

DISTRICT OF SOOKE

REQUEST FOR TENDER IFT 2022-004

SUPPLY AND DELIVERY OF WASTEWATER EQUIPMENT INCLUDING: ROTARY DRUM THICKENER, ROTARY DRUM THICKENER FEED PUMP, POLYMER SYSTEM, AND CONTROL PANEL

DISTRICT OF SOOKE WWTP UPGRADES 2022

April 12, 2022

The District of Sooke invites qualified Tenders for the supply, delivery, start-up and commissioning of:

- Rotary Drum Thickener
- Rotary Drum Thickener Feed Pump
- Polymer System
- Control Panel

and related equipment for incorporation into the District of Sooke WWTP Upgrades 2022 in the District of Sooke, BC. The tender consists of the supply, start-up and commissioning and delivery of equipment and system and accessories as herein specified.

The Tender is available electronically by downloading from BC Bid's website.

A hard copy of the Tender Package is available for viewing, upon request, from 8:30 a.m. to 4:30 p.m., Monday to Friday at District of Sooke Municipal Hall, 2205 Otter Point Road, Sooke. Electronic copies are available on BC Bid.

Tenders are scheduled to close at:

Tender Closing Time: 2:00 p.m. Local Time

Tender Closing Date: Tuesday May 3, 2022
There will NOT be a Public Opening for this Tender

Delivered to: District of Sooke

2205 Otter Point Road
Sooke, British Columbia
V9Z 1J2
ATTN: Paul Bohemier, Manager of Waste
Water

Tender Enquiries:

Stan Spencer, P.Eng.,
Stantec Consulting Ltd.
Telephone: 250-589-4087
Email: stan.spencer@stantec.com

DISTRICT OF SOOKE
RECEIPT CONFIRMATION FORM
REQUEST FOR TENDER
IFT 2022-004

WWTP EXPANSION
WASTEWATER EQUIPMENT SUPPLY AND
DELIVERY
DISTRICT OF SOOKE WWTP UPGRADES 2022

As receipt of this document, and to directly receive any further information about this
Request for Tender, please return this form to:

Attention: Stan Spencer, P.Eng.
Stantec Consulting Ltd.
400-655 Tyee Road
Victoria, BC V9A 6X5
Fax: 250.382.0514
Email: stan.spencer@stantec.com

Company Name: _____

Address: _____

District: _____

Province/State: _____ Postal/Zip Code: _____

Telephone No: _____ Fax No: _____

Contact Person: _____

Title: _____

Email: _____

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Invitation

INVITATION TO TENDER

- Part 1 .1 The District of Sooke (the “District”) invites Tenders from qualified Tenderers for the supply, delivery, start-up, testing and commissioning of:
- 1.1 .1 Rotary Drum Thickener
.2 Rotary Drum Thickener Feed Pump
.3 Polymer System
.4 Control Panel for the above items

SCOPE OF SUPPLY AND DESCRIPTION OF GOODS

- 1.2 .1 The supply, delivery, start-up, testing and commissioning of wastewater equipment for incorporation into the District of Sooke WWTP Upgrades 2022 in Sooke, BC. This consists of the following.
- .1 Supply of Rotary Drum Thickener to thicken waste activated sludge from SBR systems
.2 Supply of single Rotary Drum Thickener Feed Pump compatible with the proposed rotary drum thickener.
.3 Supply of a polymer solution preparation and blending system compatible with the proposed rotary drum thickener.
.4 Supply of a single control panel for the above items
.5 Installation support services.
.6 Testing, start-up, training and commissioning support services.
- .2 This tender should be read in conjunction with related specifications and drawings as listed above.
- 1.3 .3 Tenders can include all or portion of the Goods.
.4 Delivery Point: Sooke Waste Treatment Facility, V9Z 0S2.

TENDER SUBMISSION

- .1 Tenders will be received at the specified physical location referred to below no later than (“Tender Closing”):

Paul Bohemier, Manager of Waste Water
District of Sooke
2205 Otter Point Road
Sooke, British Columbia
V9Z 1J2

Tender Closing Time: **2:00 p.m. local time**

Tender Closing Date: **Tuesday, May 3, 2022**

There will NOT be a public opening for this Request for Tender

- .2 The Tenderer must submit to the District all the completed and executed documentation in a sealed envelope or package including all attachments and enclosures, on the exterior of which should be indicated the name of the Tenderer.
- .3 The time of Tender Closing shall be established by the time shown on the clock for local area network at the closing location.
- .4 Tenders received after the Tender Closing\, Clause 1.3.1 will not be considered by the District and will be returned unopened to the Tenderer.
- .5 No oral or electronically transmitted Tenders or amendments to Tenders will be considered.
- .6 By submitting a Tender, the Tenderer agrees that it shall be solely responsible for any and all costs and expenses incurred by it in preparing and submitting its Tender, including any costs incurred by the Tenderer after the Tender Closing.
- .7 Defined terms in the Tender Documents shall have the same meanings as set out in Clause 1.1 of the General Conditions Section 00 50 00, except where the contrary is expressed.
- .8 Tenderers are requested to return the enclosed Receipt Confirmation Form within two working days of receipt.

Part 2

Tender Documents

2.1

An electronic version of the Tender Documents is available on BC Bid.

2.2

The District's language in its procurement documents shall be English.

Part 3

3.1

Tender Enquiries and Addenda

Enquiries should be addressed to the Contact Person:

3.2

Stantec Consulting Ltd.
Stan Spencer, P.Eng.
Telephone: 250.589.4087
Email: stan.spencer@stantec.com

3.3

Any requests for explanations, interpretations or clarifications made by Tenderers should be submitted in writing to the individual named in Section 00 10 00, clause 1.3.1 at least three (3) business days before Tender Closing.

Explanations, interpretations, or clarifications may be made in the form of Addenda. All Addenda issued by the District shall be incorporated into and become part of the Tender Documents.

Addenda may be issued by the District before Tender Closing and will be distributed via e-mail by the contact person to all who have provided a completed Receipt Confirmation Form.

3.4 The Tenderer must carefully examine the Contract Documents and the site of the proposed works and the Delivery Point, judging for and satisfying themselves as to the probable conditions to be encountered. Should a Tenderer find omissions from or discrepancies in the Contract Documents, or be in doubt as their meaning, the Tenderer should notify the contact person no later than 5 days prior to the tender closing, who may cause to send a written instruction to all Tenderers in the form of an addendum, which shall become part of the contract and shall be covered in the contract price.

3.5 The Tenderer may not claim, after the submission of a tender, that there was any misunderstanding with respect to the conditions imposed by the documents.

3.6 No oral interpretations made to a Tenderer as to the meaning of the Contract Documents shall be considered binding. Every request for an interpretation shall be made in writing, forwarded to the Contact Person referred to in paragraph 3.1.

Inspection of Delivery Point

Part 4
4.1 The submission of a Tender by the Tenderer shall be deemed to be an acknowledgement that the Tenderer has relied and is relying on its own examination of the Delivery Point and all other matters related to the completion of delivery.

Completion of Tender Documents

Part 5
5.1 The Tenderer shall complete the Tender Form in ink or in type.

5.2
5.3 The quantities stated herein are estimates only and are given for the purpose of providing a uniform basis for the comparison of tenders. Payment will be based on actual quantities.

Part 6
6.1 All prices are to be in Canadian currency, unless otherwise stated. Prices shall be shown for each unit specified and shall include all necessary costs including but not limited to supply, fabrication and finishing, conveyance and delivery, packing, crating, freight, cartage, shipping charges, drafting charges, overhead, profit and all tariffs, duties and taxes, including Provincial Sales Tax. The applicable Goods and Services Tax (GST) shall be shown as a separate item in the tender price.

Solicitation

The Tenderer may not make any representations or solicitations to any council member, officer or employee of the District with respect to the Tender either before or after submission of the Tender except as provided herein. If any director, officer, employee, agent sub-contractor, supplier or other representative of the Tenderer communicates with any council member, officer or employee of the District or any consultant engaged by the District in connection with this Invitation to Tender about this Invitation to Tender, other than the Contact Person named under Part 3 – Pre-Tender Enquiries and Addenda, the District may, regardless of the nature of the communication, reject the Tender submitted by the Tenderer.

Submission of Tenders

The Tenderer must submit the following completed and executed documentation:

- Part 7
7.1
- .1 Tender Form Sections 00 20 00, 00 40 00, 00 52 10;
 - .2 A security (“Bid Security”) in the form of a bid bond issued by a surety licensed to carry on the business of suretyship in British Columbia in a form reasonably satisfactory to the Owner in an amount equal to 10% of the Tender price;
 - .3 In a sealed envelope or package, on the exterior of which should be indicated the Tender Number and the name of the Tenderer.
 - .4 The Tender shall be submitted no later than the Tender Closing at the following specified physical location set out in Section 00 10 00 Clause 1.3.1.

No oral or electronically transmitted Tenders or amendments to Tenders will be considered.

- 7.2
7.3
- It is solely the responsibility of the Tenderer to ensure that it has obtained, prior to the Tender Closing, all Addenda issued by the District.

7.4 The District will not accept an amendment to a previously submitted Tender unless:

- .1 it is in writing;
 - .2 it is received at the specific physical location set out in Section 00 10 00, Clause 1.3.1, prior to the Tender Closing in a sealed envelope or package on the exterior of which should be indicated the Tender Number and the name of the Tenderer;
 - .3 it indicates a change to a Tender already submitted; and
 - .4 it is signed and the amendment indicates that the person who signed is an authorized signatory of the Tenderer.
- 7.5

7.6
7.7

It is solely the responsibility of the Tenderer to ensure that its Tender and any amendments are received at the specific physical location set out in Section 00 10 00, Clause 1.3.1.

7.8
7.8

Tenderers shall be solely responsible for the completion and delivery of Tenders and any amendments in the manner and time specified by Section 00 10 00, Part 8.

Tender form must be signed by an authorized signatory of the Tenderer.

Tenderer must acknowledge receipt of all Addenda.

Withdrawal of Tenders

A Tenderer may withdraw its Tender after it has been submitted to the District, provided the request for withdrawal is made in writing, signed by an authorized signatory for the Tenderer, delivered (not mailed) to the office referred to in Section 00 10 00, Clause 1.3.1 and received by the District before the time set for the Tender closing .

Part 8

8.1

Irrevocability of Offer

The Tender submitted by the Tenderer shall be irrevocable and remain open for acceptance by the District for a period of 120 business days from the Tender Closing, whether another Tender has been accepted or not.

Part 9

9.1

If a Tenderer, for any reason whatsoever, purports to revoke its Tender within 120 business days from the Tender Closing, or if for any reason whatsoever a successful Tenderer does not execute and deliver the Agreements in accordance with Section 00 10 00, Clauses 12.1 and 15.1, the District, without limiting any other remedy it may have under the Tender Documents or otherwise, shall be entitled to require the Tenderer to pay to the District an amount equal to the difference between the tender price of its Tender and any other Tender which is accepted by the District, if such other Tender is for a greater price, plus the total of all costs, expenses and damages, including legal fees on a solicitor and own client basis, incurred by the District as a result of or related to such revocation or failure by the Tenderer.

9.2

Part 10

Acceptance and Rejection of Tenders

10.1

Notwithstanding any other provision in the Tender Documents, any practice or custom in the industry, or the procedures and guidelines recommended for use on publicly funded projects, the District, in its sole discretion, shall have the unfettered right to:

- .1 accept any Tender;
 - .2 reject any Tender;
 - .3 reject all Tenders;
 - .4 accept a Tender which is not the lowest Tender;
 - .5 reject a Tender even if it is the only Tender received by the District;
- 10.2
- .6 accept all or any part of a Tender; and
 - .7 award all or a portion of the contract to supply the Goods to any Tenderer.

If a Tender contains a defect or fails in some way to comply with any of the requirements of the Tender Documents, including where such non-compliance is material, the District may, in the sole and unfettered discretion of the District, waive the defect or non-compliance and accept the Tender.

The District will notify the successful Tenderer in writing that its Tender has been accepted (the "Notice of Award") as well as notifying, in writing, the unsuccessful Tenderers.

Acceptance of any Tender may be subject to budgetary considerations and District of Sooke Council approval.

- 10.3 If the Form of Tender requires unit prices for optional items, the District may, in its sole discretion, compare Tenders with and without pricing for all or any such optional items and may
- 10.4 accept a Tender with some, all or none of such optional items.

10.5 **Successful Tenderer Requirements**

Part 11 The successful Tenderer shall execute and deliver the Agreement in the form set out in Sections 00 40 00 and 00 52 10, in triplicate, to the District within ten (10) Days after it has received the Agreement from the District.

11.1

The successful Tenderer shall submit to the District the following original documentation within seven (7) Days of receiving the Notice of Award;

11.2

- .1 An original certificate of insurance pursuant to Section 00 50 00, Clause 5.2, in a form acceptable to the District.
- .2 Performance Bond in the amount of 50% of the Contract value.

Part 12 **Confidentiality and Security**

12.1

The following conditions apply:

- .1 The Tender Documents, or any portion thereof, may not be used for any purpose other than submission of Tenders; and
- .2 If a Tenderer considers that any part of their Tender is confidential, they shall indicate this their Tender. Tenderers should be aware, however, that pursuant to section 21 of the *Freedom of Information and Protection of Privacy Act*, the District may be required to disclose such information, even though it is expressed to be confidential, pursuant to a request for information made under that Act. Tenderers are advised to review that Act.

Part 13

13.1

Disclaimers/Limitations of Liability

The District, its council members, officers, servants, employees and agents expressly disclaim any duty of care and all liability for representations, warranties, express or implied or contained in, or for omissions from this Request for Tender or any written or oral information transmitted or made available at any time to a Tenderer by or on behalf of the District. Nothing in this Request for Tender is intended to relieve a Tenderer from forming its own opinions and conclusions in respect of this Request for Tender, and the Tenderer hereby waives for itself, its successors, heirs and executors, the right to sue the District in tort for any loss, including economic loss, damage, cost or expense arising from or connected with any error, omission or misrepresentation occurring in the preparation of Tender and the Contract Documents.

No Tenderer shall have any claim for any compensation of any kind whatsoever, as a result of participating in this Request for Tender, and by submitting a Tender each Tenderer shall be deemed to have agreed that it has no claim.

Novation Agreement

13.2

It is a condition of the Supply Contract that the Supplier enters into a Novation Agreement, annexed hereto in Section 00 52 10 as Appendix "A", with the General Contractor selected by the District, and the District.

Part 14

14.1

END OF SECTION

TENDER FORM

Contract: SUPPLY AND DELIVERY OF WASTEWATER EQUIPMENT

1. I (WE), THE UNDERSIGNED:

have received and carefully reviewed all of the Contract Documents, including the Instructions to Tenderers, and the following Addenda which form a part of this tender:

(Addenda, if any)

(Tenderer to Complete)

2. TENDER DOCUMENTS

2.1 The Tender Documents for this Contract include the following:

- a. All documents listed in Section 00 10 00, Table of Contents;
- b. Drawings: Issued for Equipment Pre-purchase
- c. Addenda as issued.

3. TENDERERS OFFER

3.1 The Tenderer hereby offers to perform and complete all of the Work and to supply all the plant, material, equipment, labour and workmanship, and to do everything further necessary, as set out in the Contract Documents for the fulfillment of **TENDER** for the **SUPPLY AND DELIVERY OF WASTEWATER EQUIPMENT** to the **DISTRICT OF SOOKE** on the terms and conditions therein contained and within the time specified limited and for the amounts set out in the completed schedule of unit prices (Schedule 1 - Quantities and Prices).

4. TENDERERS DECLARATIONS

4.1 The Tenderer declares that it has read and understood and agrees to be bound by the Tender Documents.

4.2 Without limiting the generality of Section 00 20 00, Clause 4.1, the Tenderer declares that it has fulfilled and complied with all of those obligations and requirements under the Tender Documents which are required to be fulfilled by the Tender Closing.

4.3 The Tenderer confirms, represents and warrants that all information which it has provided to the District is true and accurate in every respect.

Tenderer's Initial	Owner's Initial

5. SCHEDULES

5.1 The immediately following Schedules, namely:

- Schedule 1 - Quantities and Prices
- Schedule 2 - Supply and Delivery Dates
- Schedule 3 – Maintenance and Support

shall form part of the Tender Documents. The Tenderer shall complete the Schedules and submit per Section 00 10 00, Clause 8.1.

5.2 The information contained in the Schedules may be used by the District to assess the Tenderers ability to perform the Contract and may be taken into account by the District in its decision to award the Contract.

5.3 All prices shall be shown in Canadian currency.

Tenderer's Initial	Owner's Initial

SCHEDULE 1 – QUANTITIES AND PRICES

The Tenderer hereby submits unit prices as required by the specifications and agrees that these prices will be used for payment for the Goods including Goods additional to and deleted from the Contract and agrees that the prices quoted shall remain in force until the date of completion of the Contract.

The Tenderer confirms that the tender price, including any unit prices, include all necessary costs including but not limited to supply, fabrication and finishing, conveyance and delivery to the Delivery Point, packing, crating, freight, cartage, shipping charges, drafting charges, overhead, profit and all tariffs, customs, duties and taxes, including provincial sales tax, with the exception of GST which shall be shown separately.

The total of the unit prices plus the applicable GST shall agree with the total tender price.

SCHEDULE 1 – QUANTITIES AND PRICES

Item	Description	Qty	Unit	Unit Price (\$)	Total Price (\$)
1	Supply and delivery of Rotary Drum Thickener summarized in Section 43 71 23 and drawings as part of this Tender package.	1	LS	\$	\$
2	Supply and delivery of Rotary Drum Thickener Feed Pump summarized in Section 43 25 13 and drawings as part of this Tender package.	1	LS	\$	\$
3	Supply and delivery of Polymer System package summarized in Section 43 32 69 and drawings as part of this Tender package.	1	LS	\$	\$
4	Supply and delivery of Control Panel package summarized in Section 43 32 69 and drawings as part of this Tender package.	1	LS	\$	\$
GST (5%) of total					\$
Total					\$

⁽¹⁾ The tender assessment is based on the total price for all items related to each equipment package. No claims for lost profit will be allowed from any tenderer if the optional items do not become part of the contract.

The tender price stated above will be used to compare submitted Tenders. The District reserves the right to check the above extensions and additions and to make corrections as necessary.

The unit prices will govern payments for the Goods of the resulting Contract.

PAYMENT TERMS

Refer to Section 01 27 00 Measurement and Payment, Clause 1.4 Progress Payments, for a description on how payments will be made.

Tenderer's Initial	Owner's Initial

SCHEDULE 2 – SUPPLY AND DELIVERY DATES

1. The Tenderer shall complete the following Schedule of Supply and Delivery Dates for the Goods and shall be prepared to supply the Goods to the Delivery Point no later than the date shown on Table 1 below. The Schedule of Supply and Delivery should be the Tenderers best realistic delivery date.
2. It is the intent of the Contract that the Goods, including all main equipment, ancillaries, accessories and any tools, be supplied as completely assembled as practical. If it is the intent of the Tenderer to supply any Goods, accessories and tools in components or not completely assembled, the Tenderer should indicate the separate components or provide a description of the state of assembly for each type of equipment.
3. Final schedule is ultimately determined by the General Contractor responsible for delivering the construction contract; however, Supply Contractor shall be prepared to deliver materials as required to site by the date indicated in Table 1 below.
4. The project intent is to have the construction completed by the end of 2023.
5. Table 1 – Supply and Delivery Dates

In response to the District’s preferred delivery dates, the Tenderer offers its best delivery schedule as follows:

TABLE 1 – SUPPLY AND DELIVERY DATES

Item	Description	Tender’s Proposed Delivery Date	The District’s Preferred Delivery Date Schedule
1	Complete Shop Drawings Weeks following Notice to Proceed		4 weeks
2	Equipment Delivered to Site Weeks following completion of Shop Drawing Review		26 weeks

Tenderer’s Initial Owner’s Initial

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SCHEDULE 3 – MAINTENANCE AND SUPPORT

The Tenderer shall complete the following Schedule of Maintenance and Support for the Goods. The following are the minimum requirements of the Supplier:

- Shall provide a 24 hour, 365 day toll free service hotline
- Next day Service Technician (experienced with Manufacturer’s complete system)
- Same day or overnight parts availability

SCHEDULE 3 – MAINTENANCE AND SUPPORT

Item	Description	Suppliers Availability
1	Toll free service Hotline hours and days per year	_____ hours, _____ days a year
2	Technician Availability	Same day / overnight/ other (describe)
3	Part availability (including rectifier and electrolytic cells)	Same day / overnight/ other (describe)
4	Local Service Provider	Company: Years’ Experience with Manufacturers Equipment: Local Address:

Tenderer’s Initial	Owner’s Initial

NOVATION AGREEMENT ACKNOWLEDGEMENT

The Tender agrees to join in an assignment and Novation Agreement in the form set out in Appendix A as soon as the construction contract between the District and the General Contractor has been signed.

EXECUTION BY TENDERER

This Tender is executed at _____ this _____ day of _____, 2022.

Print name of District or District, and
Province, or if outside Canada, Country.

SIGNED

by _____

(Print Company Name)

By its authorized signatory (ies):

(Signature)

(Print Name and Title)

END OF SECTION

DISTRICT OF SOOKE

DISTRICT OF SOOKE WWTP UPGRADES 2019
CONTRACT 1790-20-WWTP-002

UNDERTAKING OF SURETY - PERFORMANCE BOND
[Undertaking to accompany Tender]

District of Sooke
2205 Otter Point Road
Sooke, British Columbia
V9Z 1J2

Gentlemen:

We, the undersigned

(Insert Bonding Company's Name)

do hereby undertake and agree to become bound to District of Sooke for a PERFORMANCE BOND for

_____ DOLLARS (\$ _____)
(Insert a Sum Equal to 50 Percent of the Total Tendered Amount)

for the fulfilment of the Contract to perform the works and services, all as specified in the attached Tender Form if the Contract is awarded to

(Insert Tenderer's Name)

Dated at _____, British Columbia, this _____ day of _____, 2019.

Yours very truly,

Signature and Corporate Seal of Surety Company Licensed to
Conduct Business in the Province of British Columbia

DRAFT CONTRACT AGREEMENT

THIS AGREEMENT made this _____ day of _____, 2022.

BETWEEN: _____ (the “Supply Contractor”)

AND: District of Sooke (the “District”)

THIS AGREEMENT WITNESSES that the Supply Contractor and the District agree as follows:

1. The Supply Contractor shall provide all labour, materials, equipment, supplies and all other items required to supply the Goods and perform all other Work within the required time, as required by the Contract Documents.
2. The District shall pay the Supply Contractor the Contract Price, as required by the Contract Documents.
3. The Contract Price shall be the sum in Canadian Dollars of the following:
 - .1 the tender price, as set out Section 00 20 00, and
 - .2 any payments made on account of changes, as may be required by the Contract Documents.

The Contract Price shall be the entire compensation payable to the Supply Contractor by the District for the Goods other Work and shall cover and include necessary costs including but not limited to all supervision, labour, materials, equipment, supplies and all other items, overhead, profit, financing costs, duty, shipping charges, fabrication and finishing, storage as required, conveyance and delivery, packing, crating, freight, cartage, drafting charges, tariffs, warranty and all other costs and expenses whatsoever incurred in performing the Contract.

4. The Supply Contractor shall supply all Goods to the Delivery Point no later than the dates shown on Section 00 20 00 Schedule 2, including revisions under Section 00 50 00, Item 7.1.2, if any.
5. The Contract Documents shall form a part of this Agreement.
6. The Contract supersedes all prior negotiations, representations or agreements, whether written or oral and is the entire agreement between the District and the Supply Contractor with respect to the subject matter of this Agreement.

Tenderer's Initial Owner's Initial

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Capitalized terms in this Agreement shall have the meanings as set out in Section 00 50 00, Clause 1.1.

7. The Supply Contractor shall not assign the Contract, or any portion of the Contract, or any payments due or to become due under the Contract, without the express written consent of the District.
8. No action or failure to act by the District or an authorized representative of the District shall constitute a waiver of any right or duty afforded any of them under the Contract or constitute an approval or acquiescence in any breach thereunder, except as may be specifically agreed in writing.
9. This Agreement shall enure to the benefit of and be binding upon the District and the Supply Contractor and their respective heirs, executors, legal representatives, successors and permitted assigns. In the event of more than one person being the Supply Contractor, such persons shall be jointly and severally liable for all of the representations, warranties, covenants and obligations of the Supply Contractor under the Contract.
10. Time shall be of the essence of this Agreement.
11. This Agreement is governed by the laws of British Columbia, Canada.
12. This Contract Agreement will be assigned to the General Contractor once that contract is awarded. (Estimated to be by fall 2022).

Tenderer's Initial	Owner's Initial
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IN WITNESS WHEREOF the parties hereto have executed this Agreement as follows:

DISTRICT OF SOOKE

by its authorized signatory on _____ day of _____, 2022:

SIGNED on behalf of the District by:

Signature: _____

Name: _____

Title: _____

[CONTRACTOR'S NAME]

by its authorized signatory on _____ day of _____, 2022:

SIGNED on behalf of the Contractor by:

Signature: _____

Name: _____

Title: _____

Signature: _____

Name: _____

Title: _____

END OF SECTION

Tenderer's Initial Owner's Initial

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General

DEFINITIONS

.1 The following words and terms, unless the context otherwise requires, in all Contract Documents, shall have the meanings set out below.

Part 1

1.1

"Addenda" means any and all addenda issued by the District;

"Agreement" means the agreement set out in Section 00 40 00;

"Construction Contract" means the agreement between the District and the General Contractor who is to install the Goods supplied pursuant to the Contract;

"Contract" means the agreement formed by the District's acceptance of the Tender for completion of the work set out in the Contract Documents;

"Contract Documents" means the following documents:

- .1 the Tender Documents
- .2 the executed Tender Form
- .3 the executed Bonds, if any,
- .4 the executed Agreement
- .5 the General Conditions
- .6 Drawings, if any
- .7 Specifications
- .8 Change orders
- .9 Addenda
- .10 other relevant documents such as but not limited to letters of clarification and any reports, standards or the like included by reference;

"Contract Price" has the meaning set out in Section 00 40 00 Clause 3;

"Day" means calendar day;

"Delivery Date" has the meaning set out in Section 00 20 00 Schedule 2;

"Delivery Point" means the location set out in Section 00 10 00 Clause 1.2.3;

"Drawings" means the drawings included in the Tender Documents together with those prepared by the District and the General Contractor and the Supply Contractor pursuant to the terms of the Contract and include:

- .1 Modifications of drawings issued by Addenda;
- .2 Drawings submitted by the General Contractor or Supply Contractor during the progress of the work and accepted by the District either as attachments to change orders or as non-modifying supplements to the drawings in the Tender Documents including drawings issued by Addenda;

- .3 Drawings submitted by the District to the General Contractor or Supply Contractor during the progress of the work either as attachments to change orders or as explanatory supplements to the drawings in the Tender Documents including drawings issued by Addenda;

"Engineer" means the Engineer of the District and any person duly authorized to act as Engineer on behalf of the District;

"General Contractor" means the person, who or which is to install the Goods supplied pursuant to the Contract;

"Goods" means the goods set out in Section 00 10 00 Clause 1.2.1 and comprising the subject matter of this Contract;

"Notice of Award" has the meaning set out in Section 00 10 00 Clause 11.4;

"Specifications" means that part of the Contract Documents consisting of general requirements and written descriptions of the technical features of materials, equipment, construction systems, standards and workmanship;

"Submittals" means the information which has to be submitted to the District in accordance with Section 01 33 00;

"Supply Contractor" means the person who or which executes the Agreement;

"Tenderer" means a person submits a Tender;

"Tender" means a Tenderer's offer set out in Section 00 20 00 and includes the Tender Documents;

"Tender Closing" has the meaning set out in Section 00 10 00 Clause 1.3.1;

"Tender Documents" means the documents, drawings and addenda set out in Section 00 20 00 Clause 2.1;

"District" has the meaning set out in Section 00 10 00 Clause 1.1

"WHMIS" means Workplace Hazardous Materials Information System.

"Work" means anything and everything required to be done for the fulfilment and completion of this agreement.

1.2

PARTNERSHIPS & JOINT VENTURES

- .1 If the Supply Contractor is a partnership or joint venture the individual partners or joint venturers shall be jointly and severally liable for all of the Supply Contractor's representations, warranties, covenants and obligations under the Contract.

CONTRACT REQUIREMENTS

- .1 Successors' Obligations
 - .1 The Contract shall enure to the benefit of and be binding upon not only the parties hereto but also their respective successors and permitted assigns.
- 1.3 .2 Assignment of Contract
 - .1 The Supply Contractor shall not assign the Contract in whole or in part, nor any payments due or to become due under the Contract without the prior written consent of the District. No assignment of the Contract shall relieve the Supply Contractor from any obligation under the Contract or impose any liability on the District. Involuntary assignment of the Contract as a result of, inter alia, bankruptcy, assignment of the Contract for the benefit of creditors or appointment of a receiver, or insolvency shall be deemed default under the Contract entitling the District to terminate the Contract as hereinafter provided.
- .3 Waiver of Rights
 - .1 Except as herein provided, no act or failure to act by the Supply Contractor, the District, or the Engineer at any time with respect to the exercise of any right or remedies conferred upon them under this Contract shall be deemed to be a waiver on the part of the Supply Contractor, the District or the Engineer, as the case may be, of any of their rights or remedies. No waiver shall be effective except in writing. No waiver of one right or remedy shall act as a waiver of any other right or remedy or as a subsequent waiver of the same right or remedy.
- .4 Amendment of Contract Documents
 - .1 The Contract Documents shall not be amended except as specifically agreed in writing signed by both the District and the Supply Contractor.

LAWS, REGULATIONS AND PERMITS

- .1 The Contract shall be construed under and according to the laws of the Province of
 - .1 British Columbia and subject to an agreement to refer a dispute to arbitration under Section 00 50 00, Clause 2.4.7, the parties agree to irrevocably attorn to the jurisdiction of the Courts of the Province of British Columbia.
- .2 The Supply Contractor shall give all notices required by law and shall comply with all laws, acts, ordinances, rules and regulations relating to or affecting the Goods. If any permits, authorizations, approvals or licences from any government or governmental agencies are necessary or desirable for the prosecution of the Work they shall be obtained by the Supply Contractor at its expense, provided that the Supply Contractor shall not make application for any such permit, authorization, approval or licence without first obtaining the written consent of the District.
- .3 Patents, Royalties and Copyright
 - .1 The Supply Contractor shall pay all fees, royalties or claims for any patented invention, article, process or method that may be used upon or in a manner connected with the Goods or with the use of the Goods by the District. Before final payment is made on the account of this Contract, the Supply Contractor shall, if

requested by the District, furnish acceptable proof of a proper release from all such fees or claims.

- .2 If the Supply Contractor, its agent, employee or any of them is prevented from furnishing or using any invention, article, material or Drawings supplied or required to be supplied or used under this Contract, the Supply Contractor either shall promptly pay such royalties and secure the requisite licences or, subject to written approval by the District, substitute other articles, materials or appliances in lieu thereof which are of equal efficiency, quality, finish, suitability and market value to those planned or required under the Contract.
- .3 The Supply Contractor shall submit to the Engineer descriptive information of these proposed substitutions. Approval by the District of any substitutions shall not relieve the Supply Contractor of its responsibility if the substitutions do not function as well as the original specified in the Contract and shall not be deemed an assumption of risk or responsibility by the District. Approval shall only mean the District has no objection to the substitution being utilized at the Supply Contractor's risk. If the District refuses to approve the substitution, the Supply Contractor shall pay such royalties and secure such valid licences as may be requisite for the District, its directors, officers, agents and employees or any of them, to use such invention, article, material or appliance without being disturbed or in any way interfered with by any proceeding in law or equity on account thereof.
- .4 All references to money in the Contract Documents shall be interpreted as meaning lawful currency of Canada.

1.5 **HEADINGS**

- .1 Headings to parts, divisions, sections, clauses and forms are inserted for convenience of reference only and shall not affect the interpretation of the Contract Documents.

Part 2

2.1 **District-Supply Contractor Relations**

AUTHORITY OF DISTRICT

- .1 Acceptability of Goods
 - .1 The District shall make the final determination of the acceptability of the Goods.
- .2 Authority of Engineer
 - .1 The Engineer shall represent the District at the Delivery Point. The Engineer shall have the authority set out in the Contract Documents and such other authority as may be delegated in writing by the District including but not limited to the following:
 - .1 to make decisions regarding the Goods;
 - .2 to make decisions regarding the manner of performance and rate of progress of supply of the Goods;
 - .3 to make decisions regarding clarifications and interpretation of the Contract Documents.The District may appoint a new Engineer from time to time by providing notice of such appointment to the Supply Contractor

RESPONSIBILITIES OF THE SUPPLY CONTRACTOR

- 2.2
- .1 Attention to the Goods
 - .1 The Supply Contractor shall diligently attend to the supply of the Goods so that they are delivered faithfully, expeditiously and in accordance with the Contract Documents.
 - .2 Authorized Representative
 - .1 The Supply Contractor shall advise the Engineer in writing of the name of the Supply Contractor's authorized representative.
 - .3 Off-loading of Goods
 - .1 The Supply Contractor shall provide all necessary instruction and Delivery Point personnel to ensure satisfactory off-loading, storage, and testing of the Goods.
 - .4 Shipment
 - .1 The Supply Contractor shall properly package all Goods for safe shipment to the Delivery Point and a Notice of Shipment shall be sent by the Supply Contractor to the District at least 2 weeks before the Goods are shipped. The Notice of Shipment shall state the number of the order, the kind of goods, the Supply Contractor's name and the carrier and route by which the shipment is being made.
 - .2 The Notice of Shipment shall indicate appropriate instructions, considerations or other information regarding the proper storage, handling, transfer, off-loading and installation of the Goods.
 - .5 Acceptable Delivery
 - .1 The Supply Contractor will arrange to have the Goods delivered to the Delivery Point between 8:00 a.m. and 3:30 p.m. Monday to Friday, statutory holidays excepted. The District shall not be responsible for Goods delivered outside the acceptable time for delivery.
 - .6 Transportation Costs
 - .1 If the Contract calls for payment of any transportation cost by the District, the District shall in no event be liable or accountable in excess of the actual costs of transportation.
 - .2 Supply Contractor shall be accountable for and pay any excess transportation costs arising from Supply Contractor's failure to make delivery to the Delivery Point or to follow shipping instructions furnished by the District.
 - .7 Employee Safety
 - .1 The Supply Contractor alone shall at all times be responsible for the safety of its employees, its subcontractors' employees and other persons and equipment lawfully at the Delivery Point in connection with the supply of Goods and shall comply with the standards for the Work Site, the Workers' Compensation Act and regulations thereto and under statutory and common law.
 - .2 The Supply Contractor shall cooperate with the directions of the General Contractor who will be designated as prime contractor for purposes of the Workers Compensation Act.
 - .8 Confidentiality

- .1 The Supply Contractor shall agree not to divulge or release any information that has been given to it or acquired by it on a confidential basis during the course of providing the Goods.

DISTRICT - SUPPLY CONTRACTOR CO-ORDINATION

.1 Notice

2.3

- .1 Any notice, order, directive, request or other communication (the “notice”) given by the District or the Engineer to the Supply Contractor shall be deemed to be given to the Supply Contractor if left at any office used by the Supply Contractor or delivered to any of its officers or employees or posted at the Delivery Point or mailed by mail addressed to the Supply Contractor at the address given in the Contract Documents or mailed to the Supply Contractor’s last known place of business. Any notice given to a Supply Contractor that is a joint venture or partnership shall be deemed to be given if delivered or mailed to any one of the joint ventures or partners or any of their officers or employees. Any notice to be given by the Supply Contractor to the District shall be deemed to have been given if sent by mail or delivered to the District at the address of the District set out in Section 00 10 00 Clause 1.3.1. Any notice sent by mail shall be deemed to have been given five (5) Days after the day of mailing.

.2 Co-operation and Entry on Delivery Point

- .1 At the time of Delivery, it is intended that the Delivery Point will be under the control of the General Contractor responsible for the delivery of the construction contract, as the Prime Contractor as debarred by WorkSafe BC Regulations. The Supply Contractor is to coordinate all actions while on the site with the General Contractor.

- .3 The Engineer, if requested by the District or the Supply Contractor or any other contractor, shall consider any differences, conflicts or disputes between the Supply Contractor and any other contractor with regard to the Goods on or near the Delivery Point. The Engineer shall give such directions as it considers desirable to resolve such difference, conflict or dispute and its directions shall be binding on the Supply Contractor and insofar as it may have the authority, on any other contractor.

2.4

DISPUTE RESOLUTION

.1 Disputes

- .1 A dispute occurs between the District and the Supply Contractor where there is a difference between the parties as to the interpretation, application or administration of the Contract.

.2 Determination by Engineer

- .1 Except as otherwise specifically provided, questions regarding interpretation, application or administration of the Contract shall be referred by the Supply Contractor in writing to the Engineer for its decision. The Engineer shall review the matter and respond to the Supply Contractor in writing with the Engineer’s decision within 21 Days after receipt of written notice from the Supply Contractor.

.3 Dispute of Decision

-
- .1 If the Supply Contractor disputes a decision or instruction of the District or the Engineer (the “Disputed Decision”), the Supply Contractor shall give a detailed written notice of the dispute to the District within 21 Days of the date that the Supply Contractor received the Disputed Decision. The written notice must set out the nature of the dispute, the circumstances which gave rise to the dispute, the date on which these circumstances arose and the estimated cost of the work.
 - .2 The Supply Contractor shall be conclusively deemed to have accepted a decision or instruction of the District or the Engineer if the Supply Contractor does not dispute the Disputed Decision by giving the required written notice within the required time .
- .4 No Engineer’s Review
- .1 Notwithstanding Section 00 50 00, Clause 2.4.3, if the Disputed Decision was made by the District pursuant to Section 00 50 00, Part 7, the Engineer shall not review the decision and the matter shall be dealt with as provided under Section 00 50 00, Clause 2.4.7.
- .5 Instructions Pending Resolution
- .1 If the Disputed Decision is not resolved promptly, the Engineer shall give any instructions as may be necessary for the supply of the Goods and to prevent delay in delivery of the Goods pending resolution of the dispute. The Supply Contractor shall comply immediately with the Engineer’s instructions. If it is subsequently determined that the instructions were contrary to the Contract Documents, the District shall pay the costs incurred by the Supply Contractor in carrying out those instructions beyond what the Contract Documents required.
- .6 Notice of Claim
- .1 No payment shall be made by the District to the Supply Contractor in addition to the Contract Price on account of any extra expense, loss or damage incurred by or sustained by the Supply Contractor for any reason unless the Supply Contractor has given written notice of a claim to the District within 30 Days of the date the Supply Contractor first became aware of the circumstances which gave rise to the claim. The written notice must set out the date on which these circumstances arose and the estimated amount of the claim.
 - .2 The Supply Contractor shall be conclusively deemed to have waived any right to make a claim for any amount in addition to the Contract Price, if the Supply Contractor does not give the required written notice within the required time and provide the required information.
- .7 Dispute/Claim Resolution
- .1 All claims, disputes or Disputed Decisions between the District and the Supply Contractor that are not resolved shall be decided by arbitration if the parties agree, or failing agreement, in a Court of competent jurisdiction within the Province of British Columbia.
 - .2 In the event that the parties agree to arbitration, pursuant to Section 00 50 00, Clause 2.4.7.1, the arbitration shall be governed by the rules of the British Columbia International Commercial Arbitration Centre, except that the arbitrator or arbitrators shall be agreed upon by the parties, and failing agreement by the parties, shall be appointed by a Court of competent jurisdiction within the Province of British Columbia.

- .3 In the event that the parties agree to arbitration, the arbitration shall take place in Victoria, British Columbia and be governed by the laws of British Columbia.

Specifications and Drawings

INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

- Part 3 .1 General
- 3.1 .1 The Specifications and Drawings are intended to be explanatory of each other. Goods specified on the Drawings and not in the Specifications, or vice versa, shall be executed as if specified in both.
- .2 Request for Clarification
- .1 If the Supply Contractor requires any clarification concerning the Specifications or Drawings, it shall direct its request in writing for clarification to the District. The District may issue a letter of clarification to the Supply Contractor if the District considers it necessary to do so.

CONFLICTING PROVISIONS, ERRORS AND OMISSIONS IN CONTRACT DOCUMENTS

- 3.2 .1 Conflicting Provisions
- .1 In case of any inconsistency or conflict between the provisions of the Contract Documents, the provisions of such documents will take precedence and govern in the following order:
- .1 the Agreement: Section 00 40 00
 - .2 the letters of clarification, if any
 - .3 the most recent Addendum
 - .4 other Addenda, the more recent taking precedence over earlier
 - .5 Addenda
 - .6 the General Conditions
 - .7 the Notice of Award and/or Purchase Order
 - .8 the Tender
 - .9 the Specifications
 - .10 the Drawings
 - .11 the Invitation to Tender
 - .12 other Contract Documents.
- .2 Errors and Omissions
- .1 If the Supply Contractor discovers that there are any errors or omissions in the Contract Documents, it shall immediately notify the District in writing. The District will review the matter and if it concludes that there is an error or omission, it shall determine the corrective actions to be taken and will advise the Supply Contractor accordingly. If the corrective work associated with an error or omission increases or decreases the amount of work called for in the Contract, the District shall issue an appropriate change order. After discovery by the Supply Contractor

of an error or omission in the Contract Documents any work thereafter performed by the Supply Contractor shall be done at its risk unless otherwise agreed by the District.

- .3 Figured dimensions on a drawing take precedence over measurements scaled from the drawing, and large-scale drawings take precedence over those of a smaller scale. Supplementary drawings and specifications supersede their antecedents. In case of conflict between figured dimensions on a drawing and the dimensions of a specified product, the dimensions of the specified product will govern.

Material, Equipment and Workmanship

GENERAL

Part 4
4.1

- .1 The Goods shall be new and of the quality specified. All work related to the Contract Documents shall be done with new materials, articles, equipment and workmanship of the best quality and description and by employment of properly skilled workers and in strict conformity with and as required by the Contract Documents. Materials and equipment shall be the product of suppliers or manufacturers of established good reputation, regularly engaged in the supply or manufacture of such materials or equipment.

4.2

DEMONSTRATION OF COMPLIANCE WITH CONTRACT REQUIREMENTS

- .1 Inspection
- .1 The District or the Engineer or any inspector or agent appointed by either of them shall have access to the Goods and to the places the Goods are being manufactured, assembled, fabricated, stored or transported or where materials, equipment and machinery are being obtained for the Goods. The Supply Contractor at the Supply Contractor's sole cost shall provide to the Engineer or the District the assistance necessary for obtaining such access and shall provide all information necessary or desirable in connection with the inspection of the Goods.
- .2 The Supply Contractor shall at all times give and cause to be given to the District or the Engineer or any inspector or agent appointed by either of them, free access to inspect and test the Goods, wherever same is being performed or carried out.
- .3 Such inspections and testing shall not in any way relieve the Supply Contractor from any of its obligations or responsibilities under the Contract Documents, and shall not in any way prejudice or constitute a waiver of any rights or remedies of the District or any guarantees, warranties or covenants in favour of the District, and the District shall be entitled to rely on the expertise and obligations of the Supply Contractor and its subcontractors and their consultants and engineers to the same extent as if such inspections and testing by the District or the Engineer or any inspector or agent had not taken place.
- .4 If the Contract Documents, laws, ordinances, or any public regulatory authority require parts of the Goods to be specially inspected, tested or approved, the Supply Contractor agrees that the Goods shall comply.
- .5 The Goods are subject to inspection and acceptance by the Engineer within a reasonable time after receipt. The Engineer will notify the Supply Contractor in writing of the rejection of any of the Goods which are not in accordance with the Contract Documents, and the Goods will be held subject to disposition by the

Supply Contractor at the Supply Contractor's risk and subject to all charges accruing as a result of such rejection.

- .6 Notwithstanding any prior payment therefore, all Goods are subject to inspection and testing by the District at the Delivery Point and if the Goods are to be incorporated into an operating facility, the District's inspection and testing of the Goods may be made under operating conditions after the Goods have been installed.

.2 Certification

- .1 Where compliance of Goods, materials or equipment with the Contract Documents is not readily determinable through inspection and tests, the Engineer may require that the Supply Contractor provide, at the Supply Contractor's expense, properly authenticated documents, certificates or other satisfactory proof of compliance. These documents, certificates or other proof shall include performance characteristics, materials of construction and the physical or chemical characteristics of materials.

.3 Expenses

- .1 Unless otherwise specified in the Contract Documents, the Engineer's travel, subsistence and labour expenses for inspection and testing shall be paid by the District. If the Supply Contractor requests the Engineer to inspect and test the Goods, materials or equipment at the point of manufacture, then the additional costs to the District for travel, subsistence and labour expenses shall be paid by the Supply Contractor and may be deducted by the District from any payment due to the Supply Contractor under the Contract. After an inspection by the Engineer, if the Goods, materials or equipment require further inspection by the Engineer, then the additional costs to the District for travel, subsistence, and labour expenses shall be paid by the Supply Contractor and may be deducted from any payment due to the Supply Contractor under the Contract.

4.3

DEFECTIVE OR IMPROPER GOODS

.1 Correction of Defective Goods

- .1 If upon inspection, testing or otherwise the Goods or any portion thereof are found to be non-conforming, unsatisfactory, defective, or of inferior quality or workmanship, or fail to meet any guarantee of operating or other specifications contained herein, or any other requirements of the Contract Documents, then without prejudice to any other rights or remedies, the Engineer may give notice of its dissatisfaction to the Supply Contractor either verbally or in writing and the Supply Contractor shall immediately upon receipt of such notice do all things that are required to satisfy the Engineer. Any such verbal notice may be confirmed in writing by the Engineer if requested by the Supply Contractor within one working day of the verbal notice. If the Supply Contractor refuses or neglects to do all things that are required to satisfy the Engineer within one week from the receipt of notice, the District may employ some other person to do so and all expenses and costs consequent thereon or incidental thereto shall be charged to the Supply Contractor. The employment of such other person or the doing of the said work by the District itself shall not affect the Supply Contractor's duties and liabilities hereunder or relieve the Supply Contractor from the performance and fulfilment of any or all of

the Supply Contractor's warranties, covenants, undertakings, obligations and duties under the Contract.

- .2 If upon inspection, testing or otherwise the Goods or any portion thereof are found to be non-conforming, unsatisfactory, defective, or of inferior quality or workmanship, or fail to meet any guarantee of operating or other specifications contained herein, or any other requirements of the Contract Documents, then without prejudice to any other rights or remedies, the District may return the Goods or any part thereof to the Supply Contractor at the Supply Contractor's sole cost and all amounts theretofore paid by the District to the Supply Contractor on account of the Contract Price of such returned Goods, shall be repaid to the District by the Supply Contractor. The Supply Contractor shall advise the District in writing, where to return the Goods, and failing such advice from the Supply Contractor, the Supply Contractor agrees to accept the returned Goods at the Supply Contractor's registered office. Neither the inspection nor failure to make inspection, nor acceptance of Goods shall release the Supply Contractor from any warranties or other provisions of this Contract nor impair the District's right to reject non-conforming Goods. The District reserves the right even after it has paid for and accepted Goods to make a claim against the Supply Contractor on account of any Goods which do not prove to be satisfactory or are defective irrespective of the District's failure to notify the Supply Contractor of a rejection of non-conforming Goods or revocation of acceptance thereof, or to specify with particularity any defect in non-conforming Goods after rejection or acceptance thereof.

.3 Retention of Defective Goods

- .1 If in the opinion of the Engineer any portion of the Goods supplied under the Contract is defective or not in accordance with the Contract Documents and if the defect or imperfection in the same is not of sufficient magnitude or importance to make the Goods dangerous or undesirable, or if the removal of such Goods is impracticable, or will create conditions which are dangerous or undesirable, the District shall have the right and authority to retain such Goods instead of requiring the defective or imperfect Goods to be removed and reconstructed, but the District shall be entitled to make such deductions from the payments due or to become due to the Supply Contractor as are just and reasonable.

.4 No Implied Approval

- 4.4 .1 The fact that the Engineer or the District has not disapproved of or rejected any part of the Goods shall not be deemed or be construed to be an acceptance of any such part of the Goods or any such materials.

WARRANTY AND GUARANTEE

- .1 The Supply Contractor agrees that the Goods Manufacturer's standard warranty will be to the benefit of the District and warrants that the Goods are free from all defects arising from faulty construction, manufacturing, materials, equipment or workmanship for the period of the Goods manufacturer's standard warranty period.
- .2 The Supply Contractor warrants and guarantees that the Goods are free from all defects arising from faulty construction, manufacturing, assembly, materials, equipment or workmanship in any part of the Goods for a period of 12 months commencing from the equipment start-up and commissioning sign-off by the District. During the warranty period, the Supply Contractor, upon the receipt of notice in writing from the District or the Engineer, shall promptly make all repairs arising out of the defects referred to in this Clause

4.4.2. The District shall be entitled to make such repairs, if 10 Days after the giving of such notice to the Supply Contractor, the Supply Contractor has failed to make or undertake with due diligence the repairs. In case of an emergency, where, in the opinion of the District or the Engineer, delay could cause serious loss or damage, or inconvenience to the public, repairs may be made without notice being sent to the Supply Contractor, only after all reasonable attempts have been made to contact the Supply Contractor. The costs of any repair made by the District in connection with this Clause 4.4.2 shall be charged to the Supply Contractor and the Supply Contractor shall reimburse the District for such costs. All covenants and agreements shall continue to be binding on the Supply Contractor until they have been fulfilled.

- .3 The District is relying on Supply Contractor's skill and judgment in selecting and providing the proper Goods and any applicable services for the District's particular use. The Supply Contractor warrants to the District and its successors in interest that the Goods and any services covered hereby will correspond with the description of the same in the Contract Documents, will conform to all applicable Specifications, will be new and of the best quality and, unless otherwise specified, will be fit for the purpose for which they are to be used and will conform in all aspects, both in the manufacture and use thereof, with all applicable safety orders or regulations of the Province of British Columbia. The Supply Contractor also warrants that the Goods are free and clear of all liens and encumbrances whatsoever and that the Supply Contractor has a good and marketable title to the same.
- .4 The Supply Contractor warrants and guarantees that the Goods are free from all defects arising at any time from faulty design in any part of the Goods.

Part 5

Indemnification and Insurance

5.1

INDEMNIFICATION AND RELEASE

- .1 The Supply Contractor shall save harmless and indemnify the District and its council members, officers, servants, employees and agents (the "Indemnified Parties") from and against all actions, claims, demands, proceedings, suits, losses, damages, costs and expenses of whatsoever kind or nature (including but not limiting the generality of the foregoing, in respect of death, injury, loss or damage to any person or property) arising in any way out of or connected with the Goods or the supply, or delivery of the Goods or performance of the Work under this Agreement, except to the extent that such actions, claims, demands, proceedings, suits, losses, damages, costs and expenses were caused by the Indemnified Parties or any of them.
- .2 Unless otherwise specified in the Contract, the Supply Contractor shall save harmless and indemnify the Indemnified Parties from and against all actions, claims, demands, proceedings, suits, losses, damages, costs and expenses of whatsoever kind or nature arising in any way from liability of any nature or kind for or on account of any copyrighted or uncopyrighted composition, secret or other process, patented or unpatented invention, articles or appliances manufactured, supplied or used in the Goods, and/or used or to be used by the District before or after supply of the Goods as a result of work performed by the Supply Contractor, and if the Supply Contractor shall fail to save harmless and indemnify in manner aforesaid, any money collected from the Indemnified Parties shall be charged to the Supply Contractor.
- .3 The indemnity provided in this Clause 5.1 by the Supply Contractor to the Indemnified Parties shall not in any way be limited or restricted by any insurance or by limitations on

the amount or type of damages, compensation or benefits payable under the Workers' Compensation Act or any other similar statute.

INSURANCE

.1 General

.1 The Supply Contractor shall itself obtain and maintain, at its own expense, the insurance set out below until all conditions of the Contract have been fully complied with.

5.2

.2 Commercial General Liability Insurance

.1 Commercial General Liability Insurance providing third party bodily injury and property damage coverage in an amount of not less than \$5,000,000 per occurrence, indicating that the District are additional insured and containing a cross liability and/or severability of interest clause protecting each insured to the same extent as if they were separately insured.

.2 The Policy shall contain a clause providing that the District will receive 30 Days notice of cancellation or of any material change in coverage which will reduce the extent of coverage provided to the District. The certificate will also indicate that the policy contains non-owned automobile liability and contractual liability coverage. The insurance policy will be in a form and with a company which are, in all respects, acceptable to the District.

.3 Evidence of Coverage

.1 The Contractor shall file with the District prior to the commencement of work a certificate of insurance covering all policies and endorsements. The Supply Contractor shall also file with the District evidence of the renewal of each policy at least fifteen (15) Days prior to the expiry date of the policy.

.4 Indemnity Not Restricted by Insurance

.1 The provisions for insurance shown above shall not in any way limit the indemnity granted by the Supply Contractor to the Indemnified Parties elsewhere in this section.

5.3

PATENT, TRADEMARK OR COPYRIGHT

.1 The Supply Contractor represents that it has fully investigated all Specifications, including any furnished by the District, in connection with the Goods and based on such investigation and its past experience and superior knowledge with respect to such Goods has determined that the production and supply thereof will not infringe any patent, trademark or copyright.

.2 The Supply Contractor warrants to the District and its successors in interest that the manufacture, sale or use of the Goods and any services covered by this Contract, whether manufactured in accordance with the Specifications or otherwise, do not and will not infringe upon any patent, trademark or copyright. The supply Contractor shall save harmless and indemnify the Indemnified Parties from and against all actions, claims, demands, proceedings, suits, losses, damages, costs and expenses of whatsoever kind or nature arising in any way from liability of any nature or kind for or on account of any copyrighted or uncopyrighted composition, secret or other process, patented or unpatented invention, articles or appliances manufactured or used in connection with the Goods, and

used or to be used by the District unless otherwise stipulated in this Contract, and if the Supply Contractor shall fail to save harmless and indemnify in manner aforesaid, any money collected from the Indemnified Parties shall be charged to the Supply Contractor.

Shipment of Goods/Damage to Goods

SHIPMENT OF GOODS

.1 Delivery of Goods

Part 6
6.1

.1 The Supply Contractor must deliver the Goods to the Delivery Point. Delivery of the Goods to a carrier for transmission to the Delivery Site does not constitute delivery of the Goods to the District. Any such carrier is deemed to be the Supply Contractor's agent and not the District's agent.

.2 Delivery Costs

.1 The Supply Contractor is responsible for all costs and expenses whatsoever in relation to the supply and delivery of the Goods to the Delivery Point, including without limitations, all shipping, carrier, transportation, freight, insurance, storage, handling costs, as well as any customs or excise charges or duties.

.3 Supply Contractor to Bear Risk

.1 The Supply Contractor shall bear all risks and shall assume all responsibility for the Goods, including, without limitation, any loss or damage to the Goods from any cause whatsoever, up to and including the delivery of the Goods at the Delivery Point.

.4 Loss or Damage

.1 If loss or damage to the Goods occurs for which the Supply Contractor is responsible, the Supply Contractor shall immediately effect repairs or replace any property as necessary in order to make good any such loss or damage. If the Supply Contractor refuses or neglects to do so, the District may make good any such loss or damage, either by itself or by employing some other person, and the expense of doing so shall be charged to the Supply Contractor. If any repair or replacement of property is performed on the Goods as a result of loss or damage to the Goods for which the Supply Contractor is responsible the Supply Contractor agrees that the warranty provided in Section 00500 Clause 4.4 shall not be affected or changed to any manner or respect whatsoever.

.5 Acceptance of Delivery of Goods by District

.1 Notwithstanding any other provision in the Contract Documents, the District is not deemed to have accepted the Goods until the Goods have been delivered to the Delivery Point and the District has had a reasonable opportunity of examining them for the purpose of ascertaining whether they are in conformity with the Contract and has confirmed such acceptance in writing. The District's acceptance of the Goods shall not prejudice any rights or remedies the District may have hereunder relating to Goods that are found to be non-conforming, unsatisfactory, defective, of inferior quality or workmanship, or which fail to meet any specifications or requirements of the Contract Documents.

Progress and Completion

CONTRACT TIME

- Part 7
- 7.1
- .1 Prosecution of the Goods
 - .1 Time shall be strictly of the essence. The Supply Contractor shall supply the Goods in accordance with the Contract Documents. The Supply Contractor acknowledges that the schedule for supply of the Goods as set out in the Contract Documents is reasonable.
 - .2 Schedule
 - .1 The Supply Contractor shall provide a schedule and reports for scheduling and co-ordinating the supply of Goods within the prescribed time. Contract time extensions, if any, shall be incorporated into updated schedules. The failure of the Supply Contractor to comply with this requirement shall entitle the District to terminate the Supply Contractor's right to continue with the supply of Goods or to delay progress payments.

TERMINATION

- 7.2
- .1 The District may terminate the Contract if the Supply Contractor at any time becomes bankrupt, makes an assignment of his property for the benefit of his creditors, or if a receiver or liquidator should be appointed. Such termination shall be effective upon the District giving notice thereof.
 - .2 If at any time the District forms the opinion that the Supply Contractor is in default under this Contract because the Supply Contractor:
 - .1 has breached any provision of the Contract ;
 - .2 has failed to supply the Goods, within the time specified in the Contract Documents;
 - .3 has failed or is failing to furnish or to maintain a detailed schedule;
 - .4 has become in any way unable to supply the Goods or any part thereof;
 - .5 has repeatedly failed to make prompt payments to subcontractors, suppliers or others for labour, materials or equipment;then the District may give notice in writing to the Supply Contractor of such opinion and require that such default or defaults be remedied forthwith. If, within five Days of such notice, such default or defaults are not remedied to the satisfaction of the District, the District may terminate the Contract. Such termination shall be effective immediately.
 - .3 Upon termination pursuant to Section 00 50 00 Clause 7.2.1 or 7.2.2 the District may take all Goods out of the Supply Contractor's hands and employ such means as the District may see fit. In such case:
 - .1 The Supply Contractor shall have no claim for any further payment in respect of the Goods;
 - .2 No objection or claim shall be raised or made by the Supply Contractor by reason of or on account of the ultimate cost of the Goods so taken over for any reason proving greater than, in the opinion of the Supply Contractor, it should have been;
 - .3 Notwithstanding Part 8 all materials and all rights, proprietary or otherwise, licences, powers and privileges, whether relating to or affecting real or personal

property, acquired, possessed, or provided by the Supply Contractor for the purposes of supply of the Goods will become or remain and be the property of the District for all purposes incidental to the completion of supply of the Goods and may be used, exercised, and enjoyed by the District as fully to all intents and purposes connected with supply of the Goods as they might theretofore have been used, exercised, and enjoyed by the Supply Contractor;

- .4 The District may assign all rights and privileges granted to the District in this clause to another supply contractor retained by the District to continue with the supply of the Goods.
 - .5 If the Supply Contractor's right to supply the Goods is terminated in accordance with the provisions of this clause, the Supply Contractor shall not be entitled to receive any further payment until the supply of Goods is completed.
- .4 Except as herein before provided, the Supply Contractor shall have no claim against the District for any reason whatsoever by reason of the termination of the Contract.

Payment

Part 8

PAYMENTS TO SUPPLY CONTRACTOR

8.1

- .1 Payments to the Supply Contractor will be made on the basis of the Schedule of Quantities and Prices, Schedule 1 of Section 00 20 00 Tender Form. Refer to Section 01 27 00 – Measurement and Payment as to description of how payments will be made.
- .2 Notwithstanding Clause 8.1.1 the District may withhold from any payment:
 - .1 Any deduction the District may be entitled to under the Contract;
 - .2 Such amount as the District determines appropriate with respect to secure the correction or completion of any obligation under the Contract not properly or satisfactorily completed in compliance with the Contract Documents; and
 - .3 Amounts required to be held back pursuant to the Builders Lien Act (British Columbia).
- .3 Payments may be withheld until the relevant operating manuals and all operating and maintenance materials together with all warranties have been delivered to the Engineer.
- .4 In addition to any other remedy the District may have in the Contract or law, the District may refuse to make payment because of subsequently discovered evidence or test results, and shall be compensated for any payment previously made to the Supply Contractor to such extent as may be necessary to protect the District from loss as a result of:
 - .1 Defective or damaged Goods;
 - .2 A deductive change order;
 - .3 Failure of the Supply Contractor to supply the Goods in accordance with the Contract Documents, including failure to maintain the supply of the Goods in accordance with the schedule;
 - .4 Disregard by the Supply Contractor of the authority of the Engineer or the laws of any public body having jurisdiction.

The District may refuse to make payment of the full amount because of claims made against the District on account of the Supply Contractor's performance or supply of Goods. In such case, the District shall give the Supply Contractor prompt written notice stating the reasons for each action.

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- .5 The District, may withhold from payment to the Supply Contractor:
 - .1 Any set-off the District may be entitled to under the Contract;
 - .2 The amount of any bona fide builder's lien claim asserted against the District or which the District acting reasonably anticipates will be made against the District.
 - .6 Prior to payment to the Supply Contractor, if requested by the District, the Supply Contractor shall deliver to the District a statutory declaration in form satisfactory to the District declaring that all subcontractors, labour and accounts for material and equipment have been paid and that no persons have any lien against the lands comprising the Delivery Point or the work together with such other documentation as the District, acting reasonably, determines is necessary or desirable.
 - .7 Builders Liens
 - .1 The Supply Contractor shall, at its own cost and expense, cause any and all builders liens and other liens for labour, services or materials alleged to have been furnished in connection with the supply of the Goods to the lands comprising the Delivery Point which may be registered against or otherwise affect the said lands or the supply of Goods, to be promptly discharged from title to such lands.

8.2

WHMIS

- .1 The Supply Contractor must comply with all requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of material safety data sheets in accordance to all applicable laws.
- .2 The Supply Contractor must deliver copies of all relevant material safety data sheets to the Engineer upon delivery of goods.

END OF SECTION

APPENDIX A
DRAFT NOVATION AGREEMENT

BETWEEN:

(DISTRICT)

AND:

(CONTRACTOR)

AND:

(SUPPLY CONTRACTOR)

WHEREAS:

- A. District entered into a Contract with the Supply Contractor dated [____], for the Supply and Delivery of Wastewater Equipment (Supply Contract), which is annexed hereto as Appendix "A";
- B. It is a requirement of the Supply Contract that the Supply Contractor enter into a Novation Agreement with the General Contractor (hereby referred to as "the contractor") selected by the District for the Construction Contract;
- C. District entered into a contract with Contractor dated [____], for [____] (Construction Contract);
- D. It is a requirement of the Construction Contract that the Contractor enter into a Novation Agreement with Supply Contractor so that Supply Contractor becomes a subcontractor to the Contractor;

NOW THEREFORE in consideration of the premises and of the mutual agreements hereinafter contained the parties agree as follows;

Tenderer's Initial	Owner's Initial

1. The Contractor and Supply Contractor agree to be bound by the terms of the Supply Contract, annexed hereto as Appendix "A", with the Contractor assuming all the rights and obligations of the District as set out therein.
2. Supply Contractor retains all the rights and obligations set out in the Supply Contract and henceforth accepts the Contractor in place of the District.
3. Supply Contractor agrees that henceforth it is a subcontractor to the Contractor in respect of the Construction Contract.
4. Supply Contractor hereby releases the District from all of the District's obligations under the Supply Contract and from all claims of every nature whatsoever arising therefrom, excepting only those claims, if any, already notified to the District in writing, and acknowledges that it will henceforth look only to the Contractor for the discharge of the District's obligations thereunder and that only the Contractor may exercise the rights of the District thereunder.
5. Henceforth, the terms and conditions of the Construction Contract insofar as they can apply to a subcontract shall govern the relations between the Contractor and the Supply Contractor; provided nevertheless, that if any term of the Construction Contract is inconsistent with any payment provision or Special Condition or Special Provision in the Supply Contract such payment provision, Special Condition or Special Provision of the Supply Contract shall prevail.
6. The District and Supply Contractor agree that the Supply Contract between them has been terminated.
7. It is agreed that as of the date hereof [\$_____] is owing to the Supply Contractor under the Supply Contract.

Tenderer's Initial	Owner's Initial

IN WITNESS WHEREOF the parties hereto have executed this Agreement as follows:

DISTRICT OF SOOKE

by its authorized signatory on _____ day of _____, 2019:

SIGNED on behalf of the District by:

Signature: _____

Name: _____

Title: _____

[CONTRACTOR'S NAME]

by its authorized signatory on _____ day of _____, 2019:

SIGNED on behalf of the Contractor by:

Signature: _____

Name: _____

Title: _____

Signature: _____

Name: _____

Title: _____

Tenderer's Initial	Owner's Initial

[SUPPLY CONTRACTORS NAME]

by its authorized signatory on _____ day of _____, 2019:

SIGNED on behalf of the Contractor by:

Signature: _____

Name: _____

Title: _____

Signature: _____

Name: _____

Title: _____

END OF SECTION

Tenderer's Initial Owner's Initial

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PART 1 GENERAL

1.1 SCOPE

- .1 Work specified in this section includes the design, supply, fabrication, assembly, performance testing (if required), delivery to the Delivery Point of the Goods, testing, commissioning and operations training of the following equipment, as described elsewhere in the Specifications:
 - .1 Rotary Drum Thickener – see Section 44 43 26
 - .2 Rotary Drum Thickener Feed Pump – see Section 43 25 13
 - .3 Polymer Feed System – see Section 44 44 36
 - .4 Control Panel for the above systems – see Section 44 43 26
- .2 The Work to be done under this contract consists of the design, fabrication, assembly, supply, delivery, assistance with installation, testing, commissioning and operations training of the equipment as herein specified.
- .3 The Goods will be installed under a separate contract. The Supply Contractor shall furnish all labour, materials, accessories and necessary parts to supply, fabricate, and deliver the Goods.
- .4 Any or all of the equipment can be provided under a single bid.

1.2 REFERENCES

- .1 Section 01 33 00 – Submittals.

1.3 SUBMITTALS

- .1 Submittals – Shops Drawings Prior to Fabrication
- .2 Any manufacturing done before the review of the shop drawings by the District will be at the Supply Contractor's risk. The District shall have the right to require the Supply Contractor to make any changes in the Supply Contractor's drawings, which may be necessary, in the opinion of the District, to make the finished product conform to the requirement and intent of the Specifications, without additional cost to the District.

1.4 DATES OF DELIVERY

- .1 The date(s) for delivery of the Goods to the Delivery Point as required by the District, or at such other date(s) of delivery as may have been proposed by the Supply Contractor in this Tender and agreed to by the District, as indicated in Section 00 20 00 – Schedule 2, defined the latest time the District can begin its process of installing and commissioning of the Goods.
- .2 Should the Supply Contractor fail to meet the accepted Contract delivery date(s), he will be held liable for all costs incurred by the District that are attributable to the late delivery of the Goods.

1.5 PLACE OF DELIVERY

- .1 Delivery Point: (See Section 00 50 00, Part 6) Sooke Waste Treatment Facility, V9Z 0S2, , BC. as defined in Section 00 10 00 Clause 1.2.3.
- .2 Specific on-site delivery location to be confirmed by and coordinated with the District and General Contractor (once selected) prior to shipment to the Delivery Point. Delivery of the Goods shall take place during regular working hours (Monday through Friday, 07:00 to 15:30 hours).
- .3 Two (2) weeks' notice shall be given to the General Contractor prior to intended delivery so that arrangements can be made for unloading and storing the Goods.
- .4 The General Contractor will arrange to provide reasonable access to the site. The Supply Contractor is responsible for arranging off-loading of the Goods at the Delivery Point and shall allow
- .5 One and a half (1.5) hours free waiting time for each load arriving at the site. This free hour and a half (1.5) will commence at the time of arrival at the site requested by the District, or at the actual time of arrival, whichever is later. Waiting time in excess of one and a half (1.5) hours will be paid for by the District at the normal rate of hire for the truck less 25 percent, provided that a claim shall be made within two (2) working days.

1.6 RATES OF DELIVERY

- .1 The District may change the schedule or sequence of the fabrication and delivery of the Goods to best suit the District's installation and commissioning program. The Supply Contractor shall adjust its manufacturing and delivery schedule for the Goods to the Delivery Point in response to reasonable requests from the District, such that the amount of re-handling of the Goods is minimized.
- .2 If required by the District to suit the construction schedule, delivery of the Goods shall be made in multiple deliveries over time, as necessary, during this time frame to minimize the time that Goods are stored on-site prior to installation.

1.7 HANDLING

- .1 The Supply Contractor shall assume full responsibility for protection and safekeeping of all Goods supplied under this Contract until such time as they are delivered to the Delivery Point, at which time the District will assume full responsibility for protection and safekeeping of the Goods after they have been off-loaded from the delivery vehicle(s). The Supply Contractor shall be responsible for the Goods while in transit to the Delivery Point and off-loading the Goods at the Delivery Point.
- .2 Any damage which may be done in handling, shipping, or off-loading at the Delivery Point shall be made good by the Supply Contractor at its expense and any cost that the District shall be put to by reason of such damage will be charged to the Supply Contractor.
- .3 The District will inspect the Goods upon delivery to the Delivery Point, and the Supply Contractor will be notified promptly of any damage prior to off-loading. The District will be

responsible for handling and storage of the Goods at the Delivery Point, and any re-handling prior to installation.

- .4 Any Goods, which do not pass the appropriate standards or are subsequently found to be defective, will be returned to the Supply Contractor at the Supply Contractor's own expense.

1.8 QUALITY ASSURANCE TESTS

- .1 Additional quality assurance testing will be at the discretion of the District upon initial inspection of the Dewatering Equipment at the Delivery Point. Refer to Section 01 43 00 – Quality Assurance.
- .2 Quality assurance tests will include any tests that the District may deem necessary to ensure the Goods will perform as required, and those required by the Specifications.
 - .1 The District may employ an independent testing firm to conduct quality control tests to determine compliance of the Work with the Contract Documents. Should material or workmanship be found to be unacceptable, the full cost of further testing relating to the deficiency shall be charged to the Supply Contractor.
 - .2 The Supply Contractor shall have no claim for delays, interruptions, double handling of materials, rejection of materials, or any other cause brought about by such tests, including awaiting the outcome of such tests.
 - .3 The Supply Contractor shall provide adequate notice to the Engineer to permit testing to be conducted at appropriate times in an efficient manner.
 - .4 Unless otherwise specified, the costs of testing will be assumed by others. In the event of a failed test the cost of retesting shall be borne by the Supply Contractor.
 - .5 The Supply Contractor shall provide material samples to the Engineer in such quantities as required for testing for conformance with the specification. The Supply Contractor shall make good to at least the original standard any area from which material samples are taken.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

- .1 This section refers to the measurement and payment of the work unique to the supply and delivery of the Goods described herein. This section must be referenced to and interpreted in conjunction with all other sections in the Contract Documents.
- .2 Descriptions contained in the payment clauses provide a general description of the tasks.
- .3 They are not meant to limit the Work.
- .4 The items mentioned in this section refer to the items so numbered in Section 00 20 00 Schedule 1 – Quantities and Prices.

1.2 SUBMITTALS

- .1 Monthly Invoice(s)
 - .1 The Supply Contractor shall submit an invoice at the end of each calendar month for all of the Goods delivered and accepted during that month.
 - .2 The invoice shall clearly indicate applicable taxes; the purchase order number; the amount of the invoice including any holdbacks and the amount billed to date.

1.3 DESCRIPTION OF PAYMENT ITEMS

- .1 The prices proposed in Section 00 20 00 Schedule 1 shall include the cost of all applicable submittals, labour, material, equipment; and other expenses necessary for supplying the Dewatering equipment, manufacturer performance tests and for performing all other work necessary and incidental to the supply and delivery of the items specified in this Tender as required to achieve the design alignment as indicated on the drawings and specifications. The prices shall include all taxes other than GST, freights, duties, brokerage fees, and similar charges.
- .2 The Supply Contractor will be paid at the prices submitted in Section 00 20 00 Schedule 1 – Quantities and Prices– Tender Form for such amounts or quantities of each classification of product as are delivered and reviewed by the Engineer from time to time.
- .3 The Supply Contractor shall make no claim for anticipated profits, loss of profit, damages, or any extra payments whatsoever, except as expressly provided otherwise herein, because of any difference between the amounts of material actually furnished and the estimated amounts as herein set forth.

1.4 PROGRESS PAYMENTS

- .1 Progress payments will be made on the following basis:
 - .1 For delivery of the shop drawings, of each item in Section 00 20 00 Schedule 1, Quantities & Prices, the Supply Contractor will be paid ten percent (10%) of the

accepted price for the item(s) received, less any amount the District is entitled to withhold pursuant to the Contract Documents.

- .2 For each item in Section 00 20 00 Schedule 1 – Quantities & Prices, thirty (30) days after delivery of the Goods to the Delivery Point and receipt of an invoice, whichever is later, the Supply Contractor will be paid eighty percent (80%) of the accepted price for the item(s) received, less any amount the District is entitled to withhold pursuant to the Contract Documents.
- .3 Thirty (30) days after the commissioning, satisfactory to the District, of the Goods following completion of the Construction Contract or upon receiving all outstanding submittals, deliverables, compliance report, and invoice, whichever is later, the Supply Contractor will be paid the remaining ten percent (10%) of the accepted price, less any amount the District is entitled to withhold pursuant to the Contract Documents. The Construction Contract is intended to be commissioned by the end of March 2020.

1.5 CHANGE ORDERS, SUPPLY CONTRACTOR'S RESPONSIBILITIES

- .1 The Supply Contractor shall complete and promptly return all Change Order price requests issued by the District. Include appropriate supporting documentation to verify prices.
- .2 The Supply Contractor shall not proceed with work affected by a change order price request until authorized to do so by Change Order.
- .3 The Supply Contractor shall make no change in the supply of Goods unless a Change Order is issued.
- .4 Change Orders are only valid when signed by the District.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This section describes the Supply Contractor's responsibilities for making submittals to the Engineer to demonstrate that materials, equipment, methods, and work comply with the provisions and intent of the Contract Documents.
- .2 The Supply Contractor shall provide submittals in accordance with this section and as specified in Section 01 10 00, Clause 1.3.
- .3 Submittals covered by this specification include manufacturers' information and technical data sheets, descriptive data, certificates, product data, shop drawings, test procedures, test results, samples, all mechanical, electrical and electronic equipment and systems, fabricated items and miscellaneous work-related submittals.
- .4 The Engineer may require additional submittals from the Supply Contractor when, in the opinion of the Engineer, such additional submittals are warranted.
- .5 The Supply Contractor shall notify the Engineer, in writing, when re-submitting any revisions other than those requested by the Engineer.
- .6 Where submittals are required in any Section, they shall be submitted by the due date specified in Schedule 2 Section 00 20 00.
- .7 Execution shall not commence until the Supply Contractor has received the District's comments on its submittals and has been advised to commence the work. The District's or Engineer's review of the submittals does not relieve the Supply Contractor of his duties and responsibilities as specified under Section 00 50 00 – General Conditions of this Contract.

1.2 SUBMITTAL REQUIREMENTS

- .1 Each submission shall be coordinated with the requirements of the Work and the Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .2 Make submittals far enough in advance to allow adequate time for coordination, review, revisions and re-submittals, and for the supply and delivery of the Goods.

1.3 SCHEDULE

- .1 The Supply Contractor shall submit a proposed schedule for review within two (2) weeks from Notice of Award. The schedule shall include all submittal dates, manufacturing, testing, and delivery of the Goods.

1.4 SUBMITTAL CATEGORIES

- .1 Submittals fall into two (2) general categories:

- .1 Submittals for review.
- .2 Submittals for information only.

1.5 SHOP DRAWINGS

- .1 The term “shop drawings” means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Supply Contractor to illustrate details of a portion of the Work.
- .2 Detail all shop drawings using the metric system. Prepare to a drafting standard equivalent to the Contract drawings.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, wiring diagrams, panel layouts with bills of material, explanatory notes and other information necessary for completion of Work. Where articles and equipment attach or connect to other articles or equipment, indicate that such item have been coordinated, regardless of the Section under which the adjacent items will be supplied and installed. Indicate cross reference to design drawings and specifications.
- .4 Adjustments made on shop drawings by the Engineer are not intended to change the Contract Amount. If adjustments affect the value of Work, state such in writing to the Engineer prior to proceeding with the Work.
- .5 Make such changes in shop drawings as the Engineer may require, consistent with Contract Documents. When resubmitting, notify the Engineer in writing of any revisions other than those requested.
- .6 Submit electronic format or four (4) “white print” copies of product data sheets or brochures for requirements requested in specification Sections and as the Engineer may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.
- .7 The Supply Contractor shall submit electronic format or a minimum of four (4) hard copies and one (1) electronic copy of each drawing to the Engineer for his review. The Engineer will retain two (2) copies of each drawing.
- .8 Where more than one type of shop drawing has been specified for one item, e.g., wiring diagrams, layout details, and dimensional drawings, the shop drawings shall be submitted together, to enable the Engineer to review the drawings as a package.
- .9 Catalogue pages or drawings applicable to an entire family or range of equipment will not be accepted as shop drawings unless they are clearly marked to show the pertinent data for the particular material.
- .10 Manufacturers’ catalogues, manuals, or price list will not be accepted as shop drawings. Such materials may be used as supplemental information to the shop drawings.
- .11 Indicate the tag number of instructions and values and clearly show the features and details applicable to the equipment being supplied.
- .12 Determine which shop drawings have, in addition to those drawings specifically mentioned in the Contract, design elements requiring the seal of a Professional Engineer

registered in the Province or Territory where the work is located, in accordance with the applicable provincial or federal engineering acts or other governing legislation. Seal such drawings before submitting them for review. Submit for review engineering calculations signed by the registered Professional Engineer responsible for the shop drawing design elements.

- .13 If, upon review by the Engineer, no errors or omissions are discovered or if only minor corrections are made, one (1) stamped electronic copy will be returned and fabricated and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings must be performed before fabrication and installation of Work may proceed.
- .14 Use only those shop drawings on the work that bear the Engineer's "REVIEWED" notation.
- .15 District may deduct, from payments due to Supply Contractor, cost of additional Engineering work incurred if correct shop drawings are not submitted after one review by Engineer.
- .16 Review by the Engineer is for the sole purpose of ascertaining conformance with the general design concept. This review does not mean that the Engineer approves the detail design inherent in the shop drawings, responsibility for which remains with the Supply Contractor, and such review does not relieve the Supply Contractor of his responsibility for errors and omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Supply Contractor is responsible for dimensions to be confirmed and correlated at the job-site, for information that pertains solely to the fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.
- .17 The specifications identify those items for which shop drawings shall be submitted.

1.6 PRODUCT DATA

- .1 Product data shall include manufacturer's catalogue sheets, brochures, literature, performance charts and manufactured products. Refer to Specifications for Specific Requirements.
- .2 Submit either four (4) hardcopies and one (1) electronic copy of all product data.

PART 2 PRODUCTS

2.1 TRANSMITTAL FORM

- .1 Accompany all submittals with a standardized transmittal form for each specific item, class of material, equipment and items specified in separate, discrete sections in duplicate containing:
 - .1 Date;
 - .2 Contract number;
 - .3 Project title and number;

- .4 Equipment number;
- .5 Supply Contractor's name and address;
- .6 Identification and quantity of each shop drawing;
- .7 Name and address of:
 - .1 Subcontractor;
 - .2 Supplier;
 - .3 Manufacturer;
 - .4 Other pertinent data.
- .2 Identify the Section in the Specifications or the Drawing number to which the Submittal refers to.
- .3 Assign a unique number, sequentially assigned, on the transmittal form accompanying each item submitted. Submittals will be classified according to categories agreed to by the Supply Contractor and District. Use the following format by category for submittal numbers: "XXX", where "XXX" is the sequential number assigned by the Supply Contractor. Resubmittals will have the following format: "XXX-Y", where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for re-submittals, i.e., A, B, or C being the 1st, 2nd, and 3rd re-submittals, respectively. Submittal 025-B, for example, is the second re- submittal of submittal 25.

PART 3 EXECUTION

3.1 ADMINISTRATIVE

- .1 Provide to the Engineer for review the submittals specified. Submit all information promptly and in an orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract time and no claim for extension by reason of such default will be allowed.
- .2 Submit four (4) copies of submittals, unless noted otherwise in these specifications.
- .3 Do not proceed with work affected by any Submittal until review is complete. Normally, submittals for review and comment will be returned to the Supply Contractor within seven (7) days of receipt, exclusive of any time awaiting clarification or further information; however, the time for returns may vary and may exceed seven (7) days depending upon the complexity of the Submittal, the number of submittals, and the express needs of the Supply Contractor.
- .4 Review all submittals prior to submission to the Engineer including those from subcontractors and suppliers. The Supply Contractor's review represents to the District that the necessary requirements have been determined and verified, or will be, and that each Submittal has been checked and coordinated with the requirements of the Work and the Contract Documents. Submittals not stamped, signed, dated and identified by the Supply Contractor will be returned without being examined and will be considered rejected.
- .5 The Supply Contractor is responsible for the accuracy and completeness of information submitted. The Supply Contractor shall notify Engineer in writing of materials, equipment

or methods of work that deviates from the Contract Documents. Notification in writing, to accompany Submittal transmittal and noted under deviations.

- .6 The Supply Contractor's responsibility for errors, omissions and deviations in submission is not relieved by the Engineer's review of Submittals.
- .7 Keep one (1) reviewed copy of each submission at the Work Site.
- .8 All shop drawings shall be prepared in metric units.
- .9 The Supply Contractor shall maintain a single schedule of the status for all Submittals. This schedule shall be kept up-to-date and presented to the District for each item submitted.
- .10 Submittals requiring re-submission shall be submitted with their entire respective document section or tab to assist in document tracking in regard to the most current revision number. Piecemeal submittals will not be accepted and will be returned without review.

3.2 SUBMITTALS FOR REVIEW

- .1 All submittals, except where specified to be submitted for information only, are to be submitted by the Supply Contractor to the Engineer for review.
- .2 Review by the Engineer is for the sole purpose of ascertaining conformance with the general design concept in accordance with the Specifications. This review does not mean that the Engineer approves the detail design inherent in the Submittals, Shop Drawings and data sheets, responsibility for which remains with the Supply Contractor, and such review does not relieve the Supply Contractor of its responsibility for errors or omissions in the Shop Drawings and data sheets or of its responsibility for meeting all requirements of the Contract Documents.
- .3 Indicate all materials, methods of construction, methods of attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for the supply of the Goods and the installation thereof. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross references to Drawings and Specifications.
- .4 Submittals for review will be returned to the Supply Contractor with one of the four following notations:
 - .1 If the review indicates that the material or equipment complies with the contract documents, submittal copies will be marked "Reviewed". In this event, the Supply Contractor may begin to implement the work method or incorporate the material or equipment covered by the Submittal.
 - .2 If the review indicates limited modifications are required, copies will be marked "Reviewed as Modified". The Supply Contractor may begin implementing the work method or incorporating the material and equipment covered by the Submittal in accordance with the noted corrections. Where Submittal information

will be incorporated in operation and maintenance data, the Supply Contractor shall provide a corrected copy.

- .3 If the review reveals that the Submittal is insufficient or contains incorrect data, copies will be marked "Revise and Resubmit". Do not undertake work covered by this Submittal until it has been revised, resubmitted and returned marked either "Reviewed" or "Reviewed as Modified".
- .4 If the review indicates that the material, equipment, or work method does not comply with the Contract Documents, copies of the Submittal will be marked "Rejected". Submittals with deviations, which have not been previously identified clearly may be rejected. Do not undertake the work covered by such submittals until a new Submittal is made and returned marked either "Reviewed" or "Reviewed as Modified".
- .5 After submittals are stamped "Reviewed" or "Reviewed as Modified", no further revisions are permitted unless re-submitted to the Engineer for further review.
- .6 If upon review by the Engineer, no errors or omissions are discovered or if only
- .7 minor corrections are made, one (1) stamped copy noting "Reviewed or Reviewed as Modified" will be returned and fabrication and supply of the Goods may proceed. If shop drawings and data sheets are rejected, the one (1) stamp copy noting "Revise and Resubmit or Not Reviewed" will be returned, and resubmission of corrected shop drawings and data sheets, through the same procedure indicated above, is to be performed before fabrication of the Goods may proceed.
- .8 The District may deduct, from payments due to Supply Contractor, costs of additional Engineering reviews incurred if shop drawings and data sheets are not corrected after one review by the Engineer.

3.3 SUBMITTALS FOR INFORMATION ONLY

- .1 Submittals for information only will be used by the Engineer for general information and filed without comment. The Engineer retains the right to return submittals for information only if the Submittal does not comply with the Contract Documents and general design criteria.
- .2 Submittals for information only are not subject to review procedures. They are to be provided as part of the Work under the Contract and their acceptability determined under normal inspection procedures.
- .3 Where specified, the Supply Contractor is to submit engineering calculations sealed by a qualified Professional Engineer for information only.

3.4 ELECTRONIC DRAWING FORMAT OF FINAL/CERTIFIED SHOP DRAWINGS

- .1 Electronic drawing files are to be AutoCAD 2014 format to District of Sooke standards. An electronic template drawing in paper space with the District's standard border and drafting standards will be provided to the Supply Contractor upon request after award.
- .2 Submit electronic drawing files or CD-ROM or USB memory stick.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

- .1 This section contains the general requirements of the District's quality assurance program as well as procedures used by the District to check the Supply Contractor's Quality Control Program.

1.2 QUALITY ASSURANCE

- .1 The District may itself carry out inspections, measurements, and testing of the Work in order to assure that the quality of the Work is in accordance with the requirements of the Contract Documents, and to check and verify the quality control results and records of the Supply Contractor's Quality Control Program.
- .2 All or any part of the Work, and any off-site locations where material or products for the Work are being prepared or stored, may be inspected by the Engineer when and as often as deemed expedient in order to meet the objectives of quality assurance.

1.3 ACCESS FOR INSPECTION AND TESTING

- .1 The District shall be granted access to the Work at all reasonable times. If parts of the Work are in preparation at locations other than the Work Site, the Supply Contractor shall, at the request of the Engineer, arrange for safe access to such locations for the purposes of granting the Engineer the opportunity to undertake quality assurance inspections and/or tests.
- .2 The District shall give the Supply Contractor timely notice of the Engineer's intention to carry out any specific inspections and tests on any aspects of the Work. The Engineer may, however, carry out routine inspections and tests on any part of the Work without notice.
- .3 Once notice has been given by the District, the Supply Contractor shall not by any means prevent access to, or deny access to, Work that has been selected for specific tests, inspections or approvals. If the Work has continued without testing, inspection or approvals, the Supply Contractor shall undo such Work to the point where testing, inspection or approvals were to be performed at no additional cost to the District.
- .4 The District may wish to inspect or test sections of the Work which have already been completed prior to any previous inspections. The costs of testing such Work will be borne by the District, unless the section of Work is found to be in non-conformance with specified quality requirements, in which case the costs shall be borne by the Supply Contractor.

1.4 INDEPENDENT TESTING AGENCIES

- .1 The District may appoint an independent testing agency to undertake quality assurance inspections or tests on any parts of the Work. The Supply Contractor shall grant to any such agency the same access privileges as are required to be given to the District. The costs of hiring an independent testing agency will be borne by the District.

- .2 The employment of independent testing agencies by the District shall in no way absolve the Supply Contractor of its responsibility to perform the Work in accordance with the quality requirements of the Contract Documents, and to conduct all necessary quality control inspections and testing.

1.5 NON-CONFORMANCE

- .1 Work that does not meet the quality requirements of the Contract Documents will be rejected.
- .2 Unacceptable quality may result from poor workmanship, improper construction procedures, non-compliance with manufacturer's instructions, improper and careless handling, and the use of defective or damaged products and/or materials.
- .3 The Supply Contractor shall rectify all sections of the Work that are found, as a result of quality assurance inspections and tests, to be in non-conformance with the quality requirements of the Contract Documents. Where it is not possible or practical to repair a non-conforming or defective material, product, or component of the Work, to the satisfaction of the District, that material, product or component shall be removed from the Work and a new replacement be provided.
- .4 Where a section of the Work, or a product, is found to be in non-conformance, the Supply Contractor shall be responsible for all the costs of rectifying, replacing, re-inspecting and re-testing the Work to bring it to conformance. The District shall have the right to deduct the costs of all re-inspection and re-testing carried out by the District from progress payments due to the Supply Contractor.
- .5 Where a section of the Work, or a product, is found to be in non-conformance by quality assurance testing, the Supply Contractor shall increase the frequency of quality control testing on adjacent areas or similar products.
- .6 The Supply Contractor may challenge the results of any quality assurance tests indicating non-conformance. The section of Work in question shall be re-tested by an independent testing agency acceptable to both the Supply Contractor and District. Should the retest confirm the results of the earlier test, the Supply Contractor shall bear the costs of the additional tests. Should the re-test indicate conformance with the required quality standards, the District shall cover the costs of the tests.

PART 2 PRODUCTS

Not applicable to this Section.

PART 3 EXECUTION

3.1 SPECIFIC QUALITY ASSURANCE TESTS

- .1 Refer to the Specifications for Specific Quality Assurance Tests to be carried out by the Supply Contractor.

- .2 The Specifications may call for specific quality assurance tests to be performed on the Work by the District. The Supply Contractor shall give the District, or its appointed independent testing agency, appropriate notice as to when the Work will be ready for such tests. The District will not be responsible for delays occasioned by the Supply Contractor's omission in giving the required notice.
- .3 The Supply Contractor shall submit samples of materials, products or equipment required for testing where specifically called for in the Specifications. These items shall be submitted promptly and in an orderly sequence so as not to cause delay to the Work.
- .4 The Supply Contractor shall provide sufficient labour and facilities to obtain and handle samples of materials, products and equipment required for test. The Supply Contractor shall also provide sufficient space to store, and where necessary cure, test samples and products.

3.2 REPORTS

- .1 At the request of the Supply Contractor, the District shall submit to the Supply Contractor copies of results of any quality assurance tests undertaken by the District or by its appointed independent testing agency.
- .2 The Supply Contractor shall provide copies of inspection and test results to its subcontractors and suppliers where quality assurance tests were performed on materials, products, or work supplied or undertaken by them.
- .3 The Supply Contractor shall provide copies of the reports required for the specific Quality Assurance tests listed in the Specifications.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

- .1 This section outlines the responsibilities of the Supply Contractor with respect to controlling the quality of the Work required to be completed under the terms of the Contract. The required quality standards for the various aspects of the Work are contained in the specific sections of these Contract Documents.

1.2 SUBMITTALS

- .1 Within seven (7) days of the date of issue of the Notice of Proceed, the Supply Contractor shall submit a Quality Control Program to the District for review. The District will, within seven (7) days of receipt of the program, respond in writing to the proposed program. The Supply Contractor shall submit copies of test results to the District within twenty-four (24) hours of them becoming available. If the tests are completed on the Work Site, the Supply Contractor shall provide the District with a field memo summarizing the results immediately following testing.

1.3 REQUIREMENTS

- .1 The Supply Contractor shall conduct, at its own cost, all necessary quality control testing that is required to demonstrate the Goods conforms to the Contract Documents.
- .2 The Supply Contractor shall be responsible for all aspects of the quality of the Work and shall put into place a suitable Quality Control Program to ensure that quality standards are met, and that the Work meets the requirements and intent of the Contract Documents.
- .3 The Supply Contractor shall appoint an independent testing agency to undertake quality control tests that are required by the Contract Documents, and for which the Supply Contractor does not have suitable resources and equipment.
- .4 The independent testing agency used by the Supply Contractor shall be manned by qualified personnel and have facilities that are certified to CSA, ASTM and other specified test methods for the sampling and testing of materials. The independent testing agency requires the acceptance of the District.
- .5 The District may carry out quality assurance testing and inspection in order to assure that Work is generally in accordance with the Contract Documents and to verify the Supply Contractor's quality control data.
- .6 Testing and inspection by the District will not relieve the Supply Contractor of its responsibility to perform quality control testing and inspection.

1.4 PAYMENTS AND DELAYS

- .1 No separate or additional payment will be made to the Supply Contractor for quality control. The costs thereof will be considered to be included in the proposal prices for the various items of work to be performed under the Contract. Likewise, no extension of time

shall be allowed for any delay occasioned by the need to carry out inspection and testing, or to rectify work in non-conformance with quality standards.

PART 2 PRODUCTS

Not applicable to this Section.

PART 3 EXECUTION

3.1 QUALITY CONTROL PROGRAM

- .1 The Supply Contractor shall develop a Quality Control Program, which shall be submitted to the District for review.
- .2 The program shall include, but not be limited to, the following:
 - .1 The names and designations of persons employed by the Supply Contractor who will be responsible for quality control and what each person's function will be.
 - .2 The name of an independent inspection and testing agency that will be used to monitor the quality of the Work.
 - .3 The procedures that will be adopted by the Supply Contractor to ensure conformance with the requirements of the Specifications and Drawings.
 - .4 The procedures for the control of items purchased by the Supply Contractor to ensure that they are of specified quality and size, and procedures for the proper care and storage of such items on site before inclusion in the Work.
 - .5 The procedures for the control of documents and drawings to make sure that only the latest revisions are used, and that the contents of change orders, instructions, minutes, etc., issued by the District, are followed.
 - .6 Inspection and testing methods, including testing of materials, welds, valve leakage, etc., and a description of what methods will be used if not specifically listed in the Contract Documents. The proposed locations and frequencies of testing shall also be indicated.
 - .7 A description of how non-conformance with quality standards or project specifications will be tracked and what remediation methods will be followed to achieve conformance.
 - .8 The procedures for the control, distribution, and safekeeping of all quality testing and inspection records.
- .3 All Work shall be performed in strict adherence to the accepted Quality Control Program.

3.2 QUALITY CONTROL TESTING

- .1 The Supply Contractor shall conduct, at its own cost, all necessary quality control tests that are required to demonstrate that the materials, products, and completed Work conform to the Contract Documents.
- .2 The Quality Control Measures listed in the Specifications are a minimum only. The Supply Contractors Quality Control Program and testing shall include such tests required to prove the functionality and safety of the equipment.

- .3 Minimum quality standards and testing requirements shall be in accordance with the Contract Documents, and if not stated therein, with all applicable laws, regulations, standards and codes.
- .4 The locations and frequencies of tests required under this section shall be determined by the Supply Contractor and/or the independent testing and inspection agency working on behalf of the Supply Contractor and shall be selected to test all aspects of the Work.
- .5 The Supply Contractor shall report, track, correct and retest any deficient Work determined by the quality control or quality assurance programs at no additional cost to the District.
- .6 The Supply Contractor's quality control testing and the District's quality assurance testing will form the basis for acceptance of the Work.
- .7 All test reports shall contain at least the following information:
 - .1 Project identification;
 - .2 The nature of the test;
 - .3 Dates of sampling, testing and reporting;
 - .4 The names of the personnel involved;
 - .5 The location of the test (with sketch if required);
 - .6 The specified quality standard required;
 - .7 The test results achieved; and
 - .8 Remarks regarding conformance or non-conformance with the specified requirements.

END OF SECTION

PART 1 GENERAL

PART 1 GENERAL

1.1 INTRODUCTION

- .1 This specification outlines the minimum requirements for the design, fabrication, supply, testing and commissioning of Electrical equipment provided as part of a mechanical or process packaged system to be supplied by a Supplier for the Sooke Dewatering Project at Sooke, British Columbia.
- .2 The equipment defined within this specification includes but is not limited to the starters, motors, enclosures, junction boxes, cable, conduit, and tagging standards as required for the packaged system.
- .3 The services defined within this specification includes but is not limited to the supply, factory acceptable testing, delivery to site, installation support, testing (lead), commissioning (lead), training (lead) and collection of all support documentation.
- .4 This specification is complementary to Equipment Data Sheets, drawings and specifications that may form part of the tender documents.
- .5 It shall apply to those items installed on equipment and those items supplied loose by the Supplier.
- .6 Refer to Specification Section 10 70 12 for specification of common I&C elements.

1.2 DEFINITIONS

- .1 **Contractor:** Site Installation Contractors
- .2 **Supplier:** Equipment or Process System material provider
- .3 **The Owner:** District of Sooke; the end user
- .4 **Engineer:** Equipment Specifier
- .5 "When specified", "Where specified" or "As specified" shall mean information shown on the accompanying Data Sheets or drawings by the Engineer.

1.3 LANGUAGE AND UNITS

- .1 All documentation shall be provided in English.
- .2 International Systems of Units (SI units) shall be the units of measure for all displayed, controlled, and alarmed variables.

1.4 **CODES AND STANDARDS**

- .1 The design and installation of all electrical and instrument systems shall comply with the rules and provisions of the latest editions and amendments of the Standards and Codes of Practice listed below.

Document No.	Standard Title
UL 508A	Standard for Industrial Control Panels
NEMA 250	Enclosures for Electrical Equipment
CEC	Canadian Electrical Code (latest edition)
CSA	Canadian Standards Association <i>(all electrical equipment shall bear the CSA label)</i>
NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities

- .2 In the absence of a specific standard, the original manufacturer's recommendations will prevail subject to approval by the Engineer.
- .3 In addition to Codes and Standards listed above, the following requirements shall apply:
- .1 All equipment and assemblies shall carry the CSA, cUL or equivalent mark approved for use by the local Safety Authority with an associated declaration of conformity.
- .2 In the event that specific equipment does not bear an acceptable equipment certification, the Supplier shall obtain local review, inspection, approval and labelling by a certification agency such as CSA, cUL or equivalent that is acceptable to the authority having jurisdiction.
- .3 The Supplier shall pay for all costs for local inspection and any equipment modification as directed by the certification agency to obtain approval.
- .4 In case of a conflict between Standards, CSA Standards take precedence in the interpretation of the requirements over other Standards.
- .5 The design and construction shall also comply with the requirements of all authorities having jurisdiction over the site for the type of equipment specified herein.

1.5 **SUPPLIER INFORMATION**

- .1 The Owner's approval of Supplier's drawings and documentation does not in any way relieve the Supplier of his responsibility to meet the above criteria.
- .2 The Supplier shall submit sufficient information (pressures, temperatures, flow rates, specific gravities, corrosive conditions, controller set points, alarm set points, ranges, etc.) to permit The Owner to execute the necessary review and checking activities and to develop control narratives, interconnecting diagrams, and shutdown and security circuits.
- .3 Supplier shall provide, and The Owner shall review, interface drawings for complete compatibility with Supplier's equipment, interfacing with The Owner's electrical System and for safe functioning of the equipment.

1.6 EQUIPMENT INSTALLED IN HAZARDOUS AREAS

- .1 All equipment and electrical devices that are fully or partially located within a hazardous area shall be suitably rated for the area classification.
- .2 Conduit and cabling systems to instruments located in hazardous areas shall be in accordance with the CEC.
- .3 Electrical equipment intended for use within a designated hazardous area shall meet the latest requirements of the Canadian Electrical Code C22.1, and as adopted in the Province of British Columbia.
- .4 Provide all necessary certification for electrical equipment specifically designed for use in designated hazardous areas. A separate certificate shall be provided for all individual pieces of equipment.
- .5 Ensure to reference the Area Classification drawings, where provided, to confirm the location of the equipment and the classification of the space where the equipment is installed.
- .6 Equipment rating methods are discussed further in Part 2 of this document.

1.7 SUPPLIER RESPONSIBILITY

- .1 The Supplier is responsible for the functionality and suitability of all equipment provided as a part of their scope supply, including equipment that is shipped loose for connection to the packaged system equipment.

1.8 SUPPLIER SCOPE

- .1 Supply all electrical equipment required to operate the package systems that either mounts directly on the equipment or is field installed and wired to the systems.
- .2 Prewire all field mounted equipment and devices to terminals in NEMA 4X junction boxes.
- .3 Make provisions in the packaged control systems to interface to the plant electrical system as defined in the equipment specification.
- .4 Provide onsite support to lead integration efforts of the equipment; this effort will coordinate with the site Contractor and the Client.

1.9 MATERIALS

- .1 Equipment shall be manufactured of material suitable for the process and atmospheric conditions specified in the Packaged Equipment specification and data sheets.

1.10 SUBMITTALS

- .1 Submittals shall be in accordance with Section 01 33 00 requirements.

- .2 The Supplier is to provide engineering assistance to The District and its consultants for various projects as they arise, as indicated below:
 - .1 The Supplier will be provided with design drawings (typically single line diagrams, floor plans and proposed equipment footprints) by The District or Engineer during the detailed design stage, along with a formal request to produce shop drawings and a cost estimate (refer to Section 01 33 00 for additional information).
 - .2 The Supplier is to provide engineered shop drawings and associated cost estimate, based upon the terms and specifications of this RFP with any changes or modifications requested by The District or Engineer.
 - .3 The District and/or Engineer will review the shop drawings and cost estimate, and work with the Supplier to make adjustments to the equipment, as required, to suit the project.
 - .4 The Supplier shall allow for three (3) such shop drawing submissions during detailed design.
- .3 Submit shop drawings, product data and samples in accordance with Section 01 33 00. The submission shall be reviewed, signed and processed as described in Section 01 33 00.
- .4 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .5 Where required in specific sections, include wiring, line and schematic diagrams. Include wiring drawings or diagrams showing interconnection with existing equipment and the work required in other divisions.

1.11 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with these specifications.
- .2 Equipment and materials shall be CSA certified.
- .3 All materials are to be new, free of defects or damage, and of uniform manufacture.

1.12 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into Owner's final maintenance manual specified in Section 01 78 39 and as follows.
- .2 Include in operations and maintenance data:
 - .1 Operating instructions and start-up procedures including receiving and installation requirements.
 - .2 Details of design elements, construction features, component function and maintenance requirements, to permit effective operation, maintenance, repair, modification, extension and expansion of any portion or feature of supplied equipment.
 - .3 Detailed instructions for the normal maintenance of all supplied equipment, including procedures and frequency of operational checks and service and troubleshooting instructions

- .4 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature is not acceptable.
 - .5 Wiring and schematic diagrams: these must be specific to each individual piece of equipment, detailed with wire/cable tags and termination information, not generic.
 - .6 Spare parts data shall be furnished for each item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply. A list and itemized price breakdown of spare parts recommended for stocking shall be furnished. The parts selected shall be those which, in the manufacturer's judgment, will be involved in the majority of maintenance difficulties encountered.
 - .7 Copies of guarantees and certificates.
 - .8 Names and addresses of local suppliers for each item of equipment, including items in the maintenance manuals.
- .3 Submit a draft copy to the Engineer for approval prior to delivery of the equipment.

1.13 PROJECT AS-BUILT DRAWINGS

- .1 During the construction period, the Installation Contractor will keep on-site a clean set of final shop drawings that will be marked-up to reflect the "As-Built" state of the equipment, for examination by the Engineer on a regular basis.
- .2 Upon completion of commissioning, the Installation Contractor will provide the marked-up "as-built" shop drawings to the Supplier(s), to be updated in AutoCAD format.
- .3 The Supplier is responsible for providing AutoCAD format "as-built" drawings which incorporate the Contractor's field mark-ups for each individual breaker and starter bucket. Typical wiring diagrams will not be accepted. The Supplier shall submit the as-built drawings in both paper and electronic format for incorporation into site O&M manuals.

1.14 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust-resistant primer inside and outside (or phosphatizing treatment), and at least 2 mil thick electrostatic powder paint coat applied to all surfaces.
- .2 Paint indoor switchgear and distribution enclosures to ASA 61, light grey.

1.15 EQUIPMENT IDENTIFICATION

- .1 Provide nameplates for electrical equipment having a standard District equipment number with the following characteristics:
 - .1 Manufacture nameplates from 3 ply lamacoid, minimum 3.2 mm thick with 0.8 mm chamfered edges, engraved lettering and gloss finish.
 - .2 Use capitalized lettering centred on each row and in Gothic font, sans serif.
 - .3 Use self-adhesive backing filling the entire area of the back for nameplates except where insufficient area exists to reliably affix a nameplate. For

nameplates without self-adhesive backing provide nameplate with 5 mm diameter tie hole.

- .2 Use self-adhesive backing, type 3M™ Adhesive Transfer Tape 467MPF or Tesafix 4970 where a nameplate is affixed to a smooth surface.
- .3 Use self-adhesive backing, type 3M™ Double Coated Vinyl Foam Tape 4432 at least 0.8 mm thick where a nameplate is affixed to a non-smooth or an irregular surface.
- .4 Do not use embossed plastic labels.
- .5 Colour coding:
 - .1 General Purpose - black face, white lettering (outer two plies black, inner ply white), gloss finish.
 - .2 Essential Electrical Circuits - white face, red lettering (outer two plies white, inner ply red).
 - .3 Warning Messages - red face, white lettering (outer two plies red, inner ply white).
- .6 Nameplate types are designated Type 1, Type 2A / 2B, Type 3 or Type 4.
- .7 Nameplate types

Nameplate Type	Size, mm (H x W)
Type 1	25 x 90
Type 2A	75 x 180
Type 2B	40 x 90

- .8 Nameplate Type 1
 - .1 Use nameplate Type 1 on all MCC and Switchgear units and compartments.
 - .2 Conform to The District equipment numbering standard for the "Equipment Number".
 - .3 The inscription is to describe the equipment. Do not exceed three lines for descriptors and do not use hyphens. Place wording logically on each line.
- .9 Nameplate Type 2A / 2B
 - .1 Use nameplate Type 2A for MCC and Switchgear identification and on stand-alone electrical cabinets.
 - .2 Conform to The District equipment numbering standard for the "Equipment Number".
 - .3 Type 2B - reduce the size of the nameplate Type 2A by 50 percent (i.e. length and width dimensions to be halved), where nameplate Type 2A is inappropriate for the equipment size.

1.16 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.

- .3 Colour code: to CSA C22.1.
- .4 Identify all other wires at each end with indelible Graff-Rite heat shrink tubular markers. Acceptable manufacturer: Graff-Rite Industries Ltd., Port Coquitlam, B.C., or approved equivalent.
 - .1 Identification numbers shall match full wiring numbers as shown on the Drawings.
 - .2 Provide wire numbers for all wires and terminals where numbers are not designated on Drawings by using the format "Device tag - terminal number".
- .5 Colour code wiring:
 - .1 600 V AC: Red for Phase A.
 - .2 Black for Phase B.
 - .3 Blue for Phase C.
 - .4 White for Neutral.
 - .5 120 V AC: Black for Hot.
White for Neutral.
 - .6 24 V DC discrete: Red for Positive.
Black for Negative.
 - .7 24 V DC Loop (analog): White for Positive.
Black for Negative.

1.17 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.18 COORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

PART 2 MATERIALS

2.1 MATERIALS AND WORKMANSHIP

- .1 All materials and equipment to be new, of a current manufacture and free from all defects and imperfections.
- .2 Electrical equipment to meet the requirements of this specification, listed codes/standards and rated for continuous operation at full load for the design conditions specified.
- .3 All electrical components must be installed in grounded aluminum metal enclosures or grounded stainless steel enclosures as per the applicable CSA standard.

- .4 Protective relay instrumentation and controls will be supplied and located in an isolated compartment of the equipment local control panel enclosure. This equipment shall be located on the skid or within the equipment the protective relay instrumentation is intended to protect. Terminal blocks, secondary CT connections, secondary VT connections and miscellaneous control devices shall be located in this isolated compartment. Connection terminal blocks shall be provided for all field wiring and as required for The District's external connections. Operation of the system shall not be affected by opening the compartment doors.
- .5 Design and arrange system packages to account for ease of maintenance. Ensure parts and components are easily accessed and removed by maintenance personnel.
- .6 Design and arrange electrical equipment to protect personnel against risk of shocks by all available means of interlock, insulation, screens, partitions, enclosures and warning labels.
- .7 Provide similar items of equipment and materials from the same Manufacturer. Standardize on products to reduce the number of required spare parts.
- .8 All equipment shall be CSA approved (or approved equivalent) and will not be shipped to site without confirmation. Any cost of electric inspection dispute related to equipment not meeting CSA approval shall be the responsibility of the Supplier.
- .9 Outgoing power connection conductors will be connected to conductor lugs. These terminal blocks will be grouped horizontally near the bottom of the panel, for connection of field wiring by installing contractor. Supplier to provide aluminum, undrilled, removable gland plates for large control panels or equipment junction boxes to facilitate clear direction for installation of field wiring and protection of internals during transportation and installation.
- .10 Control conductors will be connected to terminal blocks for field wiring (to external starters, instruments, etc.). These terminal blocks will be grouped together in a logic manner, for connection of field wiring by installing contractor. Supplier to provide aluminum, undrilled, removable gland plates for control panels or equipment junction boxes to facilitate clear direction for installation of field wiring and protection of internals during transportation and installation.

2.2 ELECTRICAL MOTORS

- .1 Provide all motors in accordance with requirements listed in standards; CSA C22.2 No. 100, CSA C22.2 No. 145, and NEMA Standard MG1.
- .2 Supplier is responsible to ensure the rating and functional characteristics of the motors match the requirements of the loads.
- .3 Motors shall be designed for continuous duty operation at rated power except where the process defines different rated duty type, per the Supplier.
- .4 Motors shall have a design life of at least 20 years with periodic maintenance interval of greater than five years and shall be of premium efficient, heavy duty industrial type per NEMA MG1.

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- .5 Provide motors capable of developing 150 percent of NEMA design B locked rotor and pull-up torques with 100 percent of rated voltage applied and capable of developing in excess of NEMA locked rotor torque values at 90 percent of rated voltage.
 - .6 Motors shall have sufficient capacity to operate the driven load and associated devices under all conditions of operation without overloading.
 - .7 Acceptable motor manufacturers are;
 - .1 ABB (Baldor / Reliance)
 - .2 US Motors (Emerson)
 - .3 TECO Westinghouse
 - .4 Siemens
 - .5 Toshiba
 - .8 Equipment electrical motor requirements classification:
 - .1 Type 1 (General Duty): Unless specified otherwise on data sheet, TEFC enclosures, to NEMA MG1.
 - .2 Type 2 (Process): Unless specified otherwise on data sheet, TEFC enclosures, to NEMA MG1, suitable for moist and corrosive environment. All internal surfaces to be coated with an epoxy paint.
 - .3 Type 3 (Explosion-proof type): Motors to be TEXP explosion proof rated for operation in a Class 1, Zone 1, Group IIB hazardous location in accordance with CSA C22.1-15. Provide an approved breather/drain device installed in the motor drain hole.
 - .4 Type 4 (submersible applications): Motors to be waterproof with 316SS motor shaft, rated for submerged operation and hazardous area classification.
 - .9 Motor Insulation
 - .1 Use Class F insulation
 - .2 Design motor for temperature rise less than 90°C at 1.15 service factor loading.
 - .3 Insulation to be non-hygroscopic.
 - .4 For all motor applications, dip and bake in Class H varnish a minimum of 2 times. For 284T and larger frames, dip and bake a minimum of 3 times.
 - .10 Motors for Variable Frequency Drives
 - .1 Select heavy duty, premium efficiency units, inverter duty rated, CSA certified to be in conformance with NEMA MG1, Part 30 and Part 31.
 - .2 Design to ensure turndown of 5:1 unless specified elsewhere.
 - .3 Use only Type 2 or Type 3 motors.
 - .4 Insulation: Class F insulation, suitable for 90°C temperature rise, with a 1.0 safety factor, suitable for moist and corrosive environments and in accordance with NEMA MG1 Part 30 and Part 31. Provide additional treatment at winding end turns to minimize stray current failures. Provide grounding or discharging rings for the motor bearings.
 - .5 Design motors for variable frequency systems so that they are not required to deliver more than 80 percent of the motor's power rating by any load imposed by

the driven machine at any specified operating condition or any condition imposed by the driven machine's performance curve at maximum operating speed.

- .6 Ensure motors have adequate cooling capacity when operating through the entire speed range capacity of the drive.
- .11 The following voltages are used based on the motor power as follows:

Application	Motor Power Range	Utilization Voltage	Phase
DOL (direct on line)	0.56kW to 75 kW (100 HP)	575 V	3
VFD	0.56kW to 450 kW (600 HP)		
DOL	Less than 0.56 kW (3/4 HP)	120 V	1

2.3 INTERFACE TO STARTERS AND VARIABLE FREQUENCY DRIVES

- .1 The Supplier will design for the use of externally mounted motor starting devices (full-voltage non-reversing, full-voltage reversing or VFD) located within a local MCC room unless otherwise specified in the packaged equipment specification.
- .2 Supplier shall provide wire termination blocks within a panel or cabinet for connection of all field wiring to the starting devices.
- .3 Where control devices are required to be mounted on or in local panels, provide panel or cabinet along with the interface terminal blocks.
- .4 The individual drives (supplied by others) will be complete with breaker or fused disconnects, drive, front panel interface module and output dV/dt filter. VFDs will communicate with the Supplier control system by hard wired interface for automatic control, and will also be wired with Profibus DP connection, providing additional diagnostic functions, such as speed / torque feedback, to the District's DeltaV system.
- .5 Input power shall be based on previously defined motor voltages, based on motor sizes.
- .6 The Supplier shall be responsible for coordinating the drive and motor characteristics with the installing contractor which shall include, but not be limited to, the following:
 - .1 A guarantee that the drive and motor meet the load demands and acceleration requirements of the driven equipment throughout the speed range when the input voltage varies over a range of $\pm 10\%$; and,
 - .2 Ensuring complete compatibility of the drive's current limit protection with the motor thermal withstand capability.

2.4 SUPPLY OF VARIABLE FREQUENCY DRIVES

- .1 If the packaged equipment specification calls for the supply of VFDs instead of wiring to VFDs supplied by the Contractor, the following clauses apply.

- .2 Approved VFD make and model is Rockwell Automation Powerflex 753 or Eaton Power XL. No alternates.
- .3 The Supplier shall be responsible for coordinating the drive and motor characteristics with the installing contractor which shall include, but not be limited to, the following:
 - .1 A guarantee that the drive and motor meet the load demands and acceleration requirements of the driven equipment throughout the speed range when the input voltage varies over a range of $\pm 10\%$; and,
 - .2 Ensuring complete compatibility of the drive's current limit protection with the motor thermal withstand capability.
- .4 Filters shall be provided on the incoming line and on the load side of the VFD.
- .5 Controlled acceleration and deceleration times, separately adjustable, shall be provided.
- .6 Separately adjustable minimum and maximum frequency limits shall be provided.
- .7 The drive shall be capable of regulating the frequency to a $\pm 1\%$ of the set point over the full input voltage and ambient temperature operating range.
- .8 The vendor data shall indicate the efficiency, power factor, kW output, heat rejection and harmonic distortion of the drive at 25%, 50%, 75% and 100% operating points.
- .9 Audible noise levels produced by the drive shall be limited to 75 dBA sound pressure at one meter, at any point throughout the operating range of the drive.
- .10 The drive input shall be protected to withstand surges as defined in ANSI Std. C37.90.1 - Guide for Surge Withstand Capability (SWC) Tests.
- .11 The drive enclosure shall meet the requirements of panels and enclosures, detailed within this specification, based on the area to be installed.
- .12 When auxiliary cooling is required, the drive shall have fans and the required controls for proper operation.
- .13 The drive shall have, as a minimum, circuits within the drive for connection of remote signals via Ethernet I/P communication and where required wired to terminal blocks for hardwire I/O as follows:
 - .1 Drive permissive signal (lock out switch): normally closed contact, open to emergency stop drive, operable in remote or local control mode;
 - .2 Remote Run signal: normally open contact, closed for run and open for stop;
 - .3 Remote Speed Reference signal: Isolated analog 4 mA to 20 mA input for speed set point from the packaged control system.
- .14 Alarms must be latched in with first-out indication.
- .15 The diagnostic system shall monitor each alarm and shutdown function and shall display the status of each point on the front panel interface module.

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- .16 The drive shall provide the following relay outputs (form C, rated 2 Amp at 120 VAC) as minimum:
- .1 Run Status, normally open;
 - .2 Fault signal: normally closed contact, closed for normal and open for fault;
- .17 The drive shall provide at least two isolated 4-20 mA analog outputs that are programmable to frequency, speed, current, torque, or power factor configured for:
- .1 Remote Speed Indicator: Isolated analog 4 mA to 20 mA output for speed feedback to the packaged control system.
 - .2 Remote Current Indicator: Isolated analog 4 mA to 20 mA input for amperage feedback the packaged control system.
- .18 Terminal blocks for controls, alarms, metering and diagnostics shall each be readily accessible, grouped and shall be segregated from power devices, for personnel safety.
- .19 Each terminal block, fuse, control switch, circuit breaker, auxiliary switch, relay, instrument transformer and other auxiliary component shall be permanently labeled to correspond with the schematics and wiring diagrams.
- .20 Input Power
- .1 VFDs shall have nominal voltage rating of 690 VAC; if this rating is not available, confirm acceptability of product with Engineer minimum of ten (10) days prior to bid close.
 - .2 Unless otherwise noted, the plant operating voltage shall be 600 VAC $\pm 10\%$ 3 \emptyset , 60 Hz, power supply, with line frequency variation of up to ± 5 Hz.
 - .3 The VFD shall withstand switching surge of three (3) times the normal peak line to ground voltage at $\frac{1}{2}$ cycle or less duration, without damage.
 - .4 The VFD shall tolerate power line interruptions of 50% voltage sag for up to 0.5 seconds without shutting down on a fault, providing an extended power loss ride-through. If the VFD trips on under-voltage, the VFD shall activate the Automatic Restart/Reset for under-voltage trips and utilizing the flying start function to allow the VFD to restart immediately when the power returns, if in "Remote" and the control calls for the VFD to run. The VFD shall match the motor rotating speed and take control.
 - .5 The VFD shall present a displacement power factor of 0.95 lagging or better to the AC line at any speed or load.
 - .6 Efficiency of VFD shall be not less than 96% at 60 hertz output when driving the specified maximum load. Determine the efficiency by measuring true RMS power into the VFD and measuring output on a dynamometer.
 - .7 The variable frequency control to operate satisfactorily when connected to a bus supplying other solid state power conversion equipment which may be causing up to 10 percent total harmonic voltage distortion and commutation notches up to 36,500 Volt microseconds, or when other VFDs are operated from the same bus.
 - .8 The VFD shall not require an input isolation transformer.
 - .9 The VFD shall not be sensitive to supplied power that has one phase grounded (Delta) or referenced to earth ground (Wye).
 - .10 The VFD shall not be sensitive to incoming phase sequence.

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- .11 The VFD shall include transient voltage suppression to allow reliable operation encountered in an industrial power distribution system.
 - .21 Output Power
 - .1 The VFD shall produce a three-phase output for the motor load.
 - .2 The VFD output power stage shall convert the rectified DC into 3Ø AC power utilizing voltage source type digitally generated sine weighted pulse width modulation (PWM) switching signals.
 - .3 Unless otherwise specified, the standard VFD output frequency shall be adjustable from 10 to 66 Hz.
 - .4 Unless otherwise specified, the VFD output voltage shall be adjustable from 0 to 600 VAC, reaching 600 VAC at 60 Hz.
 - .5 Unless otherwise specified, the VFD shall produce a reduced volts-per-hertz (V/Hz) ratio in the below 60 Hz range.
 - .6 Unless otherwise specified, the VFD shall supply a constant 600 VAC output when operating above 60 Hz.
 - .7 The volts-per-hertz output of the VFD shall not be affected or require readjustment when other VFD adjustments (such as maximum speed) are changed.
 - .8 Provide selectable constant V/Hz ratio or configurable V/Hz ratio. The VFD shall have selectable pre-programmed V/Hz ratios and the capability of programming a custom V/Hz pattern. Specific V/Hz patterns shall be available for both constant torque and variable torque applications and shall be programmable.
 - .9 When subject to the range of ambient conditions stated herein, the VFD shall be capable of maintaining 100% of rated output current continuously.
 - .10 When subject to the range of ambient conditions stated herein, the VFD shall be capable of delivering 150% of rated output current for up to one minute.
 - .11 The VFD output waveform shall be the PWM type waveform producing smooth torque at low frequencies and low harmonics.
 - .12 The VFD shall have a programmable PWM carrier frequency. Minimum PWM frequency range of 2 - 15 kHz.
 - .13 The VFD shall be capable of operating output open circuited with no fault or damage for start-up and testing purposes.
 - .14 Manufacturer shall indicate on the shop drawings, the anticipated levels of audible and electrical noise, harmonics and heat generated for the range of VFDs to be supplied.
 - .22 The VFD shall be capable of withstanding the maximum fault level available (RMS symmetric short circuit current), as indicated on the drawings. In no case shall it be less than 50 kA.
 - .23 The loss of AC input power longer than 15ms shall cause the drive to shut down in an orderly fashion, without causing pulsations in the drive or motor system.
 - .24 The VFD shall have the capability of being restarted with a remote signal from either the system control panel or the plant PLC/SCADA system.
 - .25 The VFD shall not be affected by radio frequencies emitted by portable radio transmitters.

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- .26 The drive shall protect itself against the following as a minimum:
- .1 The VFD shall protect itself against the following as a minimum:
 - .2 Under / over voltage
 - .3 Incoming power system phase loss
 - .4 Overcurrent
 - .5 Over temperature
 - .6 Output short circuit
 - .7 Output ground fault
 - .8 Output power phase loss and current imbalance
 - .9 DC Bus overvoltage
 - .10 Inverter Over-temperature
 - .11 Stall
- .27 Loss of input power or faults (when cleared) shall be "self-reset", i.e., after the loss of AC supply power, there shall be an orderly shutdown of the system. After restoration of power, the VFD shall self-reset and start automatically if in "Remote" and the control calls for the VFD to run.
- .28 VFD output faults and short circuit faults shall be manual reset at unit HMI.
- .29 Built-in-network communication (Ethernet I/P).
- .30 Diagnostics – device, warning, and trip status, time to overload trip, history of last trips, and time to reset.
- .31 Control Features:
- .1 Provide complete integrated control and metering as follows:
 - .1 Door mounted non-resettable elapsed time hour meter.
 - .2 Adjustable linear acceleration and deceleration from 1.0 to 25 seconds.
 - .3 Adjustable maximum VFD output voltage.
 - .4 Adjustable maximum voltage/hertz.
 - .5 Adjustable IR compensation.
 - .6 Adjustable slip compensation.
 - .7 Adjustable current limit from 10 to 150%.
 - .8 Adjustable minimum speed, 0 to 50%.
 - .9 Adjustable maximum speed, 50 to 110%.
 - .10 Remote / Local bumpless speed transfer.
 - .11 Input terminals for remote interlocks. Allow for minimum two interlocks or otherwise shown on the drawings.
 - .12 Sufficient I/O for all discrete and analog signals as indicated on the RFP drawings and wiring schematics.
 - .13 Minimum of four (4) discrete relay outputs.
 - .2 Surge Suppression: Provide isolation and voltage surge suppression for contacts used for external monitoring to limit inductive switching surges to less than 200 V

peak. Provide DC coils with free-wheeling diodes to limit inductive surges to 28 V peak.

- .3 Human-Machine Interface (HMI) on VFD Front Door: Provide a digital local operator interface on the VFD door complete with the following features as a minimum:
 - .1 Speed raise / lower pushbuttons with digital frequency display for local speed adjustment,
 - .2 START / STOP pushbutton,
 - .3 FAULT RESET pushbutton,
 - .4 VFD RUN indicator,
 - .5 VFD STOP indicator,
 - .6 VFD FAULT indicator,
 - .7 LOCAL / REMOTE pushbutton with capability to transition without stopping, and,
 - .8 Parameter selection and programming capability.

2.5 ALTERNATE SUPPLY OF MOTOR STARTERS (NON-VFD)

- .1 If the packaged equipment specification calls for the supply of motor starters instead of wiring to MCC mounted starters supplied by the Contractor, the following clauses apply:
- .2 The Supplier's standalone control panel shall have all control components such as motor starters, pushbuttons, selector switches, signal lamps, relays, etc. to run the system. Three phase, 60Hz power at 600 V AC and single phase 120/208 V AC is available by others as required to power Supplier's panel.
- .3 Motor starters for low voltage motors shall be of the combination type with circuit breaker and contactor type with overload protection for direct-on-line service, unless specified otherwise.
- .4 Supplier's motor starter circuit breaker disconnect or system circuit breaker disconnect shall be suitable for padlocking without opening the control panel door.
- .5 Preference for motor starter control power from a control transformer provided with each starter. Alternatively, Supplier shall provide independent 120 VAC power supply, separately fused for each starter.
- .6 Starters shall as a minimum have ambient temperature compensated thermal overload protective element in each phase, and status wired back to the plant PLC/SCADA control system.
- .7 The equipment enclosure shall meet the requirements of panels and enclosures, detailed within this specification, based on the area to be installed.
- .8 External reset buttons shall be provided for thermal overload devices.
- .9 Overload relays, circuit breakers and contactors shall be sized based on the load requirements.

- .10 Include a control station complete with HOA selector switch and indicating devices mounted within sight for all motors.
- .11 Provide a red drive running indicator light mounted on the panel or starter.
- .12 For reversing motors provide a red (forward) and separate red (reverse) indicating lights mounted on the panel or starter.
- .13 Provide a green 'Stop/energized' indicating light mounted on the panel or starter.
- .14 Provide, at minimum, hard-wired signals between starters and the package control system as follows:
 - .1 Run permissive and/or Run-Stop command (120 V AC isolated contacts)
 - .2 Input to the control system (120 V AC isolated contacts):
 - .1 HOR Selected input (Hand and Remote positions to control system)
 - .2 Overload Tripped input (to control system)
 - .3 Running input (two inputs for reversing motors)
 - .4 Run Command output (two outputs for reversing motors).
- .15 Provide a minimum of two (2) normally open (NO) and two (2) normally closed (NC) spare auxiliary run contacts in addition to those required for seal-in and interlocking.
- .16 All power and control wiring to be terminated on terminals in each individual starter cubical or control panel section.
- .17 Each starter wiring and schematic diagram located inside control panel door mounted document holder.

2.6 MAIN DISCONNECT

- .1 The Supplier shall provide a local main disconnect for each separate power distribution unit included in the Supplier's scope per Canadian Electrical Code requirements.
- .2 The main disconnect shall be an unfused safety disconnect switch rated for the maximum full load current of the equipment, located within sight of the equipment and as per the Canadian Electrical Code.
- .3 The switch shall provide for padlocking in the open position.

2.7 MOTOR DISCONNECT SWITCH

- .1 Indoor process areas: Non-metallic CSA Enclosure Type 4X, compact, non-fusible, horsepower rated disconnect switch, size as required.
- .2 Outdoor Process areas: Stainless steel CSA Enclosure Type 4X, non-fusible, horsepower rated disconnect switch, size as required.
- .3 Hazardous Process areas: Non-metallic CSA Enclosure Type 7, non-fusible, horsepower rated disconnect switch, size as required.

- .4 Provision for padlocking in on/off position by up to three locks.
- .5 Mechanically interlocked door of disconnect to prevent opening when handle in ON position.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.
- .8 Provide equipment identification in accordance with Section 01 60 12.

2.8 ELECTRICAL PROTECTION AND CONTROL

- .1 All circuits fed from packaged control panels, which are part of Supplier's scope, will be protected and controlled by the Supplier.
- .2 The Contractor is responsible for installing and wiring all control stations for equipment within packaged equipment scope that are defined as being shipped loose. Supplier to wire and install all control stations for equipment within packaged equipment scope when the mounted point is located on the skid.
- .3 All control stations shall be accessible from finished floor or platform whichever is more practical. Power and control devices shall be mounted at 1200mm above finished floor or platform.

2.9 CONTROL PANELS, CABINETS AND TERMINAL BOXES

- .1 Electrical equipment to be mounted inside electrical / mechanical rooms shall have a minimum NEMA 12 rating.
- .2 All equipment, not mounted in a dedicated electrical or mechanical room, shall be of weatherproof construction, unless specified otherwise, with a minimum NEMA 4X rating.
- .3 Construct enclosure from fabricated steel of at least 2mm in thickness or heavy duty aluminum. Outdoor mounted or process area enclosures shall be constructed of stainless steel.
- .4 Short circuit rating of industrial control panels to be a minimum of 65kA, series ratings of equipment within the control panels is permitted.
- .5 The enclosure surface treatment, with exception of stainless steel, shall be painted with protective coating, color ASA61 Grey.
- .6 The height of the enclosure shall not exceed 2,400 mm.
- .7 All enclosures shall be equipped with SS hinged doors and hardware. The door shall be electrically bonded to the enclosure and hinged to open at least 120 degrees.
- .8 Equipment intended to be accessed by the operator shall only be mounted on the front of the enclosure.

- .9 Provide main power disconnect switch with fuses or a circuit breaker appropriately rated for the panel loads. Equip disconnects with a lock-off device suitable for padlocking.
- .10 Each control panel and control cabinet to include LED lighting and a light switch within the control panel enclosure.
- .11 Design circuits for easy fault finding, with isolation for servicing. It shall be possible to replace any device or apparatus without exposure to energized busbars or the live side of any main switch or isolator, and without removal or dismantling of other equipment.
- .12 Provide all the necessary termination boxes for interfacing field wiring.
- .13 Submit termination box details for approval. Ensure boxes are adequately rated and sized to accommodate field wiring terminal blocks.

2.10 GROUNDING AND BONDING

- .1 Intrinsically safe (IS) circuits to have separate grounding circuits insulated from the panel.
- .2 An instrument ground to be fitted and be insulated from the panel.
- .3 Common ground bars to be connected to a ground point near the gland plate, as well as all metal parts of the panel including doors and handles.
- .4 Braided ground strap to be installed for all doors and handles.
- .5 Internal ground wiring to be stranded copper with 600 V, green/yellow PVC V75 sheathing.

2.11 POWER SUPPLIES

- .1 Where packaged equipment contains components which require dedicated power supplies, power supplies shall be provided as part of the Supplier's package.
- .2 The heating effect of power supplies shall be considered when calculating the overall heat load of the enclosure.

2.12 CABLE TRAY

- .1 Not included in this supply package.

2.13 CABLING AND TERMINATION

- .1 Each alarm, instrument and control device shall be wired back to terminal blocks mounted in the Supplier's control panel.
- .2 Provide 20% spare volume capacity when sizing control panels and distribution boards.
- .3 Provide control cables with a minimum of 20% spare cores.

- .4 Run wiring in slotted wiring ducts fitted with snap on lids. Do not fill ducts to more than 75% of full wiring capacity. Where ducts are mounted upside down support wiring to prevent the duct lid being forced open by the weight of wiring.
- .5 Where wiring ducts are not practicable, wiring shall be in looms using cable ties at suitable intervals.
- .6 Segregate different voltages (AC, DC) and instrumentation circuits.
- .7 Group terminal blocks according to instruments, control and voltage levels.
- .8 No more than two conductors to be terminated on any one side of a terminal. If there is a requirement for more than two conductors, terminals with jumper pins shall be used.
- .9 No more than one wire to be connected to a terminal designated for external wiring.
- .10 All terminals are to be numbered in accordance with wiring diagrams.
- .11 Outgoing power connections to be connected to terminal blocks for connection by others are to be grouped horizontally near the bottom of the panel. Provide aluminum, undrilled, removable gland plates for large control panels or equipment junction boxes.
- .12 Provide ferrules on each end of all wires for control.
- .13 Provide numbered wire markers on each end of all wires with designations shown on design drawings. Wires to be of slip on and heat shrink type, with white insulating material and have black numerals. Reference Specification 01 60 12.

2.14 WIRE AND CABLE

- .1 All conductors to be stranded, 98% conductivity copper, with 600V RW90 XLPE insulation, unless specified below. No aluminum conductor permitted.
- .2 Branch Circuit Wiring: conductors smaller than No. 12 AWG not permitted for 120 Volt lighting, power or motor branch circuits.
- .3 BX cable is not permitted.
- .4 Teck Cable
 - .1 Cable: to CAN/CSA-C22.2 No. 131 Type Teck 90 Cable and No. 174 – Cable and Cable Glands for Use in Hazardous Areas .
 - .2 Conductors: sized as per Canadian Electrical Code.
 - .3 Grounding conductor: copper.
 - .4 Circuit conductor: copper, size as indicated.
 - .5 Insulation Type: Chemically cross-linked thermosetting polyethylene rated type RW90, 1000 V.
 - .6 Inner jacket: polyvinyl chloride material.
 - .7 Armour: interlocking aluminum.

- .8 Overall covering: thermoplastic polyvinyl chloride material, fire retardant rated and marked as FT4.
- .9 Fastenings: One hole malleable iron straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .10 Channel type supports for two or more cables at 1.5 mm centers.
- .11 Threaded rods: 6 mm diameter to support suspended channels.
- .12 Wire rope: to support suspended channels.
- .13 Connectors: Watertight approved for TECK cable in non-hazardous and corrosive areas, and putty type explosion proof seals in hazardous locations.
- .14 TECK cable to be HL rated in hazardous locations.
- .5 Drive (VFD) Teck Cable:
 - .1 To CSA C22.2 No. 123 – Metal Sheathed Cable.
 - .2 To CSA C22.2 No. 174 – Cable and Cable Glands for Use in Hazardous Areas.
 - .3 CSA designated Teck cable, CSA approved for open wiring, concealed or buried, and for use in Class 1, Zone 1 and Zone 2 hazardous locations.
 - .4 Vendor certified for VFD – drive connection to electrical motor constructed to provide a low resistance path to ground to reduce the effect of standing and common mode voltage.
 - .5 Conductors:
 - .1 Grounding conductor: three x Copper.
 - .2 Circuit conductors: Copper, size as per the Canadian Electrical Code.
 - .6 Insulation:
 - .1 1000 V chemically cross-linked thermosetting polyethylene rated type RW90.
 - .2 Sheath: continuous aluminum.
 - .3 Overall covering: Flame-retardant PVC jacket to CSA FT4.
 - .4 Product equal to Nexans DriveRx VFD.
- .6 Instrumentation and Control Wiring
 - .1 Instrumentation wiring installed in conduit to be twisted pair shielded cables #16 AWG copper conductors minimum, 300 Volt insulation, 100% coverage aluminum mylar shield, bare tinned copper drain wire #16 AWG minimum with overall flame retardant PVC jacket.
 - .2 Where multi-conductor twisted pair shielded cables are installed on cable tray, each pair shall be individually shielded, and the cable assembly shall have an overall shield with an inner PVC jacket, aluminum armor and outer PVC flame retardant jacket rated 600 Volt.
 - .3 Control wiring to be type TR-64, #16 AWG tinned copper conductor.
- .7 Hazardous Area Wiring and Fittings
 - .1 Where a process area is classified as hazardous as indicated on the drawings, requiring explosion-proof fittings, the following copper free aluminum (Crouse Hinds option suffix code –SA) equipment shall be installed:
 - .1 Breather-drains, to prevent condensation in conduit systems, Crouse-Hinds Type ECD.

- .2 Conduit seals – Crouse-Hinds Type EYS or EZS.
- .3 Conduit drain seals – Course-Hinds Type.
- .4 Conduit unions – Crouse-Hinds Type UNY.
- .5 Fittings – Crouse-Hinds Type LBY, LBH, GUA, and GUB complete with corrosion-free Epoxy Powder Coating.
- .6 Conduit runs – rigid aluminum complete with corrosion-free Epoxy Enamel Coating.

PART 3 EXECUTION

3.1 GENERAL

- .1 Reference other specification sections for execution of the contract.

3.2 GENERAL TESTING AND INSPECTION

- .1 The equipment shall undergo factory acceptance testing in accordance with this specification and The District's standard specifications for quality requirements.
- .2 A factory acceptance Inspection shall be submitted by the Supplier for review by the District and Engineer.
- .3 The equipment shall satisfactorily withstand the tests specified below and any additional tests specified.
- .4 The records of all tests and all relevant certificates shall be provided as required in the requisition document and this specification.
- .5 Electronic devices shall be completely tested and burned-in before being assembled into the supplied panel or gear.
- .6 The Supplier shall give two (2) weeks' notice prior to any test commencement unless defined otherwise.
- .7 The District/Contractor reserves the right to inspect the equipment at the Manufacturer's work site prior to shipping to confirm compliance with specification.
- .8 The Manufacturer shall ensure that all required documentation has been collated prior to the final inspection and testing.
- .9 Acceptance inspection and testing shall be carried out on the entire assembly unless previously agreed by the Engineer and The District.
- .10 The Supplier to make available power supplies, tools and skilled labour to enable the final inspection and test to proceed without undue delays.

3.3 CONDUITS, FASTENINGS AND CONDUIT FITTINGS

- .1 Provide all aluminum conduit entering or leaving hazardous areas and equipment with Crouse-Hinds Type EYS-SA or EZS-SA copper free aluminum fittings to seal in accordance with applicable code rules and as shown on the drawings. Normally, the seal shall be adjacent to the equipment, but in the case of equipment that may be removed or maintained, such as motors, control stations, switches, receptacles and instruments, a union shall be located between the seal and the equipment. Care shall be exercised to ensure that all seals are made up in accordance with the manufacturer's instructions. Seal in vertical conduits shall be drain-seal type, with a universal breathing-drain installed.
- .2 Where conduits penetrate from heated to cold area, seal conduit with approved vapor sealing compound.

3.4 TEST RECORDS

- .1 The records of all tests and all relevant certificates shall be provided as required in the requisition documents and this specification.
- .2 The test reports shall clearly and unambiguously present all relevant information of the tests. A functional description and definition of specification limits for the acceptance criteria shall be provided by the Supplier and noted in the test report.

3.5 FUNCTIONAL TESTING

- .1 Main circuits and auxiliary circuits shall be checked to verify compliance with approved schematic circuit diagrams.
- .2 When solid-state relays or other electronic devices are fitted, Manufacturer shall produce evidence that the equipment or individual components have withstood a reliability test, including a 'heat soak' test for an agreed period of time.
- .3 Insulation resistance tests shall be carried out between each phase, and neutral against ground, with the remaining phases/neutral connected to ground.
- .4 Circuits shall be random tested (with a minimum of 10% of each type) for electrical operation, including the operation of their control and protective devices. Variations in the control supply shall be taken into account.
- .5 Complete records of this inspection and tests, shall be compiled into one inspection document by the Manufacturer and a copy shall be sent to the Engineer for inclusion into the final Manufacturer's Test Report (MTR).

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

- .1 This Section includes, but is not limited to, the furnishing of all materials, labour, equipment and services necessary for the shipment, protection and storage of the Goods.
- .2 This section supplements recommendations or requirements from suppliers, manufacturers and information provided elsewhere in the Specifications for the shipment, protection and storage of the Goods.

1.2 CARE

- .1 Package, ship, handle and store the Goods to prevent damage.
- .2 Damaged items will not be permitted as part of the Goods except in cases of minor damage(s) that have been repaired to the satisfaction of the District. These minor repairs will be deemed acceptable only upon written confirmation by the District after the repair(s) have been performed.

1.3 SHIPPING DOCUMENTATION

- .1 For each scheduled delivery, provide a written Notice of Shipment at least five (5) working days prior to the delivery of the Goods to the Delivery Point.
- .2 Each Notice of Shipment shall include legible copies of the approved Shipping Document as specified herein.
- .3 Submit a Shipping Document for each shipment.
 - .1 The Shipping Document shall clearly state the manufacture, contract number, and shipment number.
 - .2 Where more than one shipment is made, the shipment number shall be "Shipment 1 of XX", "Shipment 2 of XX", etc.
 - .3 Each Shipping Document shall include a detailed packing list and bill of materials indicating weights of package of item(s) and special unloading and handling instructions.
 - .4 Each item, package, or bundle of material contained on the detailed packing list(s) and bill of materials shall be tagged or marked as identified in the delivery schedule or on the shop drawings.
 - .5 Complete packing lists and bills of material shall be included with each shipment.
- .4 The Shipping Document shall include a description of all packing material such as wood pallets, plastic, Styrofoam, cardboard, or other indicating approximate weights of each material.
- .5 Provide written instructions to the District clearly indicating proper handling, protection, and maintenance of the Goods while stored at the Delivery Point.

1.4 TRANSPORTATION

- .1 The Supply Contractor shall pay all costs of transportation and insurance of the Goods to the Delivery Point.
- .2 The Supply Contractor shall suitably package all materials to facilitate handling and provide protection against damage from moisture, dust, handling, or other cause during transport from the supplier's and/or manufacturer's premises to the Delivery Point, and during storage thereafter.
- .3 Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces that are damaged prior to receipt and acceptance of equipment at the Delivery Point shall be repainted by the Supply Contractor to the satisfaction of the District.
- .4 Use stiffeners or bracing, where necessary to maintain shapes, and to give rigidity and support to the Goods and/or packaging during transport and storage.
- .5 Deliver parts of the Goods in assembled or sub-assembled units to the maximum extent practicable.
- .6 The Supply Contractor shall correct any damage in order to conform to the requirements of the Supply Contract before the Goods are stored temporarily or are incorporated into the facilities and pay the costs arising out of dismantling, inspection, repair and reassembly, as applicable.
- .7 The Supply Contractor shall be responsible for unloading the equipment and materials, inventorying and the District for inspecting the delivered equipment and materials upon receipt at the Delivery Point.

END OF SECTION

Part 1 General

1.1 INTENT

- .1 This Section describes general requirements relating to equipment delivery, equipment storage, handling and protection, equipment installation training, equipment installation, equipment Demonstration, and System Performance Testing.
- .2 Details specific to the Commissioning and are provided in Section 01 66 20.

1.2 DEFINITIONS

- .1 **System:** A System is defined as the equipment, piping, controls, ancillary devices, electrical power, etc. which together perform a specific function at the Facility.
- .2 **Facility:** The Facility is defined as the Systems, which together perform the intended functions of the Plant expansion.
- .3 **Supplier (or Manufacturer):** The Supplier (also referred to as the Manufacturer) is the person, partnership or corporation responsible for the fabrication of equipment provided for the completion of the work.
- .4 **Supplier's (or Manufacturer's) Representative:** Supplier's Representative (also referred to as Manufacturer's Representative) is a trained technical service person empowered by the Supplier to provide:
 - .1 Installation training.
 - .2 Assistance and/or witnessing of equipment installation.
 - .3 Assistance and/or witnessing in equipment/System Demonstration and System Performance Testing and Commissioning.
 - .4 Assistance and/or witnessing of Performance Testing, where specified.
- .5 **Demonstration Testing:** One (1) hour Major Equipment testing to demonstrate the operation of the equipment and any ancillary services that are the responsibility of the Supplier to provide. The equipment will be turned on and off as per manual input and control signals.
- .6 **System Performance Testing:** Short term (perhaps 1 hour but maybe less) demonstration or test that shows that the process mechanical, structural, electrical and instrumentation and control elements related to the process System have been installed as intended and operate over the range of design conditions specified. The Performance test will prove that the equipment is able to comply with specific design requirements listed in the Technical Specifications and that controls function properly and are fully automated as detailed in the technical specifications.

- .7 **Substantial Performance:** Note that all **Forms 104 “Certificate of Satisfactory Commissioning”** are required before the Work is substantially performed.
- .8 **Hand Over:** For the purpose of this Work Package, Hand Over will occur on receipt of all completed **“Certificate of Satisfactory Commissioning” (Form 104)** documentation, at which point operation of the Facility will be transferred from the Contractor to The District, under the direction of the Commissioning Team (refer to Section 01 66 20). Care of the Facility will remain the responsibility of the Contractor until Substantial Performance award.
- .9 **Critical Failure:** A Critical Failure shall be deemed as one that prohibits the process from functioning successfully for an eight (8) hour period, or one that requires the use of available standby equipment, or one that creates a safety hazard

1.3 EXPERTISE AND RESPONSIBILITY

- .1 The Engineer recognizes the expertise of the Supplier.
- .2 Should the Engineer issue an Addendum, Notice of Proposed Change, Field Order or Change Order to change the work, which would, in the opinion of the Supplier, compromise the success or safety of the Work, then it must be incumbent on the Contractor to notify in writing the Engineer to this effect within three (3) days upon receipt.

1.4 EQUIPMENT DELIVERY

- .1 Arrange for delivery of all equipment to the Work Site including freight, duty, insurance and all covering charges on the delivery scheduled within the time frame stated in the Work Package documents, and in coordination with the Contractor. At that point, the Contractor will assume responsibility for taking delivery, unloading and storage of the equipment. Written acceptance of receipt, at delivery, by the Contractor shall constitute “Delivery to Site”. A representative from the Supplier, Contractor and Engineer shall be in attendance at time of delivery.
- .2 Investigate thoroughly and follow all precautions to be taken in the unloading of equipment and its subsequent storage.
- .3 The Supplier may attend the delivery Site to check the delivery and to examine the Major Equipment for damage or loss, and inspect the Contractor’s storage facilities for the equipment supplied for compliance with the Supplier’s recommendations. Suppliers will maintain an inventory of all equipment supplied and delivered to the Contractor.
- .4 In conjunction with the Contractor, the Supplier may examine all crates and packages on delivery and compare them with the packing lists. Ensure both the Supplier and Contractor inform the Engineer and the carrier in writing of any

visible damage, missing items or defects. Arrange to replace forthwith items not delivered or delivered defective or damaged to the Site. The Supplier will be held responsible for damage during shipping, and any costs accrued in replacing/repairing equipment.

- .5 The Supplier will give notice to the Contractor (with a copy to the Engineer) ten (10) days before delivery to allow arrangements for receipt and inspection. Contractor to arrange for deliveries and inspection/unloading during normal working hours. When the Supplier and Contractor are satisfied that the equipment has been delivered in its entirety without damage, complete the **“Certificate of Equipment Delivery” (Form 100)** attached to this Specification. Deliver the completed form to the Engineer.
- .6 Prepare one (1) copy of **Form 100** for each piece of Major Equipment and for each delivery.

1.5 EQUIPMENT DELIVERY SCHEDULE

- .1 Present the initial equipment procurement and delivery schedule (single or multiple shipments) within a timeframe identified in the Work Package documents. These documents define all equipment to be procured, the confirmed Supplier delivery date, and the scheduled installation date.
- .2 Do not have the equipment delivered to Site until suitable storage facilities have been made available by the Contractor, and the Contractor and Supplier have agreed upon a delivery date

1.6 STORAGE, HANDLING, AND PROTECTION OF PRODUCTS

- .1 Ensure that equipment Suppliers and Manufacturers adequately pack and crate each component to provide protection during transport, handling and storage. No item shall be shipped loose or in such a way as to be adversely affected by weather conditions, pilferage, normal transit hazards or other reasonably anticipated shipping hazards.
- .2 Ensure that equipment Suppliers and Manufacturers:
 - .1 Protect polished and machined metal surfaces from corrosion and damage during shipment and storage
 - .2 Protect threaded connections with threaded plugs or caps
 - .3 Protect open plain end pipes with caps.
 - .4 Specially pack electrical equipment and control panels to prevent scratching; ingress by dirt, moisture or dust; or damage to insulation
 - .5 Cover equipment having exposed bearings and glands to exclude foreign matter.
- .3 Off-loading and storage of the equipment at the job site will be the responsibility of the Contractor.

- .4 The Contractor is responsible to arrange for storage at the job site as required by the Supplier for sensitive items of equipment. Clearly identify such sensitive items prior to delivery to Site, with clear markings placed on the packages and crates.
- .5 Where the equipment is to be stored on Site for longer than one (1) month before installation and Demonstration and Performance Testing, ensure the Supplier instructs Site staff how to undertake the specific storage and maintenance requirements that ensure there is no uneven wear or distortion of equipment component parts.
- .6 Products subject to damage from weather are to be stored in weatherproof enclosures.
- .7 Contractor is responsible to arrange for heated, covered and humidity-controlled storage at the job Site as required by Suppliers or Manufacturers for sensitive items of equipment.
- .8 Ensure the Supplier informs the Contractor in writing on the off-loading, storage and periodic maintenance requirements for the materials and equipment, emphasizing any particular precautions, including any special oils or greases needed, to be taken during the off-loading, storage and pre-start-up periods.
- .9 Pack equipment suitable for outside storage to the satisfaction of the Supplier, Contractor, and Engineer. Identify each component with durable labels or tags securely attached to each piece of equipment, crate, container, module or skid.
- .10 Store packaged or bundled products in original and undamaged condition with Manufacturers' or Suppliers' seals and labels intact. Do not remove from packaging or bundling until required in the Work.

1.7 INSTALLATION ASSISTANCE

- .1 Supplier may attend the Site to provide instructions to Site staff in the methods, techniques, precautions, and any other information relevant to the successful installation of the equipment. Make the Site visit before the installation of the equipment commences.
- .2 Inform the Engineer, in writing, of the attendance at the Site of the Supplier's Representative for installation training at least fourteen (14) days prior to arrival.
- .3 Have the Supplier instruct Site staff in the proper installation of the equipment and provide all necessary installation instructions in writing, copy to the Contractor and Engineer.
- .4 Ensure Supplier provides advice and instructions to the Contractor on the installation of the equipment, but recognize that responsibility for the detailed supervision of the installation of the equipment and of the workers installing it rests with the Contractor. Notify the Contractor and the Engineer in writing

immediately in the event of any disputes with the Contractor concerning installation of the equipment.

- .5 For all Major Equipment, when the Supplier is satisfied that the Site staff and Contractor is aware of all installation requirements, certify the same by completing the “**Certificate of Equipment Installation Instructions**” (**Form 101**) attached to this Specification and ensure the Contractor also signs. To the completed form, attach all written instructions provided by the Supplier or Manufacturer. Provide this certification to the Engineer before leaving the Site.
- .6 Do not commence installation of the equipment until the Engineer has advised that he has accepted the completed **Form 101**.
- .7 Prepare one copy of **Form 101** for each piece of Major Equipment.

1.8 **INSTALLATION**

- .1 If necessary, or if so directed by the Engineer during the course of equipment installation, contact the Supplier to receive clarification of installation procedures, direction, or any other additional information necessary to continue or complete the installation in an appropriate manner.
- .2 If it is found necessary, or if so directed by the Engineer, arrange for the Supplier to visit the Site to provide assistance and review of procedures during installation.
- .3 Prior to completing installation, inform the Supplier and arrange for the attendance at the Site of the Supplier’s Representative to verify successful installation.
- .4 With the Supplier’s Representative, conduct a detailed inspection of the installation including alignment, attached pipe work, wiring and motor starters, electrical connections, controls and instrumentation, rotation direction, running clearances, lubrication, workmanship, satisfactory noise and vibration emissions and all other items as required to ensure successful long term operation of the equipment.
- .5 Identify any outstanding deficiencies in the installation and provide a written report to the Engineer and Contractor describing such deficiencies. The Manufacturer’s or Supplier’s Representative is required to re-inspect the installation after the deficiencies are remedied, at no cost to The District
- .6 When the Supplier’s Representative accepts the installation, the installer and the Supplier will certify the installation by completing the “**Certificate of Satisfactory Equipment Installation**” (**Form 102**), attached to this Specification. To the completed form, attach any check lists or installation reports provided by the Manufacturer’s or Supplier’s Representative that exhibits reasonable compliance with the Manufacturer’s or Supplier’s installation requirements.

- .7 Deliver the completed **Form 102** to the Engineer prior to departure of the Supplier's Representative from the Site.
- .8 Tag the equipment with a 100 mm by 200 mm card stating "Equipment Checked. Do Not Run." stenciled in large black letters. Sign and date each card.
- .9 Prepare one (1) **Form 102** for each piece of Major Equipment.

1.9 DEMONSTRATION AND SYSTEM PERFORMANCE TESTING PLAN

- .1 Two (2) months prior to commencing System Performance Testing, the Supplier will assist the Contractor to prepare and submit a draft detailed start-up plan to indicate the schedule and sequence of equipment installation checks and tests required to validate proper operation. The purpose of this test plan is to outline the steps needed to demonstrate that the equipment meets Performance requirements, as defined in the Technical Specifications (e.g. blower air flow, electrical loop validation, etc.). The final plan is to be submitted to the Engineer one (1) month prior to commencement of System Performance Testing, incorporating all comments received on the draft copy.
- .2 The plan will be prepared by the Contractor with input from Subcontractor(s) and the Supplier.
- .3 No equipment testing work can commence until this plan has been reviewed by all parties involved and accepted by the Engineer and The District.
- .4 Include the following in the Demonstration and System Performance Testing plan:
 - .1 Detailed schedule of events, including but not limited to the schedule for completion of testing of all component parts of the System.
 - .2 Methods for introducing flow required during System Performance Testing.
 - .3 Methods for disposing of flow required during Performance Testing.
 - .4 Planned attendance schedule for the Supplier's Representative.
 - .5 List of personnel who are planned to be in attendance for the Demonstration and System Performance Testing, indicating their qualifications for this Work.
 - .6 A checklist of all conditions and operating properties that will be tested through the System Performance Testing period including: starting, normal stop, emergency stop, modulated operation (if relevant) at various conditions, vibration, alignment, noise, etc. Describe the expected performance/System reaction for each condition.
 - .7 Contingency plans in the event of a System malfunction.
 - .8 Drawings and sketches as required, illustrating the planned sequence of events.

- .9 List and details for all temporary equipment required to facilitate testing. Supply all temporary equipment not supplied by the Contractor.
- .5 The Demonstration and System Performance Testing plans must be reviewed and agreed by the Demonstration and System Performance Testing teams prior to implementation. The District will be the final arbiter of the plan's suitability for purpose.

1.10 DEMONSTRATION AND SYSTEM PERFORMANCE TESTING TEAM

- .1 A team led by the Contractor, and including representation from the Supplier (if required), Subcontractor (if required), Engineer, and The District's engineering and operations staff (if available) will plan and conduct the Demonstration and System Performance Testing.
- .2 The District will have ultimate authority to stop the System Performance Testing effort. The Contractor will coordinate the System Performance Testing with input from the remainder of the Team.
- .3 The District will provide staff trained in wastewater treatment plant operation to operate the Facility during the System Performance Testing. During this period, maintenance is the responsibility of the Contractor.
- .4 Provide personnel representing the appropriate trades, including mechanical, electrical, control and instrumentation personnel during the Demonstration and System Performance Testing. Ensure that these personnel are skilled, able to expedite any repairs, adjustments, etc. as are required to complete the testing with as few delays as possible.
- .5 The Supplier must make available as required, representatives who are experienced in on-site start-up and commissioning of similar equipment.

1.11 DEMONSTRATION AND SYSTEM PERFORMANCE TESTING – GENERAL REQUIREMENTS

- .1 The Major Equipment will be subjected to one (1) hour Demonstration Test or System Performance Test using clean water and/or wastewater, polymer solution, sludge or air, depending on the System.
- .2 The tests will be conducted after installation has been verified and any identified deficiencies have been remedied, training has been provided and operations and maintenance manuals have been reviewed and accepted.
- .3 Inform the testing team at least sixty (30) days in advance of the expected date of the Demonstration and System Performance Testing and arrange for the attendance of the Supplier's Representative at Site. The tests may be concurrent with the inspection of satisfactory installation if mutually agreed with the Contractor and testing team.

- .4 Have the Supplier conduct all necessary checks to demonstrate that the Major Equipment is properly installed. Alignment, piping connections, electrical connections, sample product, etc. will be checked and if appropriate, code certifications provided. The Supplier will advise the testing team of any further work needed prior to confirming the equipment is ready to run.
- .5 All necessary temporary piping, connections, etc. needed to allow the equipment to operate in isolation will be complete. Also, finalize arrangements to have the necessary commodities in place during the test, complete with the planning and physical arrangements necessary for the discharges and allowances for disposal of those discharges.

1.12 EQUIPMENT TRAINING

- .1 Refer to Section 01 66 40 – Training for details of training requirements.

Part 2 Products – Not Used

Part 3 Execution

3.1 SYSTEM AND/OR EQUIPMENT PERFORMANCE TESTING

- .1 Prior to the System Performance Test, ensure the following:
 - .1 Clean water, wastewater, sludge or air, depending on the System, is available for System Performance Testing (Contractor must confirm availability of such medium with The District).
 - .2 All necessary System piping, wiring, control and other conduit systems have been installed and tested.
 - .3 Any necessary equipment servicing has been completed
 - .4 Individual elements of the equipment or controls have been tested prior to the testing of any Systems.
 - .5 Electrical connections are complete and inspected to the satisfaction of the governing authorities.
 - .6 Control systems are complete and the related control software debugged (If any control software malfunction was recognized during System Demonstration Test).
 - .7 All alarms, safety interlocks and shutdown functions are Performance.
 - .8 All automated, programmed functions are Performance, so that no damage could result to the equipment when operated in automatic mode. Control and monitoring of the functions of the equipment will be fully achievable through the SCADA system.
 - .9 Architectural finishes, heating and ventilation and lighting are substantially complete to provide a safe and comfortable working environment for the testing team during the System Performance Testing process.

- .2 Provide the initial charges of oil, grease, and all materials necessary for the System Performance Test all to the satisfaction of the Engineer.
- .3 Provide a list of personnel who are planned to be in attendance for the System Performance Test, indicating their qualifications for this Work.
- .4 Procedure: Each piece of Major Equipment will be started and operated for about one (1) hour. Satisfactorily verify local controls by cycling the equipment through several start-stop operations, modulating output, or some combination. Check operating parameters such as temperature, pressure, voltage, vibration, etc. to ensure that they are within the specified or Supplier's recommended limits, whichever are more stringent.
 - .1 Demonstrations test should verify minimum, maximum and typical operating conditions with respect to flow rates, pressures, concentrations, velocities, power draw, controls, interlocks, etc.
 - .2 Should Demonstration Testing reveal any defects under the scope of the Work Package, promptly remedy those defects. After rectification, continue Demonstration Test to the satisfaction of the testing team. Additional costs incurred due to repeated days of failure of testing caused by defects under the scope of the Work Package will be the responsibility of the Contractor.
 - .3 The District / Engineer reserve the right to request additional testing.
- .5 Initial staff training sessions must be completed and "**Certificate of Satisfactory Training**" (**Form T1**) signed. Refer to Section 01 66 40 for details of training requirements.
- .6 Operating and Maintenance Manuals must have been submitted and accepted with "**Equipment Warranties and Guaranteed**" (**Form OM1**), "**Certificate of Satisfactory Submission of Equipment Guarantee**" (**Form OM2**) and "**Certificate of Satisfactory Submission of O&M Manuals**" (**Form OM3**) signed and all spare parts must be received with "**Certificate of Spare Parts Provision and Documentation**" (**Form SP1**) signed.

3.2 SEQUENCE

- .1 Systems will be tested in a logical manner. Test upstream components first to the degree possible.
- .2 The following sequence of events must be followed:
 - .1 Process Control Narratives must be made available by the Engineer one (1) month prior to System Performance Testing.
 - .2 Draft Operating and Maintenance Manuals must be available from the Supplier at least one (1) month prior to the System Performance Testing.
 - .3 Control System tested and fully Performance to operate the System through the SCADA system

- .4 Start and run System in manual mode.
- .5 Turn separate items of equipment to automatic in a planned and logical manner. Ensure that the control system is operating the equipment in a manner which precludes damage of the equipment and which is consistent with the process operating requirements.

3.3 SYSTEM PERFORMANCE TESTING

- .1 During the System Performance Testing, the testing team will start, stop, modulate, vary the speed of, and otherwise operate the equipment in the Systems in the facility. The Contractor will have ultimate responsibility of the Systems at this stage. With the Supplier, immediately undertake any remedial measure required to ensure satisfactory operation.
- .2 Contractor to provide water or wastewater, chemicals, temporary power, and any other ancillary services except as indicated, specifically used to conduct System Performance Testing at no additional cost to The District.
- .3 Provide any temporary piping, valves, fittings, or related ancillary equipment necessary to conduct testing, all at no additional cost to The District. Take responsibility to ensure that temporary facilities employed are adequate to avoid failure.
- .4 The equipment will be re-started and run continuously as part of the System Performance Test. During the System Performance Test, as practicable, conditions will be simulated which represent maximum or most severe, average, and minimum or least severe conditions. These conditions will be mutually agreed by the testing team as well as the methods utilized to create the simulated conditions and the time periods allotted to each.
- .5 The results of the one (1) hour Demonstration Test and the System Performance Test will be submitted to the testing team, documented and summarized in a format acceptable to the Engineer and The District. The District and the Engineer reserve the right to request additional testing.
- .6 Should System Performance Testing reveal any defects under the scope of the Work Package, then promptly rectify those defects and repeat the System Performance Test to the satisfaction of the testing team. Contractor will bear all additional costs incurred by the Contractor, Engineer or The District, due to repeated System Performance Test.
- .7 Any problems or deficiencies which occur during the System Performance Testing must be rectified before the signing of **“Certificate of Satisfactory System Performance Testing” (Form 103)**.
- .8 After System Performance Testing, remove any temporary facilities. Completion of this task will be required before signing of **Form 103**.

3.4 VALIDATION OF SUCCESSFUL TESTING

- .1 On successful completion of the Demonstration and System Performance Test, **Form 103** attached to this Specification will be signed by the Supplier, Contractor, Engineer and The District.
 - .1 **Form 103** will not be issued for a System without successful completion of respective System training (**Form T1**), submission and acceptance by the Engineer of equipment warranties and guaranteed (**Forms OM1 and OM2**), Operations and Maintenance Manuals (**Form OM3**), and submission of spare parts (**Form SP1**). Refer to Sections 01 66 40, 01 66 20 and 01 33 00 for details.
 - .2 Use one copy of **Form 103** for each System.

3.5 SYSTEM PERFORMANCE TESTING ACCEPTANCE

- .1 An acceptance meeting will be held at the end of the System Performance Testing to confirm the status of the Facility. This meeting will be called by and coordinated by the testing team and attended by The District, Engineer, Supplier (if necessary for a specific System), and Contractor. The purpose of the meeting is to review the schedule of any remedial work necessary prior to Commissioning.

CERTIFICATE OF EQUIPMENT INSTALLATION INSTRUCTIONS
FORM 101

I have familiarized the Contractor of the specific installation requirements related to the equipment listed below and am satisfied that he understands the required procedures.

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

REFERENCE SPECIFICATION: _____

Print Name (Authorized Signing Representative of the Supplier or Manufacturer)	Signature	Date
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I certify that I have received satisfactory installation instructions from the equipment Manufacturer or Supplier.

Print Name (Authorized Signing Representative of the Contractor)	Signature	Date
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**CERTIFICATE OF SATISFACTORY EQUIPMENT INSTALLATION
FORM 102**

I have completed my check and inspections of the installation listed below and confirm that it is satisfactory and that defects have been remedied to my satisfaction except any as noted below:

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

**REFERENCE
SPECIFICATION:** _____

OUTSTANDING DEFECTS: _____

Print Name
(Authorized Signing Representative of the Supplier or
Manufacturer)

Signature

Date

Print Name
(Authorized Signing Representative of the Contractor)

Signature

Date

**CERTIFICATE OF SATISFACTORY SYSTEM PERFORMANCE TESTING
FORM 103**

We certify that the Major Equipment listed below operates satisfactorily and meets its specified operating criteria. No defects in the equipment were found. The piece of equipment is therefore classed as "conforming".

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

**REFERENCE
SPECIFICATION:** _____

Print Name	Signature	Date
(Authorized Signing Representative of the Supplier or Manufacturer)		

Print Name	Signature	Date
(Authorized Signing Representative of the Contractor)		

Print Name	Signature	Date
(Authorized Signing Representative of the Engineer)		

I Acknowledge Receipt of the O&M Manuals, training and spare parts (**OM1, OM2, OM3, T1, and SP1 Forms** complete)

Print Name	Signature	Date
(Authorized Signing Representative of The District)		

END OF SECTION

Part 1 General

1.1 INTENT

- .1 This Section describes the Contractor's and Supplier's responsibilities for the satisfactory Commissioning and Handover of the Work of this Work Package including process, electrical, mechanical, instrumentation and control and other systems to be supplied. The intent is that the Contractor, and Supplier shall provide technical assistance and supervision to ensure successful equipment operation during the Commissioning period.

- .2 During the Commissioning period the responsibility to operate the Facility will rest with The District (with The District in ultimate control of operating the equipment under all circumstances).

1.2 DEFINITIONS

- .1 **System:** A System is defined as the equipment, piping, controls, ancillary devices, electrical power, etc. which together perform a specific function at the Facility.

- .2 **Facility:** The Facility is defined as the Systems, which together perform the intended functions of the Plant expansion.

- .3 **Commissioning Team:** During the Commissioning and Performance Testing periods, the Contractor will lead a Commissioning Team also comprised of staff from The District, Engineer, Subcontractor(s), and Supplier(s). The Commissioning Team members may be called upon by The District to provide support to remedy equipment problems or provide related services.

- .4 **Commissioning:** The successful operation of all Facilities and Systems in accordance with the design requirements for a period of one (1) month to prove compliance with the requirements listed in the Technical Specifications without a Critical Failure.

- .5 **Substantial Performance:** Substantial Performance definition includes the definition elsewhere in the Contract documents. Note that the completion of the **Certificate of Satisfactory Commissioning” (Form 104)** pre-requisites is required before the Wok is substantially performed.

- .6 **Performance Testing (PT):** Equipment will be subjected to Performance Testing, where specified in the Technical Specifications prior to Commissioning.

- .7 **Hand Over:** For the purpose of this Work Package, Hand Over will occur on receipt of all completed **Form 104** documentations, at which point operation of the Facility will be transferred from the Contractor to The District (under the direction of the Commissioning Team). Care of the Facility will remain the

responsibility of the Contractor until the Substantial Performance Certificate award.

- .8 **Critical Failure:** A critical failure shall be deemed as one that prohibits the process from functioning successfully, or one that requires the use of available standby equipment, or one that creates a safety hazard.

1.3 **COORDINATION AMONGST THE SUPPLIER, CONTRACTOR, SUBCONTRACTORS, ENGINEER AND THE DISTRICT**

- .1 The Commissioning period will not start until a copy of **Form 103** has been signed for each related System of Work. Refer to Section 01 65 00 for details.

1.4 **COMMISSIONING TEAM**

- .1 For Commissioning Team definition refer to clause 1.3.
- .2 The District will have ultimate authority for directing the Performance aspects of Commissioning effort. The Contractor will coordinate Commissioning, with assistance from the Engineer and The District.
- .3 Responsibility for performance of the equipment and maintenance lies with the Contractor through Commissioning.
- .4 Provide personnel representing the appropriate trades, including mechanical, electrical, control and instrumentation personnel during Commissioning. These personnel shall be skilled workers, able to expedite any minor repairs, adjustments, etc. as are required to complete Commissioning with as few delays as possible.
- .5 The Supplier must make available as required, representatives who are experienced in on-site start-up and Commissioning of similar equipment.

1.5 **COMMISSIONING PLAN**

- .1 Through a series of meetings, the Commissioning Team will develop a finalized detailed methodology for the Commissioning of each System at thirty (30) days prior to the planned start of System Performance Testing. The plan will be prepared by the Contractor with full participation from The District, Engineer, Subcontractors (if required), and the Suppliers. The Contractor shall lead the development of the Commissioning plan, including scheduling meetings.
 - .1 All members of the Commissioning Team will attend Commissioning meetings held at the Engineer's Site office to develop the Commissioning plan.
- .2 Include the following in the Commissioning plan:

- .1 Detailed schedule of events, including but not limited to the schedule for completion of testing of all component parts of each System prior to Commissioning.
- .2 Methods for introducing flow required at the beginning of Commissioning process, and subsequently thereafter as required to restart equipment. District staff shall be responsible for implementation of these measures.
- .3 Methods for disposing of flow treated through the portion of the plant that is being commissioned.
- .4 Planned attendance schedule for the Subcontractors and Suppliers' Representatives.
- .5 Contingency plans in the event of a process, electrical, or Instrumentation and Control (I&C) malfunction.
- .6 Drawings and sketches as required illustrating the planned sequence of events.
- .7 List and details for any temporary equipment (pumps, etc.) required to facilitate Commissioning. Supply all temporary equipment.
- .8 The Commissioning plan must be reviewed and agreed by the Commissioning Team prior to implementation. The District will be the final arbiter of the plan's suitability.

1.6 TIMING

- .1 Steps leading up to, and including, Commissioning may or may not occur consecutively.
- .2 It may be necessary for the Contractor/Subcontractors to return to the Site, if installation has been completed earlier to the stage of testing, to carry out and complete testing of the Systems.
- .3 Additional compensation will not be considered for delays and/or the need to return to Site for steps leading up to, and including, Commissioning.

Part 2 Products – Not Used

Part 3 Execution

3.1 PREPARATION

- .1 All process, mechanical, electrical, control and miscellaneous equipment related to a System must be successfully installed and tested in accordance with Section 01 65 00 – Equipment Installation and Performance Testing and any specific requirements noted in other Sections. **Form 103** must be completed and signed for each System.

- .2 The Control System governing the portion of Work to be commissioned must be functionally complete prior to introduction of water or wastewater, chemicals or air, depending on the System. All alarms, safety interlocks and shutdown functions must be operational. All automated, programmed functions will be operational, so that no damage could result to the equipment or Plant when operated in automatic mode. Control and monitoring of the functions of the equipment will be fully achievable through the SCADA system.

3.2 SEQUENCE

- .1 Systems will be commissioned in a logical manner. Test upstream components first to the degree possible.
- .2 The following sequence of events must be followed:
 - .1 All Equipment components to be tested in accordance with Section 01 65 00 - Equipment Installation and Performance Testing.
 - .2 Control System tested and fully demonstrated to operate the System through the Plant SCADA system in accordance with Section 01 65 00 – Equipment Installation and Performance Testing.
 - .3 Turn separate items of equipment to automatic in a planned and logical manner. Ensure that the control System is operating the equipment in a manner which precludes damage of the equipment and which is consistent with the process operating requirements.
 - .4 One (1) month of successful operation to satisfy the requirements of the Commissioning period in accordance with this Section.
 - .5 Substantial Performance Certificate will be granted upon successful completion of “**Certificate of Satisfactory Commissioning – Phase 1**” (**Form 104**) documentation.

3.3 COMMISSIONING

- .1 Process streams will be introduced to the System by the Commissioning Team in a manner which precludes the damage of any equipment or structures.
- .2 During Commissioning, The District will operate the plant according to the design intent and training received with assistance from the Contractor and Supplier as required.
- .3 The Contractor will co-ordinate the efforts of all parties involved (the Supplier(s), Subcontractor(s), the Engineer, and The District) in planning and initiating the Commissioning.
- .4 The Contractor, Subcontractor(s) and Supplier(s) must immediately undertake any remedial measures required to ensure operation satisfactory to the Engineer.
- .5 Should Commissioning reveal any defects under the scope of the Work, promptly remedy those defects and Commissioning is to continue to the satisfaction of the

Commissioning Team. Take responsibility for additional costs incurred by the Engineer or The District, due to repeated days of failure of Commissioning caused by defects under the scope of the Work Package.

- .6 Minor failures shall not void the Commissioning period. A minor failure is defined as one which does not present a safety hazard, does not impact overall process functioning and can be temporarily overcome by the use of available standby equipment.
- .7 Every effort shall be made to ensure that the Commissioning period provides for the full and comprehensive operation of the supplied equipment under all anticipated normal and adverse operating conditions.
 - .1 This means that the equipment or process area may be taken out of service, be operated manually or subjected to anticipated emergency conditions.
- .8 Commissioning of the Work shall be considered complete when the process has operated successfully, in a stable manner, satisfying the design criteria for a period of one (1) month.
- .9 The Commissioning Team shall prepare a report providing a summary of the Commissioning efforts and the results of the Commissioning sequence, documented and summarized in a format acceptable to the Engineer and The District. The District and the Engineer reserve the right to request additional information.
- .10 After Commissioning, remove any temporary facilities. Completion of this task will be required before signing of **Form 104**.
- .11 On successful completion of Commissioning, The District, Engineer and Contractor will sign the “**Certificate of Satisfactory Commissioning**” (**Form 104**) attached to this Specification.

3.4 COMMISSIONING ACCEPTANCE

- .1 An acceptance meeting to be held at the end of Commissioning to confirm the status of the Facility. This meeting will be called by and coordinated by the Engineer and attended by The District, Engineer, Contractor, Subcontractor(s), and Supplier(s) (if required, depending on the System). The purpose of the meeting is to review the schedule of any remedial work necessary.

**CERTIFICATE OF SATISFACTORY COMMISSIONING
FORM 104**

We certify that the District of Lake Cowichan Water Treatment Facility has been operated, tested and commissioned as per the Contract Documents for at least one (1) month successfully and that the facility and all systems, equipment and components meet their performance criteria, including effluent criteria and fully automatic controls. The treatment equipment and systems are therefore classed as “conforming”.

PROJECT: _____

FACILITY: _____

Print Name (Authorized Signing Representative of Contractor)	Signature	Date
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Print Name (Authorized Signing Representative of the Engineer)	Signature	Date
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Print Name (Authorized Signing Representative of The District)	Signature	Date
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Part 1 General

1.1 DESCRIPTION

- .1 This Section contains requirements for training the District's operations and maintenance staff in the proper operations and maintenance of the equipment and systems installed under this Contract.
- .2 The training session to be provided prior to the System Performance Testing.
- .3 Training is required for all equipment and components that comprise the Wastewater Treatment Facility.
- .4 Allow at least one and a half (1.5) to seven (7) hours of training for each item of equipment for which training is required. Refer to the equipment specifications to indicate where training is required and for specific training time periods required for each equipment and system where training is required.
- .5 Unless specified otherwise, allow for presenting the Training Materials two (2) times during training.
- .6 Some training sessions are expected to have a longer duration, e.g. process system, control system, etc. The intent is that the operations and maintenance staff receive sufficient training on the equipment system that they are going to operate and maintain. The District will have the authority to determine the duration and content of each training session required.

1.2 QUALITY ASSURANCE

- .1 Training includes instruction of the District staff in equipment operation and preventive maintenance and instruction of mechanics, electricians, instrumentation and communications technicians in normal maintenance, including major repairs.
- .2 Where required by the equipment specifications, provide on-the-job training of the District staff. Training sessions will be conducted by qualified, experienced (2 years' experience minimum), factory-trained representatives of the various equipment Suppliers. The trainer(s) proposed by the Supplier will be conversant in all aspects of the equipment that is the focus of the training, an excellent communicator, and "trained in training" so that those he trains can in turn, train others.

1.3 SUBMITTALS

- .1 Submit the information in accordance with Section 01 33 00 – Submittal Procedures. Template for required Training Materials is provided in Attachment A of this Section.

- .2 Training submittals must be submitted in an electronic format at the same time as the initial Shop Drawing submission. Electronic format to follow the Specifications as defined in Section 01 33 00, clause 1.7.
 - .1 The Commissioning Trainer qualifications to verify the trainer's qualifications
 - .2 Training Plans and Training Materials, electronic copy of classroom presentation(s) with instructor's notes, handouts, visual aids, and other reference materials for each training session.
 - .3 Training schedule
- .3 Subject to each training session, identify the qualifications of individuals to be conducting the training.
- .4 Submit one (1) overall training schedule including the date, time and duration for all training sessions. Coordinate training schedule with the District staff to accommodate the Plant's operations and maintenance schedule.
- .5 The Engineer and the District will review the Training Plans and Training Materials within fifteen (15) Business Days of submittals.

Part 2 Products – Not Used

Part 3 Execution

3.1 LOCATION

- .1 Where specified, conduct training sessions on the operation, care, and maintenance of the equipment and Systems installed in the Work. Training will take place at the work Site and under the conditions specified herein. Training Plans and Training Materials will be reviewed and accepted at least thirty (30) days prior to the date scheduled for the individual training session.
- .2 The District or the Engineer may direct the classroom training to take place at another suitable location other than the Treatment Facility.

3.2 TRAINING PLANS

- .1 Contractor to administer the preparation of formal written Training Plans for each training session and coordinate with the Engineer and the District. Training Plans must contain a detailed outline of the material to be presented along with a description of instructional strategies and visual aids to be utilized during the session. Each plan will contain a time allocation for each subject as well as detailing any related reference material such as Standard Operating Procedures (SOPs) or Operating Manuals. Provide finalized electronic copy of classroom presentation(s) with instructor's notes, handouts, visual aids and reference materials.

- .2 Provide one (1) copy of necessary training manuals, handouts, visual aids and reference materials for each trainee at least three (3) weeks prior to each scheduled training session.

3.3 FORMAT AND CONTENT

- .1 Include time in the classroom and at the location of the equipment or system for each training session. As a minimum, cover the following topics for each item of equipment or system:
 - .1 Familiarization
 - .2 Safety
 - .3 Operation
 - .4 Troubleshooting
 - .5 Preventive maintenance
 - .6 Corrective maintenance
 - .7 Parts
 - .8 Local representatives
- .2 Modify all Training Materials to reflect the actual equipment supplied under this Work Package.
- .3 The most recent versions of Training Materials, as submitted during the Shop Drawing Review Phase and updated to incorporate any changes/revisions to equipment or procedures mandated by the District and the Engineer's review, must also be modified to reflect changes introduced during installation and testing at the Site.
- .4 If any Training Materials utilize U.S. or Imperial measurements, convert to Metric measurements.
- .5 Provide separate files for all images (photos, diagrams, schematics) included in all Training Materials, either in high resolution .jpg or .png formats.

3.4 VIDEO RECORDING

- .1 The District staff may video record any or all training sessions. After recording, the material may be edited and supplemented with professionally produced graphics to provide a permanent record for the District's use.

3.5 TRAINING SCHEDULE AND PRE-REQUISITES

- .1 Conduct initial training in conjunction with the System Performance Testing period defined in Section 01 65 00 – Equipment Installation and Performance testing. Coordinate with the District and Engineer on class scheduling. Schedule classes such that classroom sessions are interspersed with field instruction in logical sequence, with no more than four (4) hours of classes scheduled for any one shift.

- .2 Successful completion of initial training as defined by signing **Form T1** is a pre-requisite to System Performance Testing. Refer to Section 01 65 00 for more details.

3.6 EQUIPMENT AND SYSTEMS FOR TRAINING

- .1 Provide initial training just prior to the System Performance Testing period for the following equipment and Systems:
 - .1 Pre-selected equipment;
 - .2 Process equipment as specified in Division 40-46
 - .3 Mechanical Equipment as defined in Divisions 21-27
 - .4 Electrical equipment as specified in Division 25-27
 - .5 Instrumentation and control system as defined in Division 25-27

3.7 OPERATOR CLASSROOM TRAINING

- .1 The Engineer will provide a brief introduction to training sessions (5 to 15 minutes) wherein he will identify the role of the process mechanical, building mechanical, electrical, I&C, or other equipment and system in the Project. This introduction will summarize the design intent and the basic sizing and performance criteria.
- .2 As a minimum, the Supplier's trainer will conduct classroom equipment training for operations personnel including:
 - .1 The equipment's specific location in the plant and an performance overview. Use slides and Drawings to aid discussion.
 - .2 Purpose and Plant function of the equipment.
 - .3 The operating theory of the equipment.
 - .4 The operating strategy of the equipment
 - .5 Design and operating parameters
 - .6 Equipment power requirements
 - .7 Start-up, shutdown, normal operation, and emergency operating procedures, including system integration and electrical interlocks, if any.
 - .8 Navigation tree chart applicable to the system control interface, if applicable
 - .9 Description of the control logic for Site specific programming, if applicable
 - .10 Screen shots with description of Site specific operator interface screens, if applicable
 - .11 Description of operator interface screen icons, color schemes and functions, if applicable
 - .12 Operator adjustable control settings or parameters, if applicable
 - .13 Alarm set-points and shutdowns
 - .14 Operator response to alarms and shutdowns

- .15 Safety items and procedures.
- .16 Routine preventive maintenance, including specific details on lubrication and corrosion protection of the equipment and ancillary components.
- .17 Operator detection, without test instruments, of specific equipment trouble symptoms.
- .18 Adverse operating conditions
- .19 Operator response to typical adverse operating conditions
- .20 Required equipment exercise procedures and intervals.
- .21 Routine disassembly and assembly of equipment if applicable for purposes such as operator inspection of equipment.
- .22 Local representative(s) and company information
- .23 Recommended spare parts

3.8 OPERATOR HANDS-ON TRAINING

- .1 As a minimum, hands-on equipment training for operations personnel will include:
 - .1 Identifying instrumentation: Location of primary element; location of instrument readout; discuss purpose, basic operation, and information interpretation.
 - .2 Discuss and demonstrate operation of equipment in all modes of control (local-manual, remote-manual, and remote-automatic as appropriate).
 - .3 Demonstrate Human Machine Interface (HMI) through operator interfaced screens, if applicable
 - .4 Discuss and demonstrate all local panel operations and functions.
 - .5 Discuss and demonstrate operator adjustment of control settings and parameters.
 - .6 Discussing, demonstrating, and performing recommended operating methods and daily visual inspection of system operation.
 - .7 Discussing and performing the preventive maintenance activities.
 - .8 Discussing and performing start-up and shutdown procedures.
 - .9 Performing the required equipment exercise procedures.
 - .10 Performing routine disassembly and assembly of equipment if applicable.
 - .11 Identifying and reviewing safety items and performing safety procedures, if feasible.

3.9 MAINTENANCE CLASSROOM TRAINING

- .1 Classroom equipment training for the maintenance and repair personnel will include:
 - .1 Basic theory of operation.
 - .2 Description and function of equipment.
 - .3 Routine start-up and shutdown procedures.

- .4 Electrical power requirements
- .5 Lockout procedures and the location of lockouts.
- .6 Normal and major repair procedures.
- .7 Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.
- .8 Routine and long-term calibration procedures.
- .9 Safety procedures.
- .10 Preventive maintenance such as lubrication; normal maintenance such as chain, belt, seal, and bearing replacement; and up to and including major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.
- .11 Local representative(s) and company contact information
- .12 Recommended spare parts

3.10 MAINTENANCE HANDS-ON TRAINING

- .1 Hands-on equipment training for maintenance and repair personnel will include:
 - .1 Locating and identifying equipment components.
 - .2 Reviewing the equipment function and theory of operation.
 - .3 Reviewing normal repair procedures.
 - .4 Performing routine start-up and shutdown procedures.
 - .5 Reviewing and performing the safety procedures.
 - .6 Performing Owner-approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.
 - .7 Reviewing and using Supplier's manuals in the hands-on training.

3.11 ELECTRICAL, INSTRUMENTATION AND CONTROLS TRAINING

- .1 Electrical, instrumentation, and controls (EI&C) training shall be provided in the classroom and in the field, as required to convey required concepts to The District staff.
- .2 Provide electrical, instrumentation and controls training for the following systems:
 - .1 Pre-selected equipment
 - .2 Process equipment as specified in Divisions 40-46
 - .3 Control systems
 - .4 Electrical equipment (refer to Division 25-27)
 - .5 Instrumentation (refer to Division 25-27)
- .3 Training for E&IC shall include the following items in general.
 - .1 Overview of the electrical and instrumentation components included.

- .2 Review of the equipment function and theory of operation.
- .3 Overview of field instrumentation.
- .4 Component by component review.
- .5 Required maintenance activities.
- .6 Troubleshooting.
- .7 Configuration and calibration for each type of instrument and control device supplied.
- .8 Control panel operation.
- .9 Sequence of operation.

3.12 TRAINING COMPLETION FORMS AND PAYMENT

- .1 **Form T1:** To be completed for initial training. One form is to be used for each System or piece of Major Equipment for which training has been provided.
- .2 Samples of **Forms T1** is attached to this Section.
- .3 Payment for this Work will be released only when the training has been completed to the District's satisfaction and the respective forms are signed.

**CERTIFICATE OF SATISFACTORY TRAINING
FORM T1**

We certify that the initial training for the equipment listed below has been provided as per the Specifications.

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

REFERENCE SPECIFICATION: _____

Print Name
(Trainer)

Signature

Date

Print Name
(Authorized Signing Representative of The District)

Signature

Date

Print Name
(Authorized Signing Representative of the Contractor)

Signature

Date

PART 1 GENERAL

1.1 INTRODUCTION

- .1 This specification outlines the minimum requirements for the design, fabrication, supply, testing and commissioning of Instrumentation and Control (I&C) equipment provided as part of a mechanical or process packaged system to be supplied by a Supplier for the Sooke Dewatering Project at Sooke, British Columbia.
- .2 The equipment defined within this specification includes but is not limited to the controls equipment, control panels, instrumentation and tagging standards as required for the packaged system.
- .3 The services defined within this specification includes but is not limited to the supply, factory acceptable testing, delivery to site, installation support, testing (lead), commissioning (lead), training (lead) and collection of all support documentation.
- .4 This specification is complementary to Equipment Data Sheets, drawings and specifications that may form part of the tender documents.
- .5 It shall apply to those items installed on equipment and those items supplied loose by the Supplier.
- .6 Refer to Division 16 for specification of common electrical elements (wiring, raceways, power supply, etc.).

1.2 DEFINITIONS

- .1 **Contractor:** Site Installation Contractors
- .2 **Supplier:** Equipment or Process System material provider
- .3 **The Owner:** District of Sooke; the end user
- .4 **Engineer:** Equipment Specifier
- .5 “When specified”, “Where specified” or “As specified” shall mean information shown on the accompanying Data Sheets or drawings by the Engineer.

1.3 LANGUAGE AND UNITS

- .1 All documentation shall be provided in English.
- .2 International Systems of Units (SI units) shall be the units of measure for all displayed, controlled, and alarmed variables.

1.4 CODES AND STANDARDS

- .1 The design and installation of all instruments shall comply with the rules and provisions of the latest editions and amendments of the Standards and Codes of Practice listed below.

Document No.	Standard Title
ASME PTC 19.3,	Temperature Measurement
ASME B 40.100,	Pressure Gauges and Gauge Attachments
ASME B 40.200,	Thermometers, Direct Reading and Remote Reading
ASME Section VIII,	Pressure Vessels, Division I
ASTM E230	Standard Specification and Temperature-Electromotive Force (EMF) Tables of Standardized Thermocouples
ISA-S5.1	Instrument Symbols and Identification
ISA-75.01-1985	(R1995) - Flow Equations for Sizing Control Valves
ISA /ANSI-MC 96.1	Temperature Measurement Thermocouples
ISA 20	Instrument Specification Forms
ISA 75.02,	Control Valve Capacity Test Procedures
ISA 75.04,	Face-to-Face Dimensions for Flangeless Control Valves (ANSI Classes 150, 300, and 600)
ISA 75.08,	Installed Face-to-Face Dimensions for Flanged Clamp or Pinch Valves
ISA 75.08.03	Face-to-Face Dimensions for Socket Weld-End and Screwed-End Globe-Style Control Valves (Classes 150, 300, 600, 900, 1500, and 2500)
ISA 75.08.04	Face-to-Face Dimensions for Butt-weld-End Globe-Style Control Valves (Class 4500)
ISA 75.08.07	Face-to-Face Dimensions for Separable Flanged Globe-Style Control Valves (ANSI Classes 150, 300, and 600)
ISA 75.15	Face-to-Face Dimensions for Butt-weld-End Globe-Style Control Valves (ANSI Classes 150, 300, 600, 900, 1500 and 2500)
ISA 75.16	Face-to-Face Dimensions for Flanged Globe-Style Control Valve Bodies (ANSI Classes 900, 1500, and 2500)
ISA 75.22	Face-to-Centreline Dimensions for Flanged Globe-Style Angle Control Valve Bodies (ANSI Classes 150, 300, and 600)
UL 508A	Standard for Industrial Control Panels
NEMA 250	Enclosures for Electrical Equipment
CEC	Canadian Electrical Code (latest edition)
API – RP551	American Petroleum Institute, Process Measurement Instrumentation
ANSI B16.36	Steel Orifice Flanges
NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities

- .1 In the absence of a specific standard, the original manufacturer's recommendations will prevail subject to approval by the Engineer.
- .2 In addition to Codes and Standards listed above, the following requirements shall apply:

- .1 All equipment and assemblies shall carry the CSA, cUL or equivalent mark approved for use by the local Safety Authority with an associated declaration of conformity.
- .2 In the event that specific equipment does not bear an acceptable equipment certification, the Supplier shall obtain local review, inspection, approval and labelling by a certification agency such as CSA, cUL or equivalent that is acceptable to the authority having jurisdiction.
- .3 The Supplier shall pay for all costs for local inspection and any equipment modification as directed by the certification agency to obtain approval.
- .4 In case of a conflict between Standards, CSA Standards take precedence in the interpretation of the requirements over other Standards.
- .5 The design and construction shall also comply with the requirements of all authorities having jurisdiction over the site for the type of equipment specified herein.

1.5 SUPPLIER INFORMATION

- .1 The Owner's approval of Supplier's drawings and documentation does not in any way relieve the Supplier of his responsibility to meet the above criteria.
- .2 The Supplier shall submit sufficient information (pressures, temperatures, flow rates, specific gravities, corrosive conditions, controller set points, alarm set points, ranges, etc.) to permit The Owner to execute the necessary review and checking activities and to develop control narratives, interconnecting diagrams, and shutdown and security circuits.
- .3 Supplier shall provide, and The Owner shall review, interface drawings for complete compatibility with Supplier's equipment, interfacing with The Owner's Control System and for safe functioning of the equipment.

1.6 DOCUMENTATION

- .1 Document software and/or annotated programmed logic in a format acceptable to the Owner. Submit format for approval. Relay Logic, both in PDF for review and in the native PLC logic after commissioning is an acceptable format.
- .2 Provide drawings / data as referenced in the subsections below.

1.7 P&ID AND FUNCTIONAL DESCRIPTION

- .1 Submit a "Piping and Instrumentation Diagram" (P&ID) showing all necessary instrumentation, pipe sizing and valve types. Include controller set points, alarms, shutdowns, PSV, and PCV settings.
- .2 Depict instruments in accordance with ISA 5.1 and 5.3 using the assigned instrument tag number and the site standard tagging (available upon request).
- .3 Submit a functional description of the system operation, including the control description overview, alarm and operative setpoints, response to abnormal conditions, normal and emergency shutdowns, normal control sequence(s) and start-up to clarify the controls depicted on the P&ID.

1.8 INSTRUMENT DATA SHEETS

- .1 Provide an ISA formatted instrument specification sheet (ISA – S20) for each type of instrument proposed. Include normal, maximum, minimum operating conditions, all process data and materials, and a functional description where applicable.
- .2 Each data sheet shall include a revision number, date and signature.

1.9 LAYOUT DRAWINGS

- .1 All field instruments and associated connections to equipment or process shall be shown in their proper locations on the following types of drawings:
- .2 Piping Plans and Elevations; and
- .3 Location Drawings.

1.10 INSTRUMENT INDEX

- .1 Provide a complete Instrument Index that includes all Instruments supplied with the Packaged Equipment. Submit information in an Excel Spreadsheet and include as a minimum the following items:
 - .1 Tag number;
 - .2 Service description;
 - .3 P&ID number;
 - .4 Piping line information (material, size, commodity);
 - .5 Manufacturer;
 - .6 Model;
 - .7 Part number (complete selection digits, including selected options);
 - .8 Power supply voltage requirement;
 - .9 Setpoint;
 - .10 Instrument ranges;
 - .11 Power Supply; and
 - .12 Calibration range.

1.11 DESIGN CONSIDERATIONS

- .1 Supplier shall be fully responsible for furnishing instruments and instrument systems, meeting the following minimum design considerations:
 - .1 Meets the design requirements of the Packaged Equipment;
 - .2 Optimum Operation of Process;
 - .3 Suitable Quality;
 - .4 Suitable materials and coatings for the environment and conditions;
 - .5 Availability of support and spare parts;
 - .6 Reliability and proven technology;
 - .7 Quality Construction; and

- .8 Safe Operability.
- .2 Provide sizing calculations (the use of computerized calculations is preferred) for flow devices, thermowell vibration, control valves, regulators, and pressure relief valves.
- .3 The Engineer will review all sizing (based on information provided by the Supplier) prior to the Supplier purchasing the instrument. Review by the Engineer does not waive the Supplier's responsibility for suitable and safe design.
- .4 Supply panel drawings for all panels supplied as part of the package. The drawings shall show equipment layout, dimensions, wiring, a bill of materials and tubing details. See Control Panels section below.
- .5 Provide standard catalogue data (including technical specifications, wiring details, and instructions for maintenance, operation, and installation) for all instrumentation provided. Highlight information relevant to the actual instrument being used.
- .6 Supplier graphics and Control Objects functionality to comply with The Owner's standards (will be provided on request).

1.12 INSTRUMENT NUMBER AND TAGGING

- .1 Label all field instruments with a 25 x 50 mm rectangular stainless steel labels stamped with the assigned tag numbers (6 mm high lettering). The Supplier shall affix the label to the instrument with drive pins or stainless steel wire in such a manner that it need not be removed for installation of the instrument.
- .2 Label all panel mounted instruments with two lamacoid nameplates engraved with the assigned tag number. Fix one label to the front of the panel and the second on the backside of the panel door.
- .3 Label all interior panel components with a lamacoid nameplate.
- .4 All PLC I/O module wiring: Numbered according to I/O point base/slot/point assignments.

1.13 INSTRUMENTS INSTALLED IN HAZARDOUS AREAS

- .1 All instruments and electrical devices that are fully or partially located within a hazardous area shall be suitably rated for the area classification.
- .2 Conduit and cabling systems to instruments located in hazardous areas shall be in accordance with the CEC.

1.14 INTRINSIC SAFETY

- .1 Intrinsic safety design methods will only be used where standard instrumentation is not available.
- .2 Where intrinsically safe instruments are provided the supplier shall also provide a suitably intrinsic safety barrier. The complete system shall be approved as providing an intrinsically safe method of protection.

1.15 ACCEPTABLE MANUFACTURERS

- .1 Provide instruments from those manufacturers listed on the preferred Supplier list in **Part 4**. Where a choice has been provided the Supplier shall source from the preferred manufacturer and if the functionality cannot be met then the Supplier will choose from the alternate manufacturer(s). The Supplier shall notify The Owner if a particular instrument type is not listed and request a list of preferred manufactures for that specific instrument type or measurement application. The Owner will review and approve any new manufacturers and append them to this list. The Owner is not obligated to provide an explanation if a particular product is rejected.

1.16 SUPPLIER RESPONSIBILITY

- .1 The Supplier is responsible for the functionality and suitability of all equipment provided as a part of their scope supply, including equipment that is shipped loose for connection to the packaged system equipment.

1.17 SUPPLIER SCOPE

- .1 Supply all instrumentation and control devices required to operate the package systems that either mounts directly on the equipment or is field installed and wired to the systems.
- .2 Prewire all field mounted instruments and devices to terminals in NEMA 4X junction boxes.
- .3 Make provisions in the packaged control systems to interface to the plant PLC system as defined in the equipment specification. Define the provisions for interfacing with external control systems. Details to include the method of communicating all signals including any applicable protocols and all recommend data points for safety and process control/monitoring.
- .4 Provide onsite support to lead integration efforts of the equipment; this effort will coordinate with the site Contractor and the Client.
- .5 Provide a testing program and site services to implement the testing of the control system (dry and wet) with the Contractor and the Client.
- .6 Provide a commissioning program and site services to implement the commissioning program of the system with the Contractor and the Client.
- .7 Provide training material, trainer, and allow 3 training sessions for operations and maintenance staff. Hands on training to be included in part of each session.

1.18 MATERIALS

- .1 Instruments shall be manufactured of material suitable for the process and atmospheric conditions specified in the Packaged Equipment specification and data sheets.

1.19 ELECTRICAL APPROVALS

- .1 Provide instruments and control devices rated for the area classification where the devices are to be installed.

- .2 CSA labelling for all Control Panels, both fabricated in a shop and modified in the field during construction.

1.20 RFI PROTECTION

- .1 Provide RFI protection of electronic devices in order to not exceed 0.1% full-scale error at one meter from a 5-watt 2-way radio for frequencies of 20-1000 MHz.
- .2 All field mounted devices shall have adequate surge and transient protection.

1.21 SUBMITTALS

- .1 Meet requirements of submittal package detailed as part of this overall submission.
- .2 Include the following:
 - .1 Power distribution wiring diagram.
 - .2 PLC wiring diagrams including all I/O points.
 - .3 PLC code (PDF).
 - .4 Communication and remote I/O interface module wiring diagrams.
 - .5 Operator interface terminal (OIT) wiring diagram if applicable.
 - .6 Back panel and subpanel layouts showing location of panel-mounted equipment.
 - .7 Enclosure elevation drawing showing location of externally mounted equipment.
 - .8 Enclosure assembly diagram if applicable.
 - .9 Complete bill of materials.
 - .10 Equipment details for each component.

PART 2 PRODUCTS

2.1 DESCRIPTION

- .1 Provide PLC based control system to allow fully automatic unsupervised control of packaged equipment and all ancillary components. Control system must be capable of interfacing with Plant Control System (PCS) via an Ethernet interface.
- .2 Supply products modified as necessary by the manufacturer to provide the specified features and to meet specified operating conditions.

2.2 MATERIALS AND WORKMANSHIP

- .1 All materials and equipment shall be new, of current manufacture and free from all defects and imperfections.
- .2 Measurement and control devices in contact with the process medium shall be 316SS (stainless steel), except as otherwise noted in this specification. If stainless steel is not compatible with the process medium the supplier shall identify the deviation and propose an alternate material.

- .3 Body material of all in-line devices shall be equal or superior to the vessel/piping material to which they are connected (i.e., pressure / temperature ratings, chemical compatibility, etc).

2.3 INSTRUMENT ELECTRICAL REQUIREMENTS

- .1 All instruments to be watertight with conduit drains at low points, rated NEMA 4X (IP66).

2.4 INSTRUMENT WIRING

- .1 Refer to Division 16 for specifications of common electrical elements (wiring, raceways, power supply, etc) for instrumentation and control devices.
- .2 Wire sizes and cable types used for instrumentation and control devices are as follows:
 - .1 16 AWG, 7 strand, twisted concentric tinned copper wires shall be used for single pair and single triad conductors, wired with mylar tape shield.
 - .2 18 AWG, 7 strand, twisted concentric tinned copper wire shall be used for multi-pair and multi-triad conductors, wired with mylar tape shield.
 - .3 PVC insulation, 75°C to -40°C handling, rated at 300V and in accordance with section 4 of CSA-C22.2 shall be used.
 - .4 Shielding shall be 100% coverage by an aluminum-Mylar tape shield and drain wire. Drain wire shall be 18 AWG on single pair and single triad wires and 20 AWG on multi-pair and multi-triad wire. The aluminum-Mylar tape shall be in contact with the drain wire at all times.
 - .5 Multi-wire conductor cables shall have each pair or triad shielded, insulated and with a drain wire. Each cable shall have an overall shield and drain wire.
- .3 Wiring and cabling shall be permanently identified with the instrument tag number and marked at junctions and terminals. Wiring on an equipment skid shall be terminated in a junction box. Junction box shall be located at skid edge. Individual conductors and drain wires shall be splice free from terminal to terminal.
- .4 The signal wire colour code shown below is intended to apply to all wiring, including the Device Cable, the Home Run Cable and Panel Room internal wiring. The number in brackets indicates the Wire Subscript to be used where single conductors are used and the colour code cannot be applied.
- .5 RTD extension wire shall be triads with aluminized shield tape and tinned copper drain wire.
- .6 Wiring for different systems shall not share the same cables, terminal boxes or conduit. Supplier shall provide segregated terminal strips in local panels. The following systems shall be separated from each other:
 - .1 120/220 V AC supply circuit
 - .2 Low voltage instruments signals

2.5 WIRING COLOR CODING

- .1 Color coding of instrumentation wiring is listed in the following table:

		Supply Label	Equipment Label	Wire Color
Control AC supplies	Power	H	BLK	Black (-1)
	Neutral	N	WHT	White (-2)
	Ground	G	GRN	Green
AC Controlled by Relay	Signal	S	RED	Red
DC supplies	Positive	+	BLU	Blue
	Negative	-	BLU/WHT	Blue w/ White Stripe
DC Controlled	Signal	S	BLU	Blue
Instrument signals 4-20 mA	Positive	+	RED	Red
	Negative	-	BLK	Black
	Signal und	SG	SG	Silver
Ethernet	Jacket			Yellow
HART (2 pair)	Jacket			Blue
	Positive Pr #1	+	BLU/WHT	Blue/White
	Negative Pr #1	-	WHT/BLU	White/Blue
	Positive Pr #2	+	ORG/WHT	Orange/White
	Negative Pr #2	-	WHT/ORG	White/Orange
Fibre Optic	Jacket		WHT	Orange

2.6 SIGNAL LEVELS

- .1 Analog instrument and control device signals shall be 4-20 mA DC with HART protocol.
- .2 Analog instrument and control device signals between packaged equipment panels and the plant control system shall be 4-20 mA DC.
- .3 It is preferred that all instruments are loop powered when suitable instruments are available. If external power is required, the preference is 24 VDC provided from the vendor control panel.
- .4 Discrete signals such as switches and solenoids shall operate at 120 VAC and be powered through the control system. The preference is for FORM-C dry contacts with wetted voltage derived from the input device.
- .5 Discrete Control shall operate at 120VAC and be powered through the control system. DC voltage will be allowed where applicable; ensure signals of different voltages are not run in common conduit (included those with high insulation ratings).
- .6 Solenoids shall be 'low power' type, 4 watts or less.
- .7 Communication between Supplier's PLC and the plant PLC system will be by Ethernet based communications using Ethernet/IP protocols.

2.7 TRANSMITTERS

- .1 Transmitters shall be equipped with LED or LCD backlit integral indicators.
- .2 Where the device mounting location obscures, or limits operator access to, the transmitter indicator, remote indicators are to be provided. Remote indicators are to be securely mounted using instrument manufactures hardware.
- .3 Process variable switches (low, high switch points) to be provided as programmable adjustable variables based on analog inputs/variables in the PLC. Minimize the use of standalone process alarm relays.
- .4 Switches, where unavoidable, shall be single pole, double throw, hermetically sealed. Applications calling for both alarm and shutdown shall be separate switches in separate housings and have separate connections and isolation manifold to sensing point.
- .5 All switches and relays shall have contact ratings of at least 120 VAC 0.5 amps. Shutdown output signals for solenoid valves shall be rated for 120 VAC, 2 amp loads.
- .6 Electric interlock circuits shall be normally energized and use contacts opening to cause a shutdown. For alarm indication use normally open contacts that close on alarm.

2.8 WINTERIZATION

- .1 Field mounted instruments, such as transmitters, gauges, etc., which are not suitable for use at -40°C shall be protected with a pre-molded instrument enclosure meeting the following requirements.
- .2 The enclosure shall have a latchable cover and if the instrument is of the indicating type, a window where the indicator is visible through the window.
- .3 Also a lamacoid label shall be affixed to the outside of the enclosure with the instrument tag clearly visible.
- .4 An electric heater and thermostat shall maintain a minimum temperature of 10°C inside the enclosure.
- .5 Where impulse tubing is located outside and is prone to freezing, prefabricated, heat-traced and insulated tube bundle shall be used.

2.9 PRESSURE

- .1 All pressure instruments shall be provided with a 19 mm (¾" NPT) x 12mm (½" NPT) isolation valve.
- .2 Each gauge or absolute pressure device shall be equipped with a two-valve manifold. Each differential pressure device shall be equipped with a five-valve manifold.
- .3 Primary pressure elements shall be 316 stainless steel minimum for all pressure instruments, unless conditions of service require otherwise. Pressure containing parts constructed from aluminum shall not be used.

- .4 For dirty, solidifying or corrosive process fluids, pressure instruments shall be equipped with a 75 mm (3 inch NPS) flanged diaphragm seal, rated to withstand the corrosive nature and temperatures of the process. A full port isolation valve and flushing connections shall be provided for each diaphragm seal. (valve manifolds not required for these applications)
- .5 Local pressure gauges shall be installed to verify the functionality of the following instruments and equipment:
 - .1 Relief valves
 - .2 Regulators
 - .3 Pressure transmitters
 - .4 Pump suction and discharge
 - .5 Exchanger nozzles
 - .6 Other equipment as necessary
- .6 Local pressure gauges for process services shall meet ASME B40.100. Further specifications shall be as follows:
- .7 Gauge Design:
 - .1 Minimum 115 mm (4.5") diameter
 - .2 Solid front with blow-out back construction
 - .3 Acceptable case materials – stainless steel or phenolic
 - .4 White dial with black numerals and linear scale
 - .5 Micrometer screw for pointer zero adjustment
 - .6 Bourdon tube, tip and socket material shall be 316 SS
 - .7 Gauges shall have a 12mm (½" NPT), male, bottom connection
 - .8 As a minimum, gauges in pulsating or vibrating service shall be filled with Dow Corning 200 fluid
 - .9 Movements shall be constructed of stainless steel. Movements shall be of the quadrant and pinion design or the helicoid arm and roller design.
 - .10 Gauge accuracy shall be 1% or better maximum scale reading. Repeatability shall be better than 0.5% of maximum scale reading. Gauges will be selected such that the normal process pressure falls between 30% and 70% of scale.
 - .11 Gauges shall be provided to withstand a pressure of up to 1.3 times the scale range. Gauge range shall exceed the set pressure of any related pressure relief device.
 - .12 Diaphragm seals shall be used for winterizing pressure gauges and corrosive services. Extended diaphragm seals can be used where there is a possibility of set up or to minimize fluid outside the pipeline. Material for diaphragm seals shall be compatible with the process fluids.
 - .13 Process gauges for low pressure application shall be as described in the preceding except that they shall have diaphragm sensing elements.
 - .14 Pressure gauge connections on vessels shall be flanged.
 - .15 In addition to the piping supplied isolation valve, each pressure gauge shall have a block and bleed calibration valve.

- .16 Gauges used in service where pressure spikes and vibration are a concern shall be supplied with pressure snubbers.

2.10 ON/OFF VALVES

- .1 Solenoid valves shall be supplied suitable for the applicable area classification. Coils shall be continuous duty (120 VAC) weatherproof encapsulated type. De-energization of the solenoid valve shall result in the valve moving to the fail safe position. Low wattage solenoids (4 watts or less) shall be utilized. Inline solenoid valves shall not be installed in lines larger than 25mm (1 inch NPS).
- .2 On/off valves shall be specified as line size, full port, or reduced port depending on the process flow rate.
- .3 Valves shall have Open/Closed position feedback. Where electrically operated valves are utilized they shall have both Remote / Local operation with status feedback and position feedback.
- .4 Actuators shall be sized for 1.3 times the valve's maximum break-out torque at full rated ANSI differential pressure, and at the minimum instrument air supply pressure as specified on the project site data form. Motorized valves may alternatively be supplied with approval of the Engineer.
- .5 On/Off valve body materials, including bolting shall be as per the corresponding piping class. Valve bodies shall have pressure—temperature ratings equal to or greater than the flange rating of the lines in which they are installed.
- .6 Depressurizing valves shall be single seat globe-style valves if suitable for the service.
- .7 Ball valves shall be of the bolted body design.
- .8 As a minimum, inner valve trim shall be stainless steel.
- .9 The finish on the flange contact face shall be specified the same as the matching pipe class.
- .10 Control functions shall not be combined in a single valve with emergency shutdown and/or depressurizing functions.
- .11 Actuators for Emergency Shutdown (ESD) valves shall be designed such that the valve fails in the chosen position whenever the motive force or signal is lost. The only exception will be motor-operated valves; these require Engineer's approval.
- .12 Emergency shut-off valves shall close within the time dictated by the process conditions, but in any case, in less than one second per inch of line size. Pipeline shut-off valves require different stroking speed to prevent severe hydraulic pulsations, which can damage equipment.
- .13 Test documentation shall reference tag number.

2.11 CONTROL PANELS

- .1 Local control panels associated with package units shall be designed and supplied by the Supplier. Front of panel layout, panel interior layout, and electrical wiring and/or tubing schematic drawings shall be submitted to the Engineer for approval. The Engineer approval shall be obtained prior to commencing work. Review by the Engineer does not waive the Supplier's responsibility for suitable and safe design.
- .2 Panels shall be of welded steel construction, framed, and braced with angle or channel steel as necessary.
- .3 Cabinet will house an LED light, convenience receptacle and Print Pocket. All cabinets to be labelled per site standards.
- .4 Doors shall be complete with piano hinge. Hinged doors shall utilize three-point, heavy duty latches. Doors shall be easily removable if not used for mounting of equipment. Panels to be mounted outdoors shall be provided with strip heaters and thermostatic controls, with power being fed from a separate external circuit. Panels shall have all cable entering from the side or bottom. If an outdoor panel is furnished with LED or LCD displays, the Supplier shall provide a sun screen to avoid direct sunlight on the panel face.
- .5 Provide manufactures standard finish. Where special colors are required sandblast panels and then paint with two coats of primer prior and finish paint color. Use 316 SS unpainted panels in process areas and outdoor locations.
- .6 Each panel, which is not permanently mounted by the Supplier on an equipment package, shall be provided with removable lifting lugs designed for lifting without deforming the panels.
- .7 Panels and all equipment shall be suitably secured and protected to ensure that it will not be damaged in shipment or storage at the job site.
- .8 Panels, including instrument components, electrical wiring, and devices, must conform to the electrical area classification where the panel is installed.
- .9 Panel cut-outs and openings shall be gasketed and sealed to provide as minimum NEMA 4X (IP66) panel enclosure rating.
- .10 Internal panel wiring shall utilize smooth, rigid, vinyl wireways as manufactured by Panduit. The wireways shall have removable closed top and slotted sides and be coloured White for DC voltages, and Grey for AC voltages. The wireways shall be limited to 50% capacity by cross-sectional area. All wiring shall be properly secured in wireways by the use of cable ties. Mixing of AC and DC wiring within the wireways is unacceptable.
- .11 All signals and spare I/O shall be wired out to the terminal strips. Terminal blocks shall utilize DIN rail mounted single level terminal blocks, complete with fuse disconnect for power connections and knife gate disconnect for signal connections. Wiring terminating within these types of terminal blocks shall be connected without the use of crimp connections.

2.12 CONTROL SYSTEM REQUIREMENTS

- .1 Process Control
 - .1 The District of Sooke utilizes a PLC/SCADA architecture based on Allen Bradley PLCs and iFIX 5.8 SCADA. The SCADA is used as the primary operator interface to monitor and control the entire plant. The SCADA will monitor and control the packaged system. In addition, it collects and provides historical plant information. It is intended that the Dewatering processes are marshaled to common areas of the supplied skid, with detailed wiring and control narratives to be provided, allowing integration into the site control system.
 - .2 Where a Programmable Logic Controller (PLC) is provided for the package control system, it shall be supplied in accordance with the following requirements:
 - .1 The PLC rack shall include power supply unit, processor and I/O. Multiple racks may be used, but the system, when commissioned, shall include 20% installed spare I/O and 10% spare slots.
 - .2 A complete listing of all PLC hardware shall be provided.
 - .3 A copy of the programmed logic in native file format and printed or PDF copy of the PLC program shall be provided. Password to access machine level programming shall be provided to The Owner.
 - .4 The PLC make and model shall be Allen Bradley, Compact Logix-based. Individual components shall be chosen by the Supplier. Card types shall be standardized. Supplier shall provide a Bill of Material (BOM) as a shop drawing.
 - .3 Provide programming information as a detailed written description and/or Cause and Effect Diagram (C&E) showing the operating sequence and interlocks. Descriptions shall include tag numbers, operating parameters, set points, and start-up AND shutdown procedures.
 - .4 An HMI (minimum 12" dimension) will be provided to allow operation of the control system locally.
 - .5 120 VAC Discrete Inputs: The control panel will provide 120VAC to field equipment for signaling purposes only.
 - .1 Wires: Red.
 - .2 Field equipment: Equipped with 120VAC rated dry contacts and will operate the dry contacts. All Emergency Stop and other alarm Inputs shall be wired Failed-Safe (normally closed), where the de-energized circuit represents an alarm.
 - .3 For each dry contact, a pair of wires shall be installed and landed from the panel to the dry contact.
 - .4 One wire shall be hot (+) the other shall be used to return power back to the when the dry contact is closed.
 - .5 Both wires shall be continuous home-runs from field equipment panel to panel with NO intermediate terminations or splices.
 - .6 A sample drawing will be provided and followed.
 - .6 120 VAC or 24VDC Relay Outputs: The panel will be Supplied with 120VAC or 24 VDC control power from the field equipment for control purposes only.

- .1 Wires: Yellow to indicate foreign voltage.
- .2 Discrete Output card will provide a dry contact to switch power on and off. Each dry contact will only have one function and serve only one piece of field equipment (for example, a single dry contact cannot be used to turn on a pump and used to illuminate a panel light).
- .3 For each dry contact, a pair of wires shall be installed and landed from the panel to the field equipment.
- .4 One wire shall be hot (+) the other shall be used to return power back to the field equipment when the dry contact is closed.
- .5 De-energizing field equipment will consequently de-energize the 120VAC or 24VDC control power.
- .6 Both wires: Continuous home-runs from field equipment panel to panel with NO intermediate terminations or splices.
- .7 A sample drawing will be provided and followed.
- .8 In general, the current for Allen Bradley output modules shall not exceed 2 Amps and never exceed the manufacturer's limitations. The A-B relay output module used on panels does not have on board fusing, therefore one of the 2 terminals provided for field connections, typically the line side, will be equipped with a 2A rated fast blow fuse.

.7 Terminal Approved Manufacturer.

- .1 Weidmuller brand or equal.

Terminal Type	Weidmuller Cat. No.
Analog input (+), fused	WSI6
Analog input (-)	WDU2.5
Analog input shield	WPE2.5
Analog output (+)	WDU2.5
Analog output (-)	WDU2.5
Analog output shield	WPE2.5
Discrete input	WDK2.5*
Discrete output	WDU2.5
Digital output, fused	WSI6
All others	WDU2.5 or WSI6

- .8 *Note: Discrete input terminal block assemblies require 2-tier terminals. The top tier is used for the individual inputs. The terminals on the bottom tier are ganged together using internal screw jumpers to form a voltage bus for wetting of field contacts.

2.13 PILOT DEVICES

- .1 Selector switches, pushbuttons, and indicating lights: Heavy duty, oil-tight, 30mm, NEMA 13-rated.
- .2 Selector switches and pushbuttons.

- .1 Supplied with operator mechanisms, appropriate number of contact blocks, and any necessary legend plates bearing pertinent information.
- .2 Contact block terminals: Labeled for identification purposes and contain no less than one single-pole, double-throw contact.
- .3 Contact blocks: Heavy duty type rated for 10A breaking current at 120V.
- .3 Stop and emergency stop pushbuttons: Red in color unless otherwise noted.
- .4 Other pushbuttons: Black unless otherwise noted.
 - .1 Pushbuttons.
 - .2 Operation: Momentary.
 - .3 Switch operation for local-remote, auto-manual, and computer-manual selection: Maintained in all positions.
 - .4 Provided with flush head bezels.
- .5 The following color code shall be used for the lenses of all indicating lights:

<u>FUNCTION</u>	<u>COLOR</u>	<u>FUNCTION</u>	<u>COLOR</u>
ON	Red	HIGH	Yellow
OFF	Green	AUTOMATIC	White
CLOSED	Green	MANUAL	Blue
OPEN	Red	LOCAL	Blue
LOW	White	REMOTE	White
FAIL	Yellow	POWER ON	White
TRIPPED	Yellow		

- .6 Indicating lights: Push-to-test LED-type, rated for 120V operation.
- .7 Selector switches, pushbuttons, and indicating lights: Allen-Bradley Series 800, Siemens Class 52, or equal.

2.14 GENERAL TESTING AND INSPECTION

- .1 The equipment shall undergo Factory Acceptance Testing (FAT) in accordance with this specification and District Standard Specifications for Quality Requirements.
- .2 Calibration and commissioning work shall be carried out by qualified technicians. The work shall be performed by the manufacturer's service representatives if so required.
- .3 Demonstrate instrument calibration and loop checks. Each loop check shall be documented and successfully demonstrated to the Engineer for sign-off.

2.15 INSPECTION AND TESTING

- .1 Refer to specification Sections 01 43 00 and 01 45 00 for Quality Control and Assurance requirements.
- .2 Supplier shall perform a control system Site Acceptance Test (SAT) as part of the systems start-up services. Supplier shall provide testing procedure and documentation to be used during system start-up, for approval by The Owner.

PART 3 EXECUTION (SEE RESPECTIVE PACAGED EQUIPMENT SPECIFICATION)

PART 4 PREFERRED SUPPLIERS

4.1 PREFERRED SUPPLIERS LIST

- .1 Provide similar types of equipment from the same Supplier.
- .2 Provide a list of proposed manufactures for the types of instruments and control devices being provide
- .3 Provide equipment from manufacturers listed in the preferred Supplier table below.

Description	Preferred	Alternate
HMI	Wonderware AIS (12" or Greater) In Touch Version 11.1	None
PLC	Allen-Bradley – ControlLogix L71 RS5000 Version 20.04	Allen Bradley CompactLogix 5380, (small systems only)
Control Valves	As per process specifications	
Automatic On/Off Valves	As per process specifications	
Analysis	Hach	Rosemount, Endress + Hauser, ABB / CEM
Level Instruments (non-contact)	Endress + Hauser	(Rosemount)
Level Instruments (non-contact, point)	Endress + Hauser Vicronic Liquiphant FTL50)	Rosemount Vibrating Fork Level Switch 2120
Level Instruments (Style)	Pressure Vessels – Differential pressure Chemical Tanks – Ultrasonic/Microwave Digesters - Microwave	
Level switches	Anchor Scientific P40N0	
Pressure switches	United Electric Controls	Ashcroft / Mid West Instruments / Dwyer-Mercoid
Flow switches (thermal)	Fluid Components International	ABB / Kayden / IFM
Pressure Transmitter (wetwell/similar)	Endress+Hauser (Waterpilot FMX 21)	
Pressure Transmitter (DP, Absolute))	Endress+Hauser (Deltabar PWD 55)	Rosemount (3051, 2051)

Description	Preferred	Alternate
Pressure Gauge	Wika	Ashcroft / Weksler
Pressure Regulator	Fisher	Masonelian
Temperature Gauge	Wika	Ashcroft / Weksler
Temperature Transmitter	Endress+Hauser (iTEMP TMT 82)	Rosemount 214C Temperature Sensor w/ transmitter
Damper & Valve Actuators (electric)	Beck or Rotork	Auma / Flowserve
Damper & Valve Actuators (pneumatic)	Flowserve	Rotork / Beck / Numatics
Flow (Liquids) (Magnetic In-Line)	Endress + Hauser (Promag)	Rosemount 8750W, 8712E, ABB, Yokogawa
Flow (Slurry, Sludge) (Non-contacting)	Flex-IM	Endress + Hauser / Emerson (Rosemount)
Flow (turbine & Positive Displacement)	Brooks, ABB	Daniels, Flowline, Liquid Controls
Flow Gas	Endress+Hauser (t-mass 65F)	Sage
Combustible Gas	MSA Ultimax XE	Emerson – Net Safety
Combustible Gas Strobe	Killark SHBG-2-23R (C1D1)	
Indicators (rate / flow)	Dwyer	Beka, Omron, Crompton
Density	Royce	Berthold / Process Automation (RSA) / Thermo-scientific / Toshiba
Solenoids	Asco	Rexroth / Parker / Festo
CCTV	Diamond Canapower	Canty / Northern Video / Schneider Electric
Warning Siren	Federal Signal	Claxon
Flashing Light (Xenon / LED)	Federal Signal	Edwards
Safety Relief	Farris	Tyco / Anderson Greenwood
Cable / Fibre Optic / Profibus	Belden / Anixter	Corning / Nexans / Optimum Cable Corporation
Terminals (Cabinets)	Weidmuller (W Series)	
UPS	Eaton (Ferrups)	Siemens Sitop
Surge Protection	Weidmuller SD323X	
Selector Switches, etc	Allen Bradley 800T	
Control Relays + Time Delay Relays	Weidmuller WDK	

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 Compile product data and related information as specified in each section appropriate for the Owner's maintenance and operation of products furnished under the Contract using the District's standard template for O&M manuals.
- .2 Prepare operating and maintenance data as specified in this Section, and as referenced in other pertinent Sections of the Specifications.
- .3 Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.
- .4 Refer to General Conditions re: holdback until complete compliance with the performance of the Work of this Section.
- .5 Submit four sets of operating and maintenance manuals for all equipment valves, pumps and fittings described herein or as requested by the contract. Include descriptive and technical data, all shop drawings, operating procedures, routine and preventative maintenance, wiring diagrams, spare parts lists, warranties, service companies, suppliers for replacement parts, test results, fire alarm certificate of verification, electrical inspection authority certificate and contract guarantee.

1.2 QUALITY ASSURANCE

- .1 Preparation of data shall be done by personnel:
 - .1 Trained and experienced with knowledge in maintenance and operation of the described products.
 - .2 Completely familiar with requirements of the Section.
 - .3 Skilled as a technical writer to the extent required to communicate essential data.
 - .4 Skilled as a draftsman competent to prepare required drawings.

1.3 FORM OF SUBMITTALS

- .1 Prepare data in the form of an instructional manual for use for Owner's personnel.
- .2 In the format required by the District's standard template for O&M manuals.
- .3 Submit two (2) complete copies for review. Once the District's comments have been incorporated, provide two (2) complete copies and an electronic copy. Provide the electronic copy in MS Word format and sections, such as, manufacturer's information may be in PDF format. O&M shall include "As-Constructed" drawings of the completed works provided in AutoCAD format complete with plot style table (CTB file), a DWF file(s) containing all drawings and a reproducible copy to NAD83 UTM coordinates.
- .4 Format:
 - .1 Each system shall be bound in a separate binder.

- .2 Size: 215 mm x 280 mm
- .3 Cover: Identifying each volume with types of printed title "OPERATIONS AND MAINTENANCE INSTRUCTIONS".
- .4 List:
 - .1 Title of Project
 - .2 Identity of general subject matter covered in the manual
- .5 Binders:
 - .1 Two D-Ring binders with clear view pockets on front and side for each manual.
 - .2 Binders to fit 215 mm x 280 mm size paper.
 - .3 When multiple binders are used, correlate the data into related consistent groupings.

1.4 CONTENT OF MANUAL

- .1 Neatly typewritten table of contents for each volume, arranged in systematic order where applicable following specification format.
 - .1 Contractor, name of responsible principal, address and telephone number.
 - .2 Names of subcontractors and suppliers.
 - .3 A list of each product required to be included, indexed to the content and the volume.
- .2 Include only those product data sheets pertinent to the specific product. On each sheet clearly identify the data applicable to the installation or delete inapplicable references.
- .3 Include the following information plus data specified:
 - .1 List all equipment which will require regular inspections and servicing.
 - .2 Maintenance instructions for all equipment and materials.
- .4 Drawings: do not use Project Record Drawings as Maintenance Drawings.
- .5 Adjusting tools, keys, spare parts: necessary adjusting tools, wrenches, brushes, keys, spares and the like as stipulated shall be provided at no additional cost to the Owner.
- .6 Equipment and Systems:
 - .1 Each Item of Equipment and Each System: include description of unit or system, and component parts;
 - .2 Panelboard Circuit Directories: provide electrical service characteristics, controls and communications;
 - .3 Include installed colour coded wiring diagrams;
 - .4 Operating Procedures: include start-up, break in and routing normal operating instructions and sequences. Include registration, control, stopping, shut-down and emergency instructions. Include any special operating instruction;
 - .5 Maintenance Requirements: include routine procedures and guide for troubleshooting, disassembly, repair and reassemble instructions; and alignment, adjusting, balancing and checking instructions;
 - .6 Provide servicing and lubrication schedule, and list of lubricants required;

- .7 Include manufacturers printed operation and maintenance instructions;
- .8 Include sequence of operation by controls manufacturer;
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance;
- .10 Provide installed control diagrams by controls manufacturer;
- .11 Provide Contractor's coordination drawings, with installed colour code piping diagrams;
- .12 Provide list of original manufacturer's spare parts, current price and recommended quantities to be maintained in storage;
- .13 Include test reports as specified in Section 01400 – Quality Control or other sections;
- .14 Additional Requirements: as specified in individual specification sections.
- .7 Warranties and Bonds (Per General Conditions Article 34)
 - .1 Compile specified warranties and bonds;
 - .2 Co-execute warranty submittals when so specified;
 - .3 Review submittals to verify compliance with Contract Documents;
 - .4 Submit to Engineer for review and onward transmittal to the Owner;
 - .5 Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors;
 - .6 Number of original copies required: one (1) each.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.1 WORK INCLUDED

- .1 The supply and application of all factory applied prime coats or factory applied finish coats.

1.2 SUBMITTALS

- .1 With the equipment Shop Drawings, the Contractor shall submit details of the coating systems to be applied.

1.3 QUALITY ASSURANCE

- .1 This specification is intended to be a minimum reference standard. The manufacturer may submit for review alternative coating systems for specific items of equipment which provide equal or better corrosion protection and maintenance service than those specified herein.

PART 2 PRODUCTS

2.1 SURFACE PREPARATION

- .1 Immersion Service: After degreasing, dry blast all ferrous components to a white metal finish in accordance with SSPC-SP5 to a degree of cleanliness in accordance with NACE #1 and obtain a 50-micron blast profile.
- .2 Non-immersion Service: After degreasing, dry blast all ferrous components to a near white finish in accordance with SSPC-SP10 to a degree of cleanliness in accordance with NACE #3 and obtain a 50-micron blast profile.

2.2 PRIME COATING

- .1 Prime coat all ferrous surfaces before the blasted surfaces deteriorate.
- .2 Coat ferrous surfaces with inorganic zinc primer, containing a minimum of 50 percent solids by volume, applied to a minimum dry film thickness of 75 microns.

2.3 FINISH COATS

- .1 Apply finish coats in conformance with Section 46 90 00 – Field Applied Corrosion Protection and Maintenance Coatings for service, coating types and application rates.

2.4 ASSEMBLY

- .1 Items which are to be bolted together before shipment shall have their surfaces cleaned and coated before the parts are assembled.

- .2 Continuous weld all welded connections, sealing the mating surface completely. On completion of the welding and fettling, treat all weld seams with phosphoric acid solution. Rinsed and thoroughly dry before the prime is applied.
- .3 Where dissimilar metals are mated such as aluminum and steel, insulate the mating surfaces from one another to provide protection against corrosion. Insulate bolts, nuts, washers and rivets in a similar manner.
- .4 Use Type 304 stainless steel or better for all nuts, bolts, washers and similar fittings for immersion service. Nuts, bolts, washers, and similar fittings for non-immersion service shall be Type 304 stainless or zinc or cadmium plated. The inner face of non-threaded bolt holes are to be cleaned and coated as required for other surfaces
- .5 Additional quality assurance testing will be at the discretion of the District upon initial inspection of the Dewatering Equipment at the Delivery Point. Refer to Section 01 43 00 – Quality Assurance.

PART 3 EXECUTION

3.1 INSPECTION

- .1 The manufacturer shall notify the Engineer two (2) weeks before commencing the protective coating in order to facilitate the inspection by the Engineer of the surface preparation and protective coating application

3.2 PROTECTION

- .1 Protect all coated equipment adequately against damage, dust, moisture and scratching during shipment, off-loading and storage on-site. If, in the opinion of the Engineer, the coating is damaged during shipment to the extent that touch up would not be satisfactory, the equipment shall be returned and re-coated at no added cost to the Owner.
- .2 Damage to coatings occurring at any time shall be made good prior to the application of any further coatings

3.3 APPLICATION CONDITIONS

- .1 Apply all factory applied coatings under controlled conditions. The atmosphere shall be dust free and kept at a temperature of between 10°C and 20°C. The relative humidity should not exceed 80 percent.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section specifies the supply, testing and commissioning of all necessary equipment and controls for:
 - .1 Thin Sludge Feed Pump to Rotary Drum Thickener
 - .2 All other access equipment and appurtenances necessary for a complete and operational system
- .2 The Thin Sludge Feed Pump is intended to transfer sludge from the WAS Equalization Tank to the Rotary Drum Thickener
- .3 The pump is intended to operate automatically and be fully integrated in the existing plant infrastructure. The feed pump will be controlled automatically via Rotary Drum Thickener Control Panel.
- .4 The pump shall be suitable for being driven by a variable frequency drive (VFD) to be located in the project supplied MCC in the electrical room.
- .5 The Contractor will provide system installation under the Supplier guidance and will provide support during testing and commissioning.

1.2 SUBMITTALS

- .1 Shop Drawings: Submit in accordance with Section 01 30 00 - Submittals, include the following:
 - .1 Certified shop showing all important details of construction, dimensions.
 - .2 Complete Bill of Materials
 - .3 Descriptive literature, bulletins and/or catalogs of the equipment.
 - .4 Ancillary equipment performance information.
 - .5 Furnish all information required in shop drawing submittal requirements.
 - .6 The total weight of the equipment, including the weight of the single largest item.
 - .7 A list of the manufacturer's recommended spare parts.
- .2 Complete assembly and installation drawings, together with detailed specifications and data covering material used, parts, devices, and other accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. The data and specifications for each unit shall include, but not be limited to, the following:
 - 1. Type, manufacturer and general description,
 - 2. General outline drawings showing clearly all general and essential dimensions.
 - 3. Descriptions and specifications of various components including:
 - a. Pump impeller
 - b. Pump casing
 - c. Wearing rings
 - d. Discharge fittings

- e. Accessories.
4. Pump characteristic curves showing efficiency, power requirements, pump capacities at various heads, curve number, impeller diameter, rated speed. A set of pump curves operating at various speeds shall be provided for the pumps to be driven by a VFD.
5. Data as follows:
 - a. power requirements, voltage, motor power output
 - b. total mass of pump and motor
 - c. level controls
 - d. pump controls.
6. Required ancillary services including, but not limited to, electrical, seal water, and drains. The sizes, ratings, and other pertinent information related to these services.
7. Installation instructions indicating assembly and mounting requirements, alignment and assembly tolerances, and points of connection for ancillary services (electrical, seal water, drains, etc.).
8. Electrical connection diagrams and ladder type schematics, identifying all items requiring electrical control or power for operation of the equipment, shall be submitted for review. Submittals shall verify each applicable feature in this Specification. All schematics shall number each wire and terminal to coincide with the assembled equipment. Each contact, timer and related items shall be labeled to coincide with the equipment installed in the Rotary Drum Thickener local control panel and on the equipment. The schematics shall be supplemented by a narrative detailing equipment start-up and shutdown functions as they relate to the electrical devices.
9. The drawings shall indicate the conduit and wiring requirements between the Rotary Drum Thickener local control panel, the MCC mounted VFD, and the Feed Pump itself.
10. Start-up instructions including lubricant requirements, electrical requirements, etc.
11. Operating and Maintenance Data: Provide for incorporation into operation and maintenance manual. Include complete description of operation together with general arrangement and detailed drawings, wiring diagrams for power and control schematics, parts catalogues with complete list of repair and replacement parts with section drawings, illustrating the connections and the part manufacturer's identifying numbers.

1.3 **COORDINATION**

- .1 Coordinate with other Divisions to ensure there are no conflict in the work.

1.4 STANDARDS

1.5 Products provided under this specification must comply with all regulations and codes in effect in British Columbia.

1.6 Electrical work shall be in accordance with the Canadian Electrical Code and with applicable standards of the Electrical and Electronic Manufacturers Association of Canada (EEMAC) and the Canadian Standards Association (CSA).

1.7 Hydraulic Efficiency and Pump Impeller tolerances shall conform to the Standards of the Hydraulic Institute.

1.8 SHIPMENT PROTECTION AND STORAGE

- .1 Ship pre-assembled to the degree that is possible.
- .2 Provide storage instructions indicating specific requirements to ensure there is no uneven wear, distortion, or weathering of components.
- .3 Identify all other special storage requirements.

1.9 MANUFACTURER

- .1 The submersible pump shall be the product of a company regularly engaged in the manufacture and supply of this type of equipment and whose equipment is of a design which has been in satisfactory service under similar conditions for not less than five (5) years.
- .2 The design is based on Xylem (ITT-Flygt pumps).
 - .1 Alternative manufacturers include KSB, Pumpex, ABS/Sulzer, and other engineer approved products.

PART 2 PRODUCTS

2.1 DESCRIPTION

- .1 The pump systems shall include the supply and installation of the specified submersible pumps and shall include the following accessories:
 - .1 cast iron discharge elbows
 - .2 lifting guide rails (stainless steel)
 - .3 guide rail supports (stainless steel)
 - .4 anchor bolts (stainless steel)
 - .5 pump lifting chains (stainless steel)
 - .6 lifting davit and hoist
 - .7 Flygt control & status (CAS) monitoring unit or approved alternative.

2.2 DESIGN CONDITIONS

.1 Sludge Feed Pump

Parameter	Value
Average daily sludge volume	136 m3/d
Typical sludge concentration	0.8% TS
Sludge composition	PS + WAS
Operation	Continuous or intermittent on demand
Pump location	Sludge EQ Tank; submerged
Static Head	7.5 m
Power	575/3/60
Drive Type	VFD
Controls	Via RDT Control Panel

2.3 MATERIALS

.1 Pump Construction

- .1 The pump shall be a submersible, non-clog, solids handling type with cast-iron vane impeller conforming to ASTM A-278.
- .2 Pump volute, motor and seal housing to be high quality cast-iron conforming to ASTM A-278.
- .3 All external mating parts to be machined and sealed with O-rings.
- .4 All fasteners or hardware including the motor nameplate exposed to the pumped liquid shall be stainless steel. Pump and motor shaft shall be stainless steel, one piece.
- .5 Pump shall have two mechanical seals, mounted in tandem, with an oil chamber between the seals. The rotating seal surfaces to be carbon and the stationary seal faces to be ceramic. The outboard seal next to the impeller shall be provided with tungsten carbide faces. Provide removable inspection plugs.
- .6 Replaceable case wearing ring to be bronze with 304 stainless steel fasteners.
- .7 All rotating components of the pump shall be statically and dynamically balanced as an assembled unit and shall be such as to produce a minimum vibration under service conditions.

.2 Pump Accessories

- .1 Pump guide rail system shall be supported by the pump base plate assembly or the pump discharge elbow.

- .2 The discharge elbow shall be cast-iron conforming to ASTM A-278.
 - .3 Anchor bolts - 316 stainless steel.
 - .4 Pump lifting/guide rail system shall be designed to allow removal of the pump without disturbing the discharge piping and shall be complete with stainless steel lifting chains.
 - .5 The pump discharge flange and the discharge elbow surface shall be machined and/or provided with seals to minimize leakage during pumping cycle.
- .3 Motors
- .1 General
 - .1 Motors shall be in accordance with EEMAC. Design Letter B, EEMAC Code Letter G and CSA Standards. Motors shall be suitable for inverter duty (except for scum pumps).
 - .2 Motors shall be provided in accordance with motor data listed below, and shall be capable of satisfactory operation at voltage of 10% above or below the rated value without harmful effects.
 - .3 Motors shall be sized to always exceed the kilowatt requirements of the pump at any point on the pump curve by at least 10%.
 - .4 Motors shall have a premium efficiency. Each motor shall have a 1.15 service factor or better.
 - .5 Motor winding, rotor and bearings to be in a sealed submersible type housing, with moisture sensing probe. Motors shall be capable of operating with motor only partially submerged.
 - .6 Motors shall be identified by a manufacturer's rating nameplate in permanently inscribed material attached to the unit.
 - .7 Motors shall be designed for continuous duty, submerged or not submerged, and shall be capable of at least 10 spaced starts per hour.
 - .8 Motors shall be fully overload protected.
 - .2 Motor Construction
 - .1 Bearings to be factory prelubricated for low maintenance and bearing life shall be not less than AFBMA B-10 life - 100,000 hours.
 - .2 Provide lifting lugs for full weight of pump and motor.
 - .3 Rotating components shall be statically and dynamically balanced to provide a minimum of vibration under service conditions.
 - .4 Provide double mechanical seals.
 - .3 Motor Protection
 - .1 Provide one (1) embedded resistance type temperature detector for winding temperature alarm with two (2) detectors in each phase of the startor windings for use with winding temperature relay in pump control panels.
 - .2 Resistance temperature detectors to be 100 ohm platinum type.
 - .4 Cables
 - .1 Power cables shall be sized to match the pump supplied, and the location and shall be fully waterproof cable and connections.
- .4 System Accessories

- .1 Supervisory Relay - Provide supervisory relay to monitor moisture, bearing and temperature sensors and provide contact output - Flygt control & status (CAS) monitoring unit or reviewed alternative.

2.4 CONTROL STRATEGY

- .1 See Specification 43 71 23

2.5 SPARE PARTS AND MAINTENANCE MATERIALS

- .1 Provide a list of critical spare parts

PART 3 EXECUTION

3.1 MANUFACTURER'S REPRESENTATIVE

- .1 The Contractor shall unload and store the equipment at the site in a suitable fashion, as recommended by the equipment manufacturer. If required, the Contractor shall erect a suitable weather protected enclosure for equipment storage.
- .2 The Contractor shall furnish and install equipment anchor bolts per the recommendations of the Equipment Contractor.
- .3 The Contractor shall run and land all required electrical and control wires.

3.2 INSTALLATION

- .1 Ensure the equipment is installed as required to provide satisfactory service.
- .2 Instruct installer in the methods and precautions to be followed in the installation of the equipment. Certify the installers understanding by completing Form 101 as illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.
- .3 Cooperate with the installer to fulfill the requirements for a successful installation, as documented by Form 102, illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.

3.3 TESTING

- .1 After installation, and start-up and debugging, the thickener feed pump shall be tested to assure conformance with the performance criteria. The performance criteria include the following:
 - .1 Pump flow rate in manual operation at minimum and maximum speed.
 - .2 Pump automatic operation based on the RDT control panel signals.
- .2 The Owner reserves the right to evaluate any and all data from the testing program, and to formulate the final conclusions regarding performance on the basis of the demonstrate system performance.
- .3 The pump supplier shall make any and all modifications to the system as required to provide satisfactory operation at no additional cost to the Owner.

- .4 Cooperate with the installer to fulfill the requirements for successful testing of the equipment as documented by Form 103, illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.

3.4 COMMISSIONING

- .1 Commissioning is defined as a 30-day period of operation which with the following conditions:
 - .1 Fully automated operation
 - .2 No interruptions due to critical equipment or control system failure or unscheduled maintenance
- .2 When commissioning testing are fulfilled, it should be documented by Form 104, illustrated in Section 01 66 20 – Commissioning and Handover.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

- .1 This Section specifies the supply, testing and commissioning of all necessary equipment and controls for:
 - .1 One Rotary Drum Thickener (RDT)
 - .2 Flocculation Tank
 - .3 Local Control Panel (for Rotary Drum Thickener, Rotary Drum Thickener Feed Pump, and Polymer Feed System.)
 - .4 All other access platforms and appurtenances necessary for a complete and operational system
- .2 The system is intended to thicken waste activated sludge from an SBR system operating in Sooke, BC. The system is intended to operate automatically and be fully integrated in the existing plant infrastructure.
- .3 In addition to providing the control of the Rotary Drum Thickener the supplied Local Control Panel provided under this specification will also provide all required control components, hardware and software, necessary to provide the control of the related Polymer Feed System and the Rotary Drum Thickener Feed and Discharge Pumps.
- .4 The Contractor will provide system installation under the Supplier guidance and will provide support during testing and commissioning.

1.2 SUBMITTALS

- .1 Shop Drawings: Submit in accordance with Section 01 30 00 - Submittals, include the following:
 - .1 Certified shop and erection drawings, showing all important details of construction, dimensions and anchor bolt locations.
 - .2 Complete Bill of Materials
 - .3 Descriptive literature, bulletins and/or catalogs of the equipment.
 - .4 Ancillary equipment performance information.
 - .5 Furnish all information required in shop drawing submittal requirements.
 - .6 The total weight of the equipment, including the weight of the single largest item.
 - .7 A list of the manufacturer's recommended spare parts. Include gaskets, packing and related items on the list. List bearings by the bearing manufacturer's numbers only
- .2 Complete assembly and installation drawings, together with detailed specifications and data covering material used, parts, devices, and other accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. The data and specifications for each unit shall include, but not be limited to, the following:

1. Rotary Drum Thickener and Auxiliary Equipment
 - a. Type and model of unit
 - b. Description of gravity drainage and screen
 - c. Sludge flocculation tank details
 - d. Shower header details
 - e. Sludge feed, washwater and filtrate connections
 - f. Type, make and full details of all bearings
 - g. Gearbox literature
 - h. Lubrication requirements
 - i. Discharge system
 - j. All material types, thicknesses, and finishes

2. Motors
 - a. Name of manufacturer
 - b. Type and model
 - c. Rated size of motor HP
 - d. Temperature rating
 - e. Base speed
 - f. Net weight
 - g. Maximum operating speed
 - h. Rated voltage
 - j. Constant Torque speed range
 - l. Service factor

3. Control Panel
 - a. Dimension and layout details
 - b. Materials of construction
 - c. Brand names and catalog literature on all control devices, such as, but not limited to:
 - (1) PLC
 - (2) Operator Interface Terminal
 - (3) Fused disconnects
 - (4) Motor starters
 - (5) Terminal blocks
 - (6) SCR controllers
 - (7) Alarm initiating devices
 - (8) All switches and lights
 - (9) Timers, relays and related equipment
 - (10) Control System equipment

 - d. Electrical connection diagrams and ladder type schematics, identifying all items requiring electrical control or power for operation of the equipment, shall be submitted for review. Submittals shall verify each applicable feature in this Specification. All schematics shall number each wire and terminal to coincide with the assembled equipment. Each contact, timer and related items shall be labeled to coincide with the equipment installed in the local control panel and on the equipment. The

schematics shall be supplemented by a narrative detailing equipment start-up and shutdown functions as they relate to the electrical devices.

- e. The drawings shall indicate the conduit and wiring requirements between the local control panel and thickener equipment that will be installed by the Contractor.
- .3 Operation and Maintenance Manual: Provide data for incorporation in the Operation and Maintenance Manual. Include complete operation description together with process control narrative, general arrangement and detailed drawings, wiring diagrams for power and control schematics, parts catalogue with complete list of repair and replacement parts with Section drawings illustrating the connections and identifying numbers.

1.3 COORDINATION

- .1 Coordinate with other Divisions to ensure there are no conflict in the work.
- .2 Polymer Feed System is specified in Section 43 32 69
- .3 Rotary Drum Thickener Pump is specified in Section 43 25 13
- .4 The Owner will provide Thickened Sludge Pump
 - .1 The pump is positive displacement type by Sydex Model BK052-1L

1.4 QUALITY ASSURANCE

- .1 Give complete responsibility for the final design, furnishing, coordination, assembly and installation supervision of all components in the RDT to a single manufacturer-supplier, regularly engaged in the design, manufacture, assembly and production of similar equipment. It is also intended that such a manufacturer-supplier make all adjustments, alterations, replacements, and tests specified and required, for a complete, satisfactory, and trouble-free operating installation.

1.5 SHIPMENT PROTECTION AND STORAGE

- .1 Ship pre-assembled to the degree that is possible.
- .2 Provide storage instructions indicating specific requirements to ensure there is no uneven wear, distortion, or weathering of components.
- .3 Identify all other special storage requirements.

PART 2 PRODUCTS

2.1 DESCRIPTION

- .1 Furnish all equipment and incidentals for one (1) Sludge Thickening system including one (1) Rotary Drum Thickener (RDT), one (1) Flocculation Tank with mixer, and one (1) local control panel. All equipment in this section shall be supplied by a single manufacture to ensure system responsibility and equipment compatibility.

- .2 The system described herein shall be capable of thickening waste activated sludge (WAS). The thickened sludge shall be greater than 4.0% Total Solids.
- .3 The sludge thickening equipment shall be designed to adequately condition and thicken the sludge such that thickened sludge is produced that easily discharges from the thickening unit, without blinding.
- .4 The system shall be designed to operate in the environment for which it is intended, continuously or intermittently on demand, and shall perform the required thickening operations without spillage of water or sludge beyond the nominal machine envelope.

2.2 DESIGN CONDITIONS

Parameter	Value
Average daily sludge volume	136 m3/d
Typical sludge concentration	0.8% TS
Sludge composition	PS + WAS
Operation	Continuous or intermittent on demand

2.3 ACCEPTABLE MANUFACTURERS/SUPPLIERS

- .1 Parkson Corporation
- .2 JWC Environmental
- .3 Approved alternative

2.4 MATERIALS

- .1 All materials used in the construction of the sludge thickening equipment shall be of the best quality and entirely suitable in every respect for the service required. All materials shall conform to the ASTM Specifications where such specifications exist; the use of such materials shall be based on continuous and successful use under similar conditions of service.
- .2 Unless otherwise specified herein, all materials in contact with polyelectrolyte or sludge shall be of Type 304 stainless steel.

Bearing housings	coated cast iron or
Covers	304 Stainless steel
Shower Header and nozzles	304 Stainless steel
Shower Header	304 Stainless Steel
Thickened Sludge Hopper	304 Stainless steel
Flexible Boot	Reinforced Molded Rubber
Drain pan	304 Stainless steel

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- | | | |
|--|----------------------|---------------------|
| | Frame | 304 Stainless Steel |
| | Hardware, fasteners, | 304 stainless steel |
| | Flocculation tank | 304 stainless steel |
- .3 RDT Structural framework
- .1 The framework shall be of welded and/or bolted construction. All welding shall conform to the American Welding Society Structural Welding Code. The structure shall be designed for installation on a prepared concrete foundation and secured with anchor bolts. Permanent lifting lugs shall be provided as necessary, to allow installation and removal of the unit.
- .2 The construction shall allow easy access and visual contact of all internal components.
- .4 RDT Drum Support Shaft
- .1 The full length drum support shafts shall be supported by a pillow block bearing mounted at each end outside the wetted environment. The shafts shall be fully coated with polyurethane and machined to match the drum support points. The polyurethane shall have a minimum thickness of ½ inch on all drum supporting surfaces. The shafts shall have stub ends manufactured from 17-4 stainless steel.
- .2 Designs must incorporate all bearing located outside of the wetted environment.
- .5 RDT Bearings
- .1 All rollers shall be supported by 3" greaseable type, high capacity "E" design roller bearings, equipped with a metal cages, in sealed, splash proof, pillow block housings. All Shafts shall be supported by self-aligning spherical roller bearings mounted in fixed pillow block housings.
- .2 All bearings shall have a minimum L10 bearing life of 675,000 hours, calculated by using the latest ANSI/AFBMA, standard. The L10 life shall be based on the summation of all forces applied to the bearings. Certified calculations, based on the AFBMA/ISO capacity formula, showing that all bearings comply with the specified requirements for minimum L10 bearing life, at maximum loadings, shall be submitted to the engineer as set forth in the contract documents.
- .3 Bearing housings shall be class 30 cast iron with two stainless steel mounting bolts and two stainless steel cap bolts.
- .4 The bearing seal in the pillow block housing shall be of nonmetallic construction with a carrier/flinger, which rotates with the roller shaft. A static sealing arrangement between the carrier/flinger and the shaft shall be a triple rubber seal, constructed in a manner that prevents relative rotation between the seal and the shaft. A dynamic sealing arrangement between the carrier/flinger and the bearing housing shall consist of a primary dynamic contact seal of ozone resistant rubber which shall seal by rotational contact with a machined housing surface.

- .5 Bearing lubrication shall be performed through a type 304 stainless steel grease fitting mounted on the bearing housing. All bearings shall be greaseable while the unit is in operation. Lubrication shall not be required more often than once every month.
- .6 RDT Wash System
- .1 Each thickener shall be equipped with individual washwater systems. The shower system will be designed for 40 PSIG water pressure and shall not require the use of a booster pump. The spray tube and nozzle assembly shall be readily removable.
- .2 Nozzle spacing and spray pattern shall be such that the sprays from adjacent nozzles overlap one another at the drum surface. Individual nozzles shall be replaceable.
- .3 Each wash spray tube shall be positioned at the top of the drums and shall extend the full length the drum. The washwater system shall be suitable for use with plant effluent water supplied at a minimum pressure of 40 psig.
- .4 The shower header shall be equipped with a manually operated handwheel attached to a flush valve and a series of internal brushes which can clean any debris accumulated on the inner surface of the nozzle orifice. When the handwheel is rotated counterclockwise, the flush valve is opened so debris dislodged from the nozzle orifices is flushed from the header. When the handwheel is rotated clockwise, the flush valve is closed and the header returned to normal operation.
- .7 RDT Drum Drive
- .1 Input power to the drive roller shaft is supplied through an A.C., high efficiency inverter rated motor via a VFD through a shaft mounted gearbox. The gearbox shall connect directly to the drive shaft. Drive roller rotational speed shall be controlled through variation in motor frequency, which is regulated by the operator input to a variable frequency drive controller. The VFD shall be mounted in the RDT local control panel.
- .2 Alternatively drive sprocket and chain can be provided. Material should be 304 stainless steel including chain guard.
- .8 RDT Filtrate Pan
- .1 Filtrate pan shall be provided as necessary to contain filtrate from all dewatering areas within the thickener without splashing and to prevent re-wetting of downstream thickened sludge. All filtrate piping shall be furnished, adequately sized for the intended service, and rigidly attached to the thickener frame. Filtrate piping shall terminate at a flanged connection at the bottom of the filtrate

pan. Flushing connections or similar provisions shall be provided for easy access during cleaning. Filtrate pan shall be located such that the moving parts do not come into contact with the pan under any conditions.

.9 Flocculation Tank

- .1 The Rotary Screen Thickener shall be provided with a sludge flocculation tank, designed to efficiently mix polymer with the sludge and to adequately condition the sludge for optimum thickener performance.
- .2 The flocculation tank shall be mounted upstream of the thickener and shall consist of a flocculation tank, and a mechanical mixer mounted inside the flocculation tank.
- .3 The flocculation tank shall be constructed of 304 stainless steel throughout. The flocculation tank shall be self-supporting.
- .4 The flocculation tank shall be supplied with a mechanical mixer. The mixer shall be equipped with a TEFC, 575 VAC, 3 phase, inverter duty rated motor sized by the manufacturer to provide adequate mixing energy for the intended flow rate. The mixer motor speed shall be adjustable with a VFD mounted in the RDT local control panel.

.10 Control System

- .1 One (1) local control panel (LCP) shall be furnished and installed for each thickening system. The RDT shall be controlled by the combined LCP that will contain all necessary control devices and equipment for complete controls of the RDT system, which includes but is not limited to controls for the thickener drum drive, wash system, polymer system, and feed pump etc.
- .2 LCP Description:
 - .1 Each local control panel enclosure shall be free-standing and fabricated of type 304 stainless steel and shall be rated NEMA 4X, as manufactured by Hoffman or approved equal. The equipment, controls, components, and control panels for all thickening equipment and ancillary equipment shall be UL listed. The control panel shall be UL listed and shall be assembled in a UL listed facility. The local control panel and its ancillary control components shall be as specified herein and as specified in specification Sections 01 60 12 and 01 70 12.
 - .2 The control panel shall accept a 575 VAC, 60 hertz, 3 - phase power input and be equipped with a door interlocked fused disconnect. When the disconnect is in the open position, all power shall be removed from the control system.
 - .3 The local control panel shall be equipped with a control power transformer fused primary and secondary with 120VAC transient voltage surge suppressor (TVSS).

- .4 The local control panel shall be equipped with a programmable logic controller (PLC) by Allen Bradley, CompactLogix PLC or ControlLogix, with sufficient relays and timers to monitor equipment-mounted electrical devices and to perform necessary control functions. All required I/O modules, Ethernet communication modules, and power supplies, etc. shall be furnished to connect all available I/O into the PLC. The PLC in the LCP shall communicate to the plant control system using Ethernet.
- .5 The equipment manufacturer shall provide IEC rated motor starters with short circuit protection for all motors in each RDT system. Motor control for the mixer motors, the drum drive motors, and the Thickened Sludge Pump shall be via variable frequency drives (VFDs) mounted inside the LCP. The speed of the floc tank mixer motors and the drum drive motors shall all be adjustable from the RDT local control panel. The speed of the Thickened Sludge Pump motor shall be controlled through the RDT local control panel to maintain a constant setpoint level in the thickened sludge hopper as determined by the level transmitter. All VFD's for the RDT system shall meet the requirements of Electrical Specification, Section 01 60 12.
- .6 Located on the front of the control panel shall be an Allen Bradley PanelView 5000 or PanelView Plus 7 series HMI or equal (10" or larger) for operator control of the system.
- .7 All other alarms, controls, switches, outputs, ladder logic programming, or other programming required to properly operate the RDT system, Polymer Feed System and the Rotary Drum Thickener Feed Pump shall be provided by the system manufacturer at no additional cost to the Owner.
- .8 All RUN, FAIL, and ALARM status from all equipment shall be integrated and displayed on LCP HMI system. The Contractor shall be responsible for coordinating with the RDT equipment manufacturer and the Systems Integrator to provide the control and status of the equipment as specified on the existing plant SCADA system.
- .9 Provide a front panel mounted HMI for local operator interface when the system is under PLC control. As a minimum, the following control pilot devices shall be located on the front of each RDT LCP to provide manual operation:
 - .1 RDT System EMERGENCY STOP mushroom style push-pull illuminated button
 - .2 CONTROL POWER ON-OFF selector switch
 - .3 CONTROL POWER ON status light

2.5 CONTROL STRATEGY

- .1 The equipment manufacturer shall furnish at minimum, the controls as specified herein. The control strategy for any other items and equipment integral to the RDT and required for the proper operation of the RDT and its ancillary systems shall be programmed and controlled per the equipment manufacturer at no additional cost to the Owner.

- .1 For RDT control, the LCP shall be equipped with a digital HAND-OFF-REMOTE switch. In HAND mode, the RDT shall be manually controlled by the operator using the START/STOP pushbuttons on the HMI. In REMOTE mode, the RDT shall be controlled from the Auto sequence command on the HMI and through the main plant PLC. The RDT equipment manufacturer shall be responsible for the control logic for the automatic operation of the RDT.

- .2 For floc tank mixer control, the LCP shall be equipped with a digital HAND-OFF-AUTO switch. In HAND mode, the floc tank mixer shall be manually controlled by the operator using the START/STOP pushbuttons on the HMI. In REMOTE mode, the floc tank mixer shall be controlled from the Auto sequence command on the HMI.

- .3 For Thickened Sludge Pump (supplied by the Owner) control, the LCP shall be equipped with a digital HAND-OFF-REMOTE switch. In HAND mode, the Thickened Sludge Pump shall be manually controlled by the operator using the START/STOP pushbuttons on the HMI. In REMOTE mode, the Thickened Sludge Pump shall be controlled from the Auto sequence command on the HMI. The Thickened Sludge Pump equipment manufacturer shall be responsible for the control logic for the automatic operation of the Thickened Sludge Pump.

- .4 The RDT LCP shall control the sludge feed using the input from the flow meter (supplied by others) and the operator set-point for desired flow. The PLC shall vary the thin sludge feed pump (supplied by others) speed to maintain a constant flow to the RDT.

- .5 The RDT LCP shall pace the polymer flow based on ratio control to the sludge feed into the RDT Flocculation Tank Only. A signal input for the flocculation tank flow meter will be used.

- .6 The RDT LCP will control the Thickened Sludge Pump speed, based on the level hopper. The Thickened Sludge Pump will vary flow to maintain a constant level. The pump speed will be adjustable from a VFD located in the RDT LCP. The level input to the PLC will be provided from the thicken sludge hopper level transmitter.

- .7 The equipment manufacturer shall be responsible for providing any interlocks required for the proper operation of RDT system.

2.6 PAINTING

- .1 Shop prime and paint all ferrous components of the equipment with high build epoxy in accordance with Section 46 90 00.
- .2 Finish stainless steel components in accordance with Section 46 90 00.

2.7 SPARE PARTS AND MAINTENANCE MATERIALS

- .1 Provide a list of critical spare parts

PART 3 EXECUTION

3.1 MANUFACTURER'S REPRESENTATIVE

- .1 The Contractor shall unload and store the equipment at the site in a suitable fashion, as recommended by the equipment manufacturer. If required, the Contractor shall erect a suitable weather protected enclosure for equipment storage.
- .2 The Contractor shall furnish and install equipment anchor bolts per the recommendations of the Equipment Contractor.
- .3 The Contractor shall set the thickeners, control panels, and appurtenant equipment on foundations and grout the units.
- .4 The Contractor shall run and land all required electrical and control wires. The rotary drum thickener supplier shall coordinate with the plant system integrator to integrating the controls between the local panel and plant SCADA system.

3.2 INSTALLATION

- .1 Ensure the equipment is installed as required to provide satisfactory service.
- .2 Provide control system programming assistance to ensure effective data communication between the plant PLC/SCADA system, and signal sharing between the Polymer Blend System and the Rotary Drum Thickener Control.
- .3 Instruct installer in the methods and precautions to be followed in the installation of the equipment. Certify the installers understanding by completing Form 101 as illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.
- .4 Cooperate with the installer to fulfill the requirements for a successful installation, as documented by Form 102, illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.

3.3 TESTING

- .1 After installation, and start-up and debugging, the thickening unit shall be tested to assure conformance with the performance criteria.

- .2 The Rotary Screen Thickeners shall be operated by the equipment manufacturer under the supervision of the engineer or plant staff. The unit shall be fed sludge and shall be operated until the unit reaches steady state optimum performance. The unit shall then begin a 2-day, 6-hour per day run period during which the average performance of the unit must equal or exceed the guaranteed performance parameters. If the unit fails to equal or exceed that required, or cannot operate continuously during the duration of the test, due to equipment failure, the test shall be repeated. The Contractor shall be given 30 calendar days to optimize performance to produce results to equal or exceeding the guaranteed performance criteria.
- .3 The following sample feed rates, calibrations or setting, shall be taken in specified 1 hour intervals. Samples shall be taken by the Owner and analyzed by a laboratory designated by the Owner and paid for by the Owner.
 - .1 Sludge feed - total solids (sludge only).
 - .2 Filtrate – total suspended solids.
 - .3 Final thickened sludge - total solids.
 - .4 Polymer feed rate – Meters cubed per hour.
 - .5 Sludge feed rate - Liters per minute.
 - .6 Polymer feed pump Speed
 - .7 Setting for sludge feed pump.
 - .8 Setting for thickener drum drive speed.
- .4 The average results of the two day test will be used to evaluate the equipment performance.
- .5 The Owner reserves the right to evaluate any and all data from the testing program, and to formulate the final conclusions regarding performance on the basis of the demonstrate system performance.
- .6 The thickener supplier shall make any and all modifications to the system as required to provide satisfactory operation at no additional cost to the Owner.
- .7 Cooperate with the installer to fulfill the requirements for successful testing of the equipment as documented by Form 103, illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.

3.4 COMMISSIONING

- .1 Attend during commissioning of the process system that includes the equipment specified in this section and to ensure the equipment functions as intended in the process system.
- .2 Commissioning is defined as a 30-day period of operation which with the following conditions:
 - .1 Fully automated operation
 - .2 Performance criteria achieved

- .3 No interruptions due to critical equipment or control system failure or unscheduled maintenance
- .3 When commissioning testing are fulfilled, it should be documented by Form 104, illustrated in Section 01 66 20 – Commissioning and Handover.

END OF SECTION

Part 1 General

1.1 WORK INCLUDED

- .1 This section includes the general requirements for the supply, delivery, and assistance with installation, testing and placement into operation of a complete liquid polymer blending system and appurtenances as specified herein and as shown on the drawings. The equipment shall be suitable for feeding emulsion or dispersion polymers.

- .2 Components of the polymer feed systems included, but are not limited to the following:
 - .1 Polymer Feed System:
 - .1 Make-down unit with duty / standby pumps
 - .2 All interconnecting piping, valves, wiring, and accessories to connect the pump assembly together to form a complete and workable chemical feed system.
 - .3 System controls

1.2 RELATED WORK

- .1 Section 44 43 26 – Rotary Drum Thickener
- .2 Section 43 25 13 – Rotary Drum Thickener Feed Pump

1.3 SUBMITTALS

- .1 Submit information for polymer feed system as follows:
 - .1 General layout, construction details, materials of construction and recommended spare parts list for the polymer make-down unit.
 - .2 Polymer make-down unit data as required in the following list:
 - .1 Rated capacity (L/h) of polymer blender
 - .2 Dilution water requirements (L/h)
 - .3 Suction and discharge pipe sizes (mm)
 - .3 Dimensioned layout of polymer make-down unit.
 - .4 Submit detailed information related to requirements for each electrical motor to ensure that the Rotary Drum Thickener control panel can be fitted with power supply, motor starter (or VFD), and control components required to safely energize and operate the polymer feed system motors.
 - .5 Submit system control drawings complete with details of all on skid components to be interfaced with the Rotary Drum Thickener control

panel including: complete bill of materials and all required wiring systems for all for polymer blender, metering pumps and controls.

- .6 Provide a complete and detailed control narrative document. The document will provide all required information to allow the successful programming of the Rotary Drum Thickener PLC to provide safe and accurate control. The control narrative document will also indicate all system conditions that should be alarmed to the operator and a complete list of system performance parameters that should be recorded in a trend archive.
- .7 General layout, construction details, and materials of construction for the day tank.
- .8 Certified shop test results for the polymer feed system.
- .9 Submit installation manuals before shipment of any equipment.
- .10 Submit as part of the bound, indexed manual for all equipment, the installation, operation and maintenance manuals, 30 days prior to start up.
- .11 Diluted polymer metering pumps capacity, turndown ratio, dimensions, general layout, installation details, and recommended spare parts list.

1.4 MANUFACTURERS

- .1 The polymer make-down unit shall be the product of a company regularly engaged in the manufacture and supply of this type of equipment and whose equipment is of a design which has been in satisfactory service under similar conditions for not less than five (5) years.
- .2 The polymer make-down unit shall be:
 - .1 Polyblend,
 - .2 Fluid Dynamics,
 - .3 DulcoBlend, or
 - .4 Approved alternative.

Part 2 Products

2.1 SERVICE CONDITIONS

- .1 The polymer feed systems shall be provided to feed polymer solution to the application point which is a flocculation tank of the Rotary Drum Thickener. The polymer feed rate is normally determined based on the sludge flow rates and chemical dose requirements.
- .2 The design criteria are as follows:
 - .1 Design Waste Activated Sludge Flow: 136 m³/d

- .2 Design WAS solids: 1155 kg/d
- .3 Sludge composition: mixture of PS + WAS from SBR system
- .3 Polymer Blending system
 - .1 Neat Polymer Dose: 2.0 – 7.0 g of polymer per kg of dry solids
 - .2 Polymer dilution ratio: up to 200:1
 - .3 Neat polymer pump rate minimum turndown ratio 100:1
 - .4 Neat polymer pump suction lift: minimum 2 m
- .4 Assume neat product composition to be 100% product.

2.2 POLYMER BLENDING SYSTEM

- .1 The neat polymer will be transferred to the dilution blender by the metering pump(s). Water will be supplied to the dilution blender simultaneously in proportion to the chemical flow to dilute the polymer solution to a concentration of 0.5 to 1.0 %. The dilution ratio shall be adjustable from the control panel of the make-down system.
- .2 The polymer blending equipment shall be skid mounted and shall include duty and shelf spare metering pumps and polymer dilution blender(s) as specified below, and complete with piping, accessories, and instrumentations.
- .3 The dilution blender shall be designed for complete and thorough mixing to provide a diluted polymer solution without fish-eyes and without degradation of the long-chain polymer molecules.
- .4 The dilution blender shall have a solenoid valve for ON/OFF control of dilution water, and a rotameter-type flow indicator/regulator equipped with an integral rate-adjusting valve. The rotameter shall be rated to handle the water flow rate specified herein for the various services.
- .5 A flow sensor shall be provided for each system to shut down the system upon water flow interruption.
- .6 All Polymer feed system measurement and control signals (discrete status, discrete command, analog measurement and analog command) shall be wired to a single marshalling junction box. Wiring interconnections between the marshalling junction box and the Rotary Drum Thickener control panel is to be provided by the project contractor based on system supplier drawings.
- .7 The marshalling junction box and related components shall meet the requirements defined in *Section 01 60 12 General Electrical Requirements* and *Section 01 70 12 General Instrument Requirements* of this specification.

- .8 The polymer system motors shall be provided with a ON/OFF lockable disconnect switch at each motor power connection.
- .9 Electric motors smaller than 0.75Hp are to be feed at 120VAC from motor starters, or DC drives, located within the Rotary Drum Thickener system control panel. Electric motors larger than 0.75Hp are to be feed at 600V 3Ø from motor starters or variable frequency drives installed in the project supplied Motor Control Center, and controlled from the Rotary Drum Thickener system control panel.
- .10 All supplied electrical systems and components shall meet the requirement of the Canadian Electrical Code and the requirements specified in *Section 01 60 12 General Electrical Requirements* of this specification.

Part 3 Execution

3.1 MANUFACTURER'S REPRESENTATIVE

- .1 The Contractor shall unload and store the equipment at the site in a suitable fashion, as recommended by the equipment manufacturer. If required, the Contractor shall erect a suitable weather protected enclosure for equipment storage.
- .2 The Contractor shall furnish and install equipment anchor bolts per the recommendations of the Equipment Contractor if required.
- .3 The Contractor shall run and land all required electrical power and control wiring between vendor supplied connection points.

3.2 INSTALLATION

- .1 Ensure the equipment is installed as required to provide satisfactory service.
 - .1 The services of the field representative should be included as needed and described in the equipment submittal.
 - .2 The Owner shall notify The Supplier when the installation of the polymer blending system has been completed. A representative of the supplier shall inspect the installation. The Owner shall be advised in writing of any corrections or adjustments that are required for the equipment installation. After the installation has been completed to the supplier's satisfaction, a letter of certification that all equipment is installed in accordance with its instructions and that the equipment is ready for operation shall be furnished.
 - .3 A process engineer shall complete operator process training including review of the controls description, a discussion of the process control features, instrument calibration and maintenance procedures, and

recommend adjustments to process setpoints based on initial plant operating data.

- .2 Provide control system programming guidance and assistance to ensure complete and accurate control of the Polymer Blend System is provided from the Rotary Drum Thickener control panel.
- .3 Instruct installer in the methods and precautions to be followed in the installation of the equipment. Certify the installers understanding by completing Form 101 as illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.
- .4 Cooperate with the installer to fulfill the requirements for a successful installation, as documented by Form 102, illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.

3.3 TESTING

- .1 After installation, and start-up and debugging, the polymer system shall be tested to assure conformance with the performance criteria. The performance criteria include the following:
 - .1 Polymer flow rate.
 - .2 Water flow rate and dilution ratios
- .2 The Owner reserves the right to evaluate any and all data from the testing program, and to formulate the final conclusions regarding performance on the basis of the demonstrate system performance.
- .3 The polymer system supplier shall make any and all modifications to the system as required to provide satisfactory operation at no additional cost to the Owner.
- .4 Cooperate with the installer to fulfill the requirements for successful testing of the equipment as documented by Form 103, illustrated in Section 01 65 00 – Equipment Installation and Operational Testing.

3.4 COMMISSIONING

- .1 Commissioning is defined as a 30-day period of operation which with the following conditions:
 - .1 Fully automated operation
 - .2 No interruptions due to critical equipment or control system failure or unscheduled maintenance
- .2 When commissioning testing are fulfilled, it should be documented by Form 104, illustrated in Section 01 66 20 – Commissioning and Handover.

END OF SECTION