falls on Saturday, the preceding Friday shall be considered as the holiday. If a holiday falls on Sunday, the following Monday shall be considered as the holiday.

7. A. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any Holiday Which Falls On A Sunday Shall Be Observed As A Holiday On The Following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

B. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

C. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

D. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8). Unpaid Holidays: President's Day. Any paid holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any paid holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

E. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

F. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the last working day before Christmas day and Christmas day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

G. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

H. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

I. Holidays: New Year's Day, President's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Day Before Christmas Day And Christmas Day (9). Any holiday which falls

on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

J. Holidays: New Year's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day (6). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

## Holiday Codes Continued

7. K. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

L. Holidays: New Year's Day, Memorial Day, Labor Day, Independence Day, Thanksgiving Day, the Last Work Day before Christmas Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

M. Paid Holidays: New Year's Day, The Day after or before New Year's Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, And the Day after or before Christmas Day (10). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

N. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. When Christmas falls on a Saturday, the preceding Friday shall be observed as a holiday.

P. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

Q. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

R. Paid Holidays: New Year's Day, the day after or before New Year's Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and the day after or before Christmas Day (10). If any of the listed holidays fall on Saturday, the preceding Friday shall be observed as the holiday. If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.

S. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, Christmas Day, the Day after Christmas, and A Floating Holiday (9). If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.

T. Paid Holidays: New Year's Day, the Day after or before New Year's Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and The Day after or before Christmas Day. (10). If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

## Note Codes

8. A. In addition to the hourly wage and fringe benefits, the following depth premiums apply to depths of fifty feet or more:
Over 50' To 100' -$2.00 per Foot for Each Foot Over 50 Feet
Over 100' To 150' -$3.00 per Foot for Each Foot Over 100 Feet
Over 150' To 220' -$4.00 per Foot for Each Foot Over 150 Feet
Over 220' -$5.00 per Foot for Each Foot Over 220 Feet

## Note Codes Continued

8. C. In addition to the hourly wage and fringe benefits, the following depth premiums apply to depths of fifty feet or more:
Over 50' To 100' -$1.00 per Foot for Each Foot Over 50 Feet
Over 100' To 150' -$1.50 per Foot for Each Foot Over 100 Feet
Over 150' To 200' -$2.00 per Foot for Each Foot Over 150 Feet
Over 200' -Divers May Name Their Own Price

D. Workers working with supplied air on hazmat projects receive an additional $1.00 per hour.

L. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $0.75, Level B: $0.50, And Level C: $0.25.

M. Workers on hazmat projects receive additional hourly premiums as follows: Levels A & B: $1.00, Levels C & D: $0.50.

N. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $1.00, Level B: $0.75, Level C: $0.50, And Level D: $0.25.

P. Workers on hazmat projects receive additional hourly premiums as follows -Class A Suit: $2.00, Class B Suit: $1.50, Class C Suit: $1.00, And Class D Suit $0.50.

Q. The highest pressure registered on the gauge for an accumulated time of more than fifteen (15) minutes during the shift shall be used in determining the scale paid.

R. Effective August 31, 2012 – A Traffic Control Supervisor shall be present on the project whenever flagging or spotting or other traffic control labor is being utilized. A Traffic Control Laborer performs the setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control vehicular, bicycle, and pedestrian traffic during construction operations. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. These classifications are only effective on or after August 31, 2012.

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T. Effective August 31, 2012 – A Traffic Control Laborer performs the setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control vehicular, bicycle, and pedestrian traffic during construction operations. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. This classification is only effective on or after August 31, 2012.

U. Workers on hazmat projects receive additional hourly premiums as follows – Class A Suit: $2.00, Class B Suit: $1.50, And Class C Suit: $1.00. Workers performing underground work receive an additional $0.40 per hour for any and all work performed underground, including operating, servicing and repairing of equipment. The premium for underground work shall be paid for the entire shift worked. Workers who work suspended by a rope or cable receive an additional $0.50 per hour. The premium for work suspended shall be paid for the entire shift worked. Workers who do “pioneer” work (break open a cut, build road, etc.) more than one hundred fifty (150) feet above grade elevation receive an additional $0.50 per hour.

Kläranlagen
Beratung
Kopp

# Dewaterability of Sewage Sludge
# From WWTP Mount Vernon, Washington (USA)

**April 2017**

**Sample April 3rd 2017**

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0253188400
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Steuernummer
Finanzamt Peine
38-123-02634

# 1. Background

According to your assignment the dewaterability of a sludge sample from WWTP Mount Vernon, Washington (USA) was investigated by KBKopp.

The following services were offered:

- determination of water distribution in sludge sample with thermogravimetric measurements $DS(A)_{KBKopp}$
- measuring of DS/VSS [%], TS [g/l], pH, conductivity [mS/cm], in input sludge
- measuring of DS/VSS [%] in sludge cake
- measuring of TS [g/l], pH, conductivity [mS/cm], and $PO_4P$ [mg/l] in filtrate
- characterization of floc-structure in input sludge (microscopic analysis)
- definition of polymer dosage on basis of lab tests (for centrifuge powder polymer without labeling)
- prediction of full scale dewatering results with the water distribution

The dewaterability of the investigated sludge sample is assessed on basis of the recorded measuring values.

The sample was delivered on April 6th by delivery service and was taken on April 3rd at WWTP Mount Vernon, laboratory tests were carried out directly afterwards.

# 2. Dewatering Results

The main results of the investigation are shown in the following tables.

Table 1: Results for sludge sample WWTP Mount Vernon (WA), April 3rd 2017

| Parameter | Index | Value | Parameter | Index | Value |
|---|---|---|---|---|---|
| Dried Solids (DS)<br>Volatile Solids (VSS) | %<br>% | 2.48<br>66.4 | Polymer demand powder, without labeling | kg AS / tDS | 12.0 |
| **$DS(A)_{KBKOPP}$ of sludge** | **%** | **20.4** | Extra polymer dosage for low shear stability | kg AS / tDS | + 0.0 |
| DS after centrifugation 1000g | % | 6.71 | **Overall polymer demand** | **kg AS / tDS** | **12.0** |
| DS sludge cake 1<br>DS sludge cake 2 | %<br>% | 13.94<br>13.87 | $PO_4$-P sludge liquor<br>$NH_4$-N sludge liquor | mg/l<br>mg/L | 515<br>1546 |
| Filterable Solids Centrate | mg/l | 1200 | el. Conductivity<br>pH | mS/cm<br>- | 10.37<br>7.61 |
| Capture rate centrifuge | % | 96.0 | Redoxpotential | mV | -202 |

Dried solids from sample of WWTP Mount Vernon amounted to 2.48 %DS and volatile suspended solids to 66.4 % VSS. Values for VSS are high for digested sludges.

Solid content $DS(A)_{KBKOPP}$ - at point A of the drying curve marks the max. mechanical dewatering result.

**Fig. 1 shows drying curve of tested sludge. The max. mechanical dewatering $DS(A)_{KBKOPP}$ result from this sludge sample is 20.4 % DS in sludge cake. Accuracy of thermogravimetric measurement lies at about ± 1.5 % DS, this means that the sludge from Tychy is adequately dewatered when a result ≥ 18.9 % is reached in sludge cake with decanters or chamber filter presses.**

This means that dewatered samples of centrifuge (13.9 %DS) were **not** adequately dewatered at time of sampling.

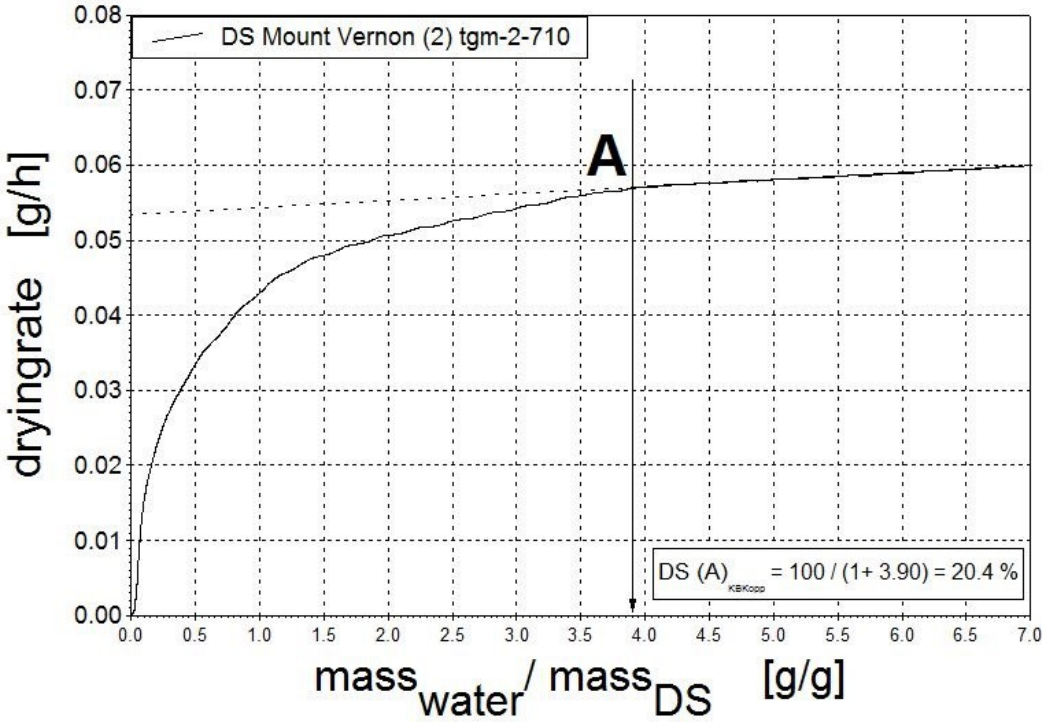



Fig. 1: Drying curve from sludge sample DS Mount Vernon (April 2017)

Capture rates at time of the sampling were 96%, referred to DS content of centrate/filtrate sample, which amounted to 1200 mg/l.
A capture rate of at least ≥ 95% (better 98%) should be always kept by dewatering process, in order to keep back load for WWTP by centrate/filtrate water as small as possible (i.e. filterable solids in centrate max = 560 mg/l with DS = 2.48% and optimal dewatering result, using black ribbon filters with 9 - 10 sec filtration rate, DIN 53137).

Cap-rate = [((24.76-1.2)*139) / ((139-.12) * 24.76)] *100 = 95.98 %

Volatile suspended solids content represents organic part of sewage sludge, and this parameter most often used to characterize dewaterability of sludge. The higher amount of organic compounds in sludge, the lower the density of the sludge particles. In addition, more water is bound, since contact angle of organic particles is smaller than that of inorganic particles thus binding more water by means of capillary forces.

That means that sludges with high volatile suspended solids content (VSS) are in general more difficult to dewater. Fig. 2 illustrates how the solids content after separation of free water content $DS(A)_{KBKOPP}$ is affected by volatile suspended solids content. One detects a general trend whereby the dewatering result improves with decreasing volatile solids content. The measured values are so scattered, however, that dewatering result of sludges cannot be determined from volatile suspended solids content alone.

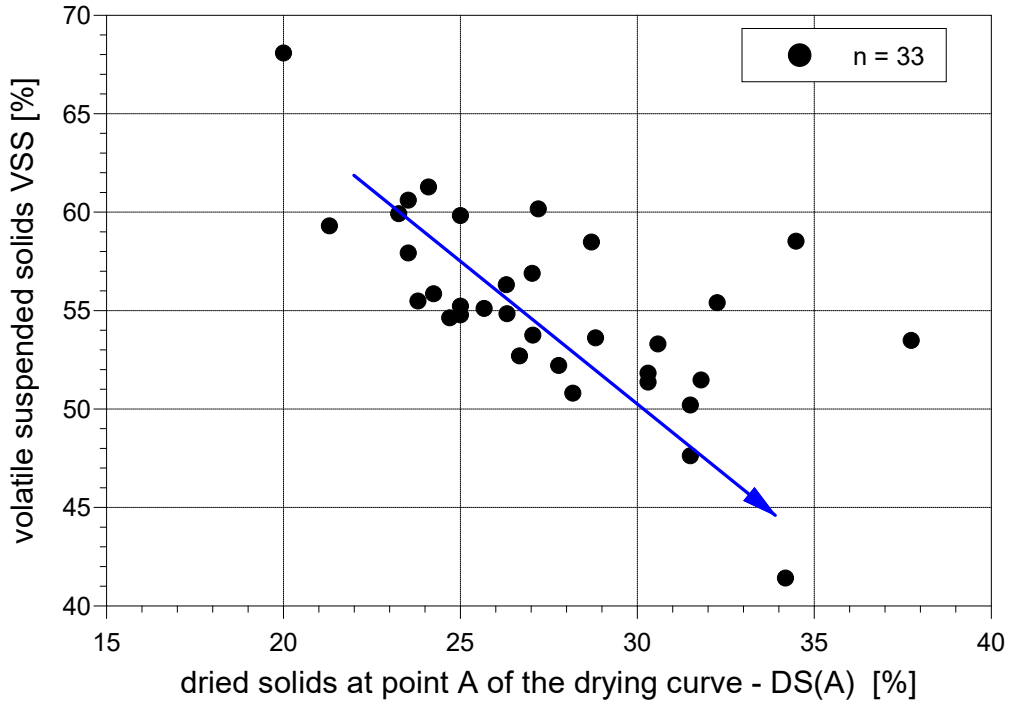



Fig.2. Dependency of parameter $DS(A)_{KBKOPP}$ on volatile suspended solids for municipal digested sludges

Fig. 3 compares the $DS(A)_{KBKOPP}$ of digested sewage sludges with dewatering results obtained with full-scale centrifuges and filter-presses. The accuracy of thermogravimetric measurement lies at about ± 1.5 % DS, thus giving an exact prediction of solids content after dewatering.

The specification for prognostic accuracy does not refer to the reproducibility of the measurements and accuracy of the thermo-gravimetric analyses, but to possible fluctuations of DS in cake of mechanical dewatering devices, which is also influenced by ratio of the effective- to the nominal-capacity of the aggregates.

With centrifuges and chamber filter presses it is possible to dewater at state of technology.

When using belt filter presses or screw presses, energy input for dewatering is lower and therefore the dewatering result lies 2 %DS points below $DS(A)_{KBKOPP}$ (see fig. 4).

Table 2: Water distribution for municipal sewage sludge

| Sludge | DS [%] | VSS [%] | Polymer [g/kg] | $DS_{dewat}$ [%] | DS(A) [%] | m(A) [g/g] | $W_{free}$* [%] | $W_{inter}$* [%] | $W_{bound}$* [%] |
|---|---|---|---|---|---|---|---|---|---|
| **Anaerobically digested sludges** (n=58) | | | | | | | | | |
| **Mean** | **2.8** | **55** | **7.7** | **26.3** | **27.7** | **2.6** | **91.7** | **7.5** | **0.8** |
| Min | 0.9 | 41 | 4.5 | 19.6 | 20.0 | 4.0 | 87.6 | 4.5 | 0.1 |
| Max | 5.9 | 68 | 13.3 | 37.5 | 37.7 | 1.7 | 94.9 | 11.6 | 1.3 |
| **Aerobically digested sludges** (n=15) | | | | | | | | | |
| **Mean** | **2.6** | **66** | **5.9** | **21.4** | **22.8** | **3.4** | **89.4** | **9.6** | **1.1** |
| Min | 1.5 | 61 | 2.0 | 15.3 | 16.4 | 5.1 | 84.2 | 7.4 | 0.5 |
| Max | 5.5 | 78 | 10.0 | 26.7 | 27.0 | 2.7 | 91.7 | 13.9 | 2.0 |

*= percent values are related to 3% SS of the sludge suspensions

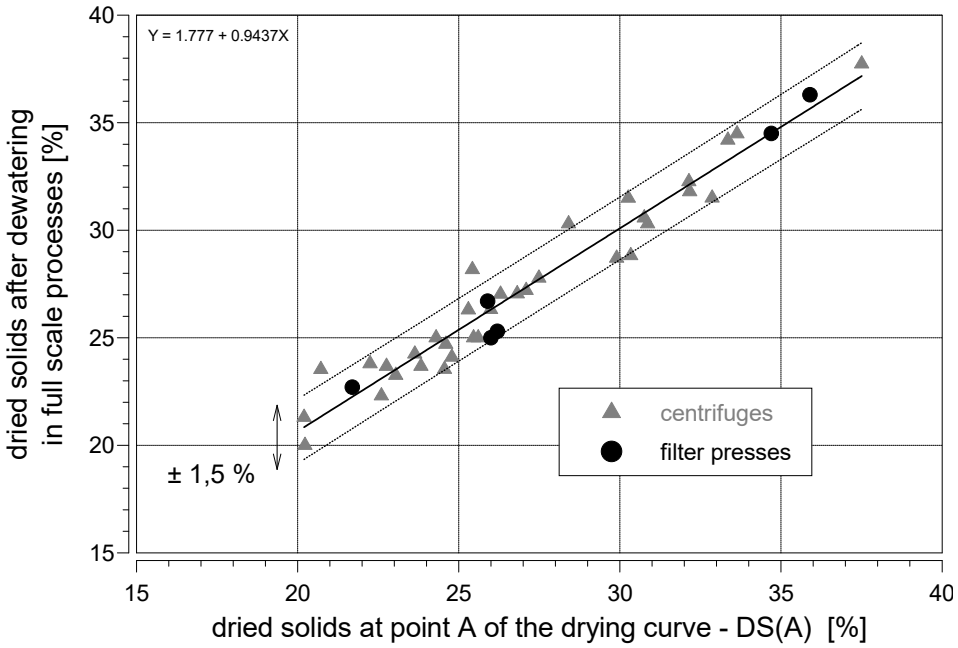



Fig. 3: Correlation between $DS(A)_{KBKOPP}$ - solids content at point A of the drying curve in dependence on the solids contents after dewatering in full scale centrifuges and filter presses

## state of technology = separation of free water

- **Decanter:** **Drum > 300 mm**
  **acceleration > 3000 g → DS(A)**

  Decanter: "small" — Drum < 300 mm
  acceleration < 3000 g → DS(A) – 2% DS

- **Belt Filter Presses:** → **DS(A) – 2% DS**

- **Screw Presses:** → **DS(A) – 2% DS**

- Chamber Filter Press: → DS(A)

- Bucher Press: → DS(A) + 1% DS
  + 3 kg AS/t DS Polymer
  according the shear force

| Input | Prozessschritt | Output | Kennzahl und Dimension | Zielwert für den Stand der Technik* |
|---|---|---|---|---|
| Faul-schlamm | Beschickung des Aggregates | TR-Fracht | [kgTR/h] | kontinuierliche Frachtbeschickung |
| | Polymer Aufbereitung | Stammlösung | Reifezeit [min] Lösungsweskostät | 45 min nach Beifüllen Verbrauch binnen 1-4 h 2-Kammer-Batchanlage und Kontrolle der Lösungsreifezeit |
| | Schlammkonditio-nierung | Polymerprodukt Dosis | Labor & Betriebsversuche [kgWS/ETR] | Flockenstruktur schertabil / druckstabil bei effizienter Dosierung |
| | Entwässerung | Energiever-brauch | [kWh/TR]; [kWh/m³] | 0.8-2.2 [kWh/m³] ** siehe Tabelle 3 |
| | Entwässerung mit **Dekanter** | entw. Schlamm | [% TR] | Abtrennung des freien Wassers; Erreichen TR(A)* AG > 95 % für stabilen Betrieb erforderlich |
| | Entwässerung mit **Bandfilterpresse** | entw. Schlamm | [% TR] | Abtrennung des freien Wassers. TR(A)* ~ 2 % TR AG > 95 % für stabilen Betrieb erforderlich |
| | Entwässerung mit **Schneckenpresse** | entw. Schlamm | [% TR] | Abtrennung des freien Wassers. TR(A)* ~ 2 % TR AG > 95 % für stabilen Betrieb erforderlich |
| | Entwässerung mit **Schlauchfilter-presse** | entw. Schlamm | [% TR] | Abtrennung des freien Wassers. TR(A) > 1 % TR*** AG > 95 % für stabilen Betrieb erforderlich |

Fig. 4: State of technology = separation of free water [13],

the **table** is also shown on last page of the report

## 3. Results of polymer conditioning sample WWTP Mount Vernon, Washington

Polymer-conditioning only increases velocity of free sludge water release. On the other hand max. dewatering result $DS(A)_{KBKOPP}$ achievable in full scale centrifuges or filter presses is independent from polymer dosage and polymer product, since these processes can only remove free water content ($w_{free}$) from sludge [12]. The retention time of sludge in a centrifuge however is that short, that optimum dewatering results can only be reached at an optimum velocity of water release from sludge respectively at an optimum polymer-conditioning.

**When using delivered powder polymer (without labeling, 100 % AS), the optimal polymer-demand of sludge sample was 12 kg AS / t DS (fig. 5). This powder is used for sludge dewatering at WWTP Mount Vernon. Almost 10 kg AS / t DS are needed to compensate dissolved charge of sludge, which is a normal portion. The strength against shearing stress of conditioned sludge flocs is very good (Angle of titration curve > 80 °), so that no extra polymer dose is not needed for compensation of low shear stability.**

**The overall needed dose for an optimal conditioning is therefore 12.0 + 0.0 = 12.0 kg AS / t DS.**

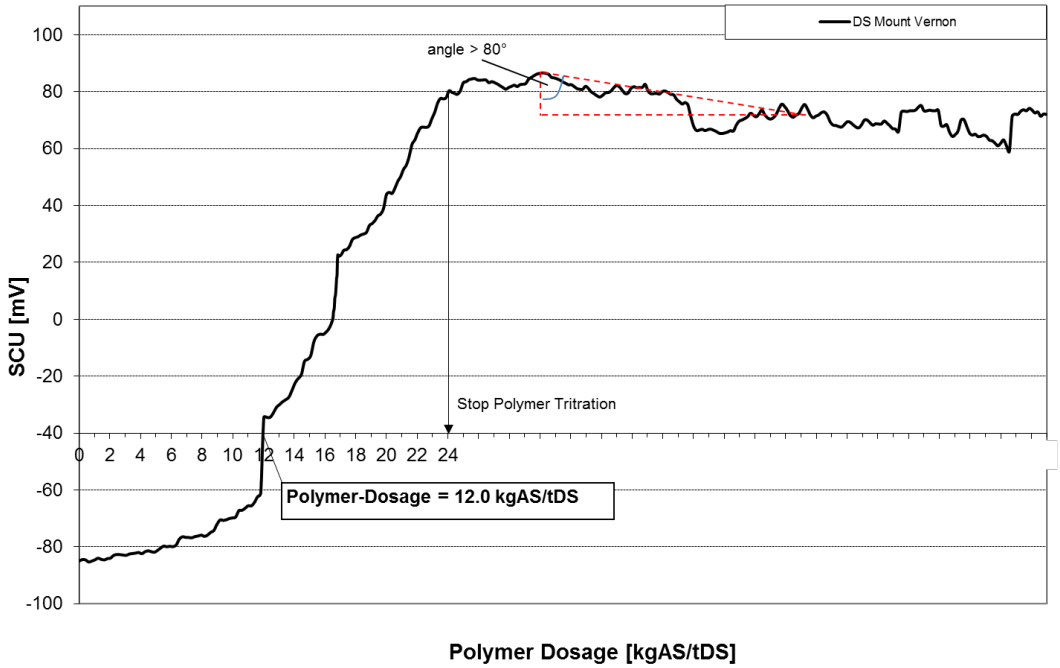



Fig. 5: SCD measurement for DS Mount Vernon (April 2017)

| Criteria Shear Stability of the Conditioned Cludge Flocs | | | | | | |
|---|---|---|---|---|---|---|
| angle | < 40 ° | | | not recommended for dekanter | | |
| angle | < 45° > 40° | | + 4,0 kgAS/tDS | | | |
| angle | < 50° > 45° | | + 3,5 kgAS/tDS | | | |
| angle | < 55° > 50° | | + 3,0 kgAS/tDS | | | |
| angle | < 60° > 55° | | + 2,5 kgAS/tDS | | | |
| angle | < 65° > 60° | | + 2,0 kgAS/tDS | | | |
| angle | < 70° > 65° | | + 1,5 kgAS/tDS | | | |
| angle | < 75° > 70° | | + 1,0 kgAS/tDS | | | |
| angle | < 80° > 75° | | + 0,5 kgAS/tDS | | | |
| angle | >80° | | | polymer extra dosage 0,0 kgAS/tDS | | |

**Electrical conductivity of the digested sludge sample was 10.37 mS/cm, which is a high but not unusual value for a municipal digested sludge. The effectiveness of the polymer appears to be good. With electrical conductivities above 10 mS/cm, cationic charge could not be completely active and conditioning might be impaired.**

Polymer consumption during full-scale dewatering tests should be adjusted to optimize discharge of dewatering device. The use of process water or groundwater decreases the polymer charge due to the fact that ferric-ions destroy the polymer charge.

Furthermore, maturing time and maximum usability time of polymer solution has to be considered. Specifically warm mixing water may lead to relevant performance degradation in the polymer conditioning as a result of hydrolysis of polymer solution. Maturing time should be at least 45 minutes and the polymer solution should be used within 4 hours.

## 4. Characterization of the floc-structure (microscopical analysis)

Fig. 6 shows the floc structure of sewage sludge sample. The sludge structure consists of medium - big sized, mostly compact particles. Amount of colloids is high for digested sludge. A high amount of colloids also raises polymer-demand.

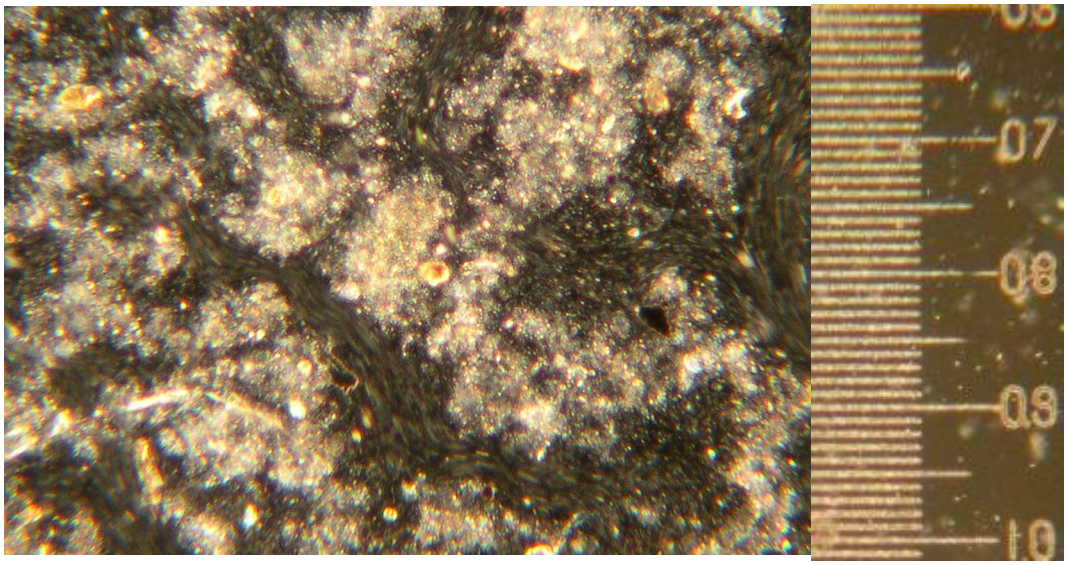



Fig. 6: Floc structure of the digested sludge sample April 2017 from WWTP Mount Vernon (extension ~ 100 times)

Very often dewaterability of sewage sludge is directly influenced by phosphate concentration, because water binding capacity of EPS structures gains with rising phosphate concentration in sewage sludge (fig. 7).

Phosphate concentration in wet sludge sample from WWTP Mount Veronen was very high and amounted to 515 mg $PO_4$-P/l. The $NH_4$-N concentration of 1546 mg/l is also high.

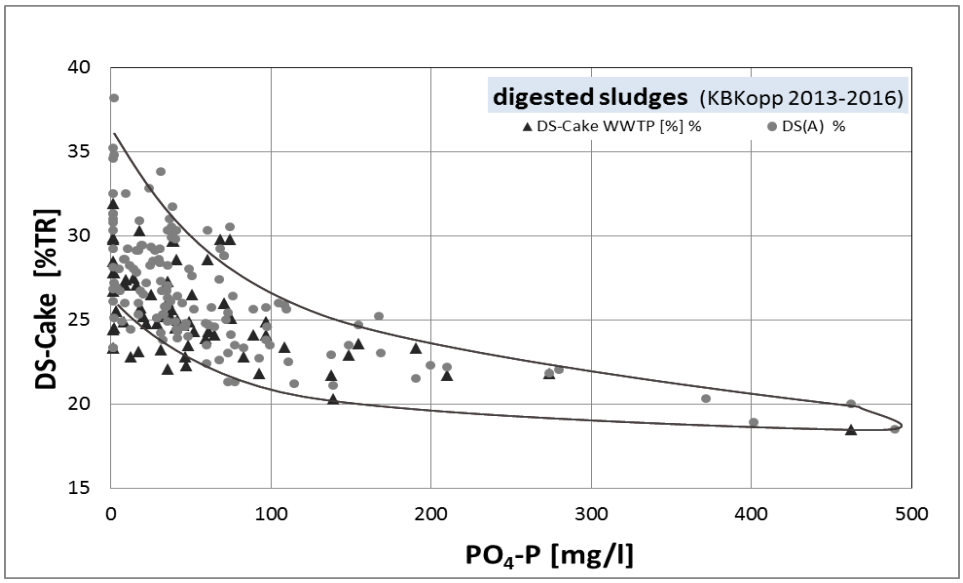



Fig. 7: $DS(A)_{KBKOPP}$ in relation to the sludge $PO_4$-P concentration [KBKopp 2016]

Please do not hesitate to contact us in case of questions.

Lengede, April 20th 2017

Dr.-Ing. J. Kopp

# 5. Materials and Methods

- **Samples and products:**

Samples of sludge were taken at the Mount Vernon (WA) wastewater treatment plant. The samples arrived in Germany April 6th and were analysed by Kläranlagen Beratung Kopp (KBKopp) in Lengede.

- **Dewatering parameters:**

The following parameters were used to characterise the dewaterability of sludge samples. The parameters will be described in the following:

(a) Dried Solids (DS) and Volatile Suspended Solids (VSS)

(b) Water distribution of the sludge samples

(c) Polymer-demand

(d) degree of separation

**(a) Dried Solids (DS) and Volatile Suspended Solids (VSS)**

A large fraction of sludge is water. To determine solids content the sample has to be dried at 105°C. The total solids content can be calculated by the equation

$$DS = (m_{dm} / m_{sl}) * 100 \qquad [\%]$$

whereas DS means dried solids, $m_{dm}$ is dried matter and $m_{sl}$ is mass of sludge suspension. There are various abbreviations for the dried solids, for example SS for suspended solids.

The volatile solids describe organic solids content. For measurement dried sample will be glowed at 550°C. This parameter is used basically for controlling of stabilisation and biogas production. The volatile solids content can be calculated by equation

$$VSS = [1- (m_{gr} / m_{dm})] * 100 \qquad [\%]$$

whereas VS means volatile solids and $m_{gr}$ residues is mass after burning. The residues are inorganic minerals and sand.

### (b) Water Distribution of the sludge samples

Achieved total solids concentration of the sludge cake depends on distribution of water types in the sludge, since only share of free water can be separated during mechanical dewatering.

Various types of water in sewage sludge are mainly distinguished by the type and the intensity of their physical bonding to solids. The bonding forces counteract the steam pressure of the water molecules, thus decreasing the steam pressure [1]. That means the higher the bonding forces, the lower the steam pressure. To explain this clearly the bonding forces can be understood as an attraction between sludge particles and adsorbed water molecules. In sewage sludge suspensions four different types of water can be distinguished according to their physical bonding to sludge particles. These are (Fig. 8):

- free water, which is not bound to particles
- interstitial water, which is bound by capillary forces between sludge flocs
- surface water, which is bound by adhesive forces and
- intracellular water

The free water content represents the largest part in sewage sludge. The water moves freely between individual sludge particles, is not adsorbed by them, not bound to them and is not influenced by capillary forces. This type of water can be separated mechanically, for example by centrifugal forces or filtration.

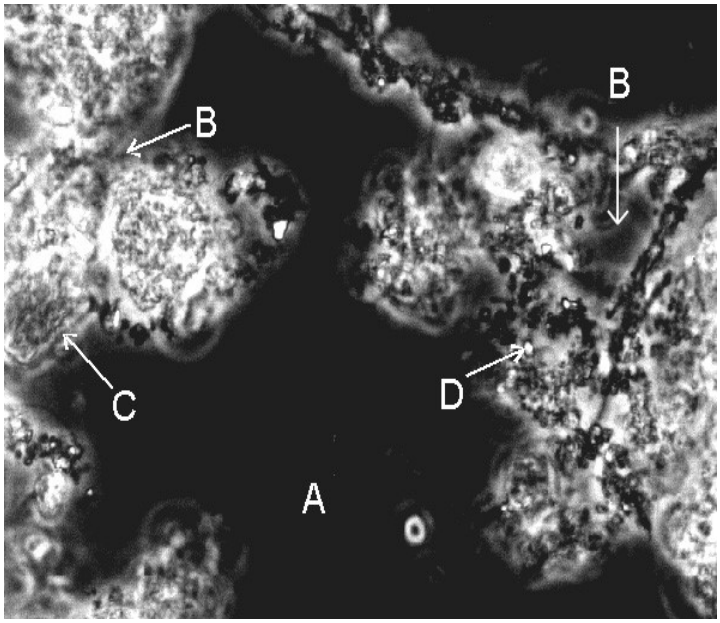
The interstitial water is kept in the interstice of sludge particles and micro organisms in sludge floc. This water is bound physically by active capillary forces.

The surface water covers the entire surface of sludge particles in several layers of water molecules and is bound by adsorptive and adhesive forces. The surface water is physically bound to particles and cannot move freely. The intracellular water contains water in cells and water of hydration. Intracellular water can only be determined together with the surface water and is often called bound water content [2].

Bound water is the smallest water content, has the strongest physical-chemical bonding to particles and can only be removed thermally. It must

be taken into account that the term ”bound water” is not clearly defined and differs according to the used method of measuring [3].
For the measuring of water distribution thermo-gravimetric and dilatometric laboratory tests [4, 5] are used. At the Technical University of Braunschweig those methods were adjusted and calibrated from the consultant, so that a direct statement can be made concerning the maximum suspended solid content in sludge cake after mechanical dewatering in centrifuges and filter-presses [6].

For thermo-gravimetric measurements the sludge sample is dried at constant conditions (air flow, temperature of 35°C). The water distribution can be derived from the curve of the drying rate in dependence on moisture content ($mass_{water}/mass_{DS}$) of the sample. In order to differentiate the corresponding amounts of water, before drying the sample is thickened in a laboratory beaker centrifuge at 1000 x g for 30 min. The drying procedure has to take place very slowly, because otherwise a distinction of the various types of water on the basis of the drying curve is not possible anymore because of high energy input. To dry one sample with a mass of nearly 1 gram we need approximately 18 hours.




A: free water

B: interstitial water

C: surface water

D: intracellular water

C+D: bound water

Fig 8: Water distribution in a sewage sludge floc

Fig. 9 shows the drying curve of a digested sewage sludge sample. Chronologically seen, drying curve starts at the top right-hand corner with high moisture content ($mass_{water}/mass_{DS}$) and ends, when all water has dried from the sample. Two critical points A and B can be seen on the drying curve. Point A marks the end of the free water content and point B the end of the interstitial water.

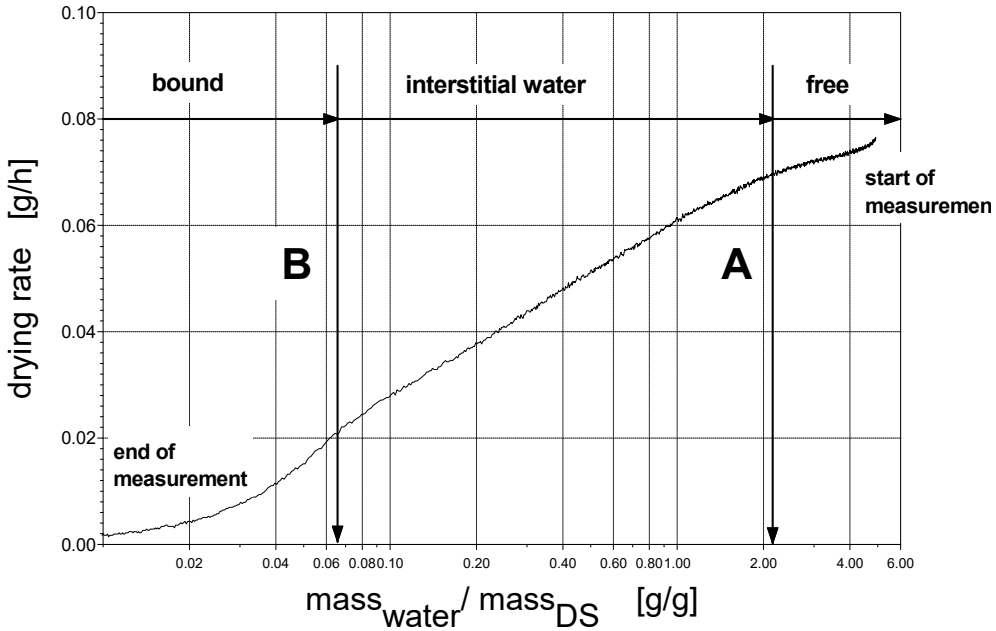



Fig. 9: drying curve of a digested sewage sludge for a logarithmic abscissa as an example from digested sludge sample WWTP Hildesheim Germany

The most interesting fact for mechanical dewatering is the exact determination of free water content, which means point A of the drying curve. Therefore, it is useful, to plot the drying curve with an arithmetical scale (Fig. 10). As long as there is free water in sludge sample, the drying rate is linear. Here the drying rate is described by weight loss of the sludge for each time unit. At point A the drying rate decreases, because of capillary bonding of interstitial water to sludge and the calculated tangent does not describe the curve anymore. The solid content of sludge DS (A) can be derived from the moisture content of the sample.

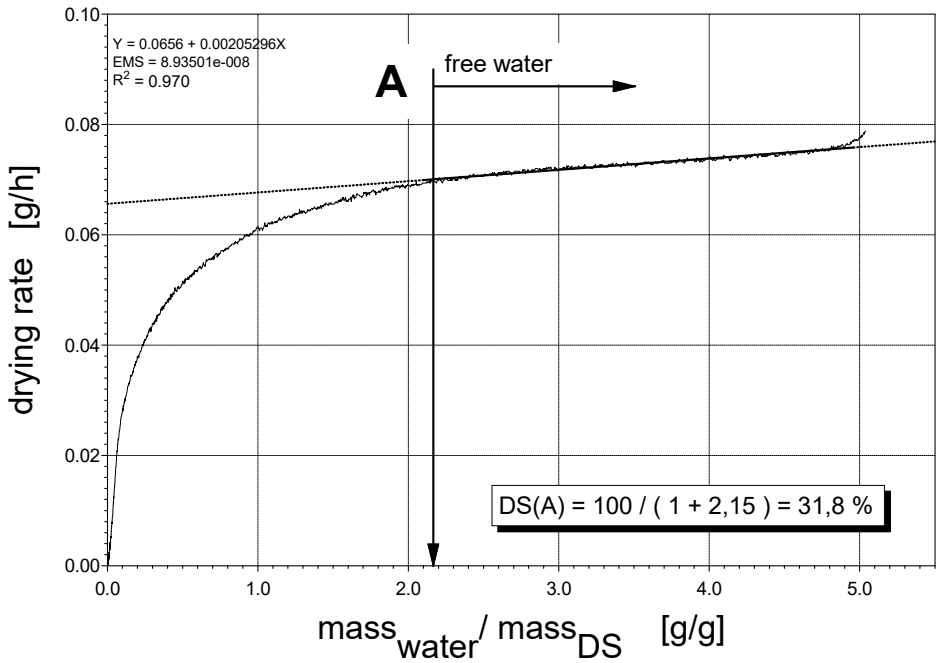



Fig. 10: Drying curve of a digested sewage sludge for an arithmetical abscissaas an example from digested sludge sample WWTP Hildesheim Germany

A calibration of the drying instrument is necessary before an exact evaluation of free water content can take place. After these prediction of full scale dewatering results is possible. Table 2 presents the water distribution, polymer-demand, Dried Solids (DS) and ignition loss (VSS) of 58 anaerobically and 15 aerobically digested sewage sludges.

Due to the present state of the art in science and technology, mechanical dewatering processes can only remove the free water content ($w_{free}$) from sludge. This water content is calculated with the drying instrument. The solids content in sludge cake, which would exist after removal of free water content, is derived as parameter $DS(A)_{KBKOPP}$. The solids content at point A – $DS(A)_{KBKOPP}$ is therefore the maximum solids content in sludge cake, which can be achieved with mechanical dewatering.

### (c) Polymer-demand

Conditioning before dewatering enhances water removal and improves solid capture. The most typical conditioning systems use inorganic chemicals and organic polymers. During conditioning the sludge coagulates because of addition of cationic polymers for example and release of free water is accelerated.

It is possible to use the streaming potential for determination of the polymer demand. An optimum polymer dose is reached, when no electrostatic repulsive forces affect the sludge particles anymore and the value of the streaming potential in sample amounts to -40 mV (due to actual calibration of the measuring device the measuring point with no electrostatic repulsive forces was shifted to – 40 mV). Fig. 11 shows the measurement unit and Fig. 12 an example for measurement results.

Polymer-demand is basically determined by the anionic surface charge of sludge particles [8]. The sludge surface charge on the other hand is determined by entire surface area and charge carriers. Exopolysaccharides (EPS) and other exopolymers contain a highly negative surface charge [9]. EPS are very voluminous and bind a lot of water because of their strong polarity. By staining the EPS, it can be shown, that when excess sludge is concerned, the entire surface area of sludge particles is covered with a gel-like slime. The amount of EPS is basically responsible for the polymer demand of sludge.

Fig. 11: measurement unit SCD

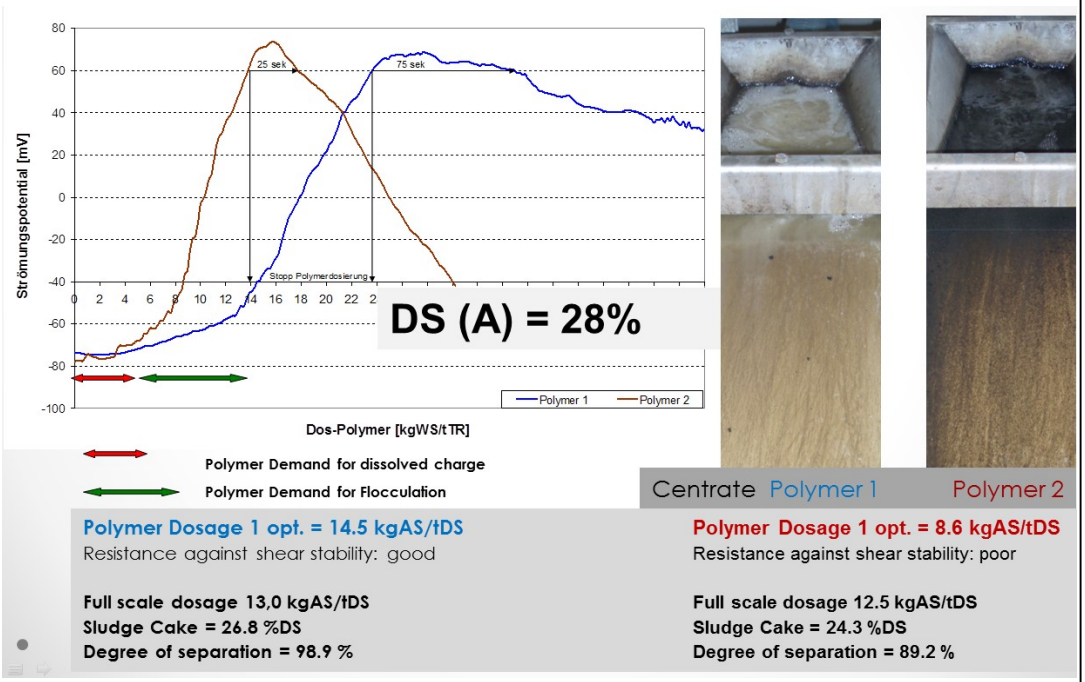



Fig. 12: polymer titration curve for a polymer with high and with low shearing stability

### (d) Degree of Separation

The degree of separation (D-Sep) is a parameter used to describe quality of dewatering process. If the degree of separation is low (< 95%, better 98%) the amount of solids in centrate is very high and quality of the separation process is insufficient. The degree of separation is calculated as

$$D\text{-}Sep = [((DSS - FSC) * DSC) / ((DSC - FSC) * DSS)] * 100 \quad [\%]$$

where DSS is dried solids of the sludge [g/l], DSC is dried solids of the sludge cake [g/l] and FSC is suspended solids of centrate [g/l].

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Table 3: performance indicators sludge dewatering [13]

| Input | Prozessschritt | Output | Kennzahl und Dimension | Zielwert für den „Stand der Technik“ |
|---|---|---|---|---|
| **Faul-schlamm** | Beschickung des Aggregates | TR-Fracht | [kgTR/h] | kontinuierliche Frachtbeschickung |
| | Polymer Aufbereitung | Stammlösung | Reifezeit [min]<br>Lösungsviskosität | 45 min nach Befüllen<br>Verbrauch binnen 1-4 h<br>2-Kammer-Batchanlage und Kontrolle der Lösungsviskosität |
| | Schlammkonditio-nierung | Polymerprodukt<br>Dosis | Labor-& Betriebsversuche<br>[kgWS/tTR] | Flockenstruktur scherstabil / druckstabil bei effizienter Dosierung |
| | Entwässerung | Energiever-brauch | [kWh/tTR]; [kWh/m³] | 0,6-2,2 [kWh/m³] **<br>siehe Tabelle 3 |
| | Entwässerung mit: **Dekanter** | entw. Schlamm | [% TR] | Abtrennung des freien Wassers; Erreichen TR(A)*<br>AG > 95 % für stabilen Betrieb erforderlich |
| | Entwässerung mit: **Bandfilterpresse** | entw. Schlamm | [% TR] | Abtrennung des freien Wassers; TR(A)* – 2 % TR<br>AG > 95 % für stabilen Betrieb erforderlich |
| | Entwässerung mit: **Schneckenpresse** | entw. Schlamm | [% TR] | Abtrennung des freien Wassers; TR(A)* – 2 % TR<br>AG > 95 % für stabilen Betrieb erforderlich |
| | Entwässerung mit: **Schlauchfilter-presse** | entw. Schlamm | [% TR] | Abtrennung des freien Wassers;<br>TR(A) + 1 % TR***<br>AG > 95 % für stabilen Betrieb erforderlich |

* = oder anderer Prognosekennwerte (DWA M-383)
** = Energieverbrauch abhängig vom Aggregat siehe Tabelle 3
*** = aufgrund der hohen Scherkräfte bei der Entwässerung in der Schlauchfilterpresse ist der Bedarf an polymeren Flockungsmitteln erhöht