DISTRICT OF SOOKE

REQUEST FOR TENDER
TENDER 1790-20-WWTP-002

SUPPLY AND DELIVERY OF DEWATERING EQUIPMENT

DISTRICT OF SOOKE WWTP UPGRADES 2019

June 7th, 2019

The District of Sooke invites qualified Tenders for the supply, delivery, start-up and commissioning of a new decanting centrifuge and related equipment for incorporation into the District of Sooke WWTP Upgrades 2019 in the District of Sooke, BC. The tender consists of the supply, start-up and commissioning and delivery of a new decanting centrifuge and polymer injection 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:	**Friday June 28, 2019** *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: Rob Howat, Director of Development Services
Tender Enquiries:	Stan Spencer, P.Eng., Stantec Consulting Ltd. Telephone: 250.389.2376 Email: stan.spencer@stantec.com

DISTRICT OF SOOKE

RECEIPT CONFIRMATION FORM

REQUEST FOR TENDER
TENDER 1790-20-WWTP-002

SUPPLY AND DELIVERY OF DEWATERING EQUIPMENT

DISTRICT OF SOOKE WWTP UPGRADES 2019

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: _____

Part 1 **Invitation**

1.1 **INVITATION TO TENDER**

The District of Sooke (the "District") invites Tenders from qualified Tenderers for the supply, delivery, start-up and commissioning of a decanting centrifuge and related equipment.

1.2 **SCOPE OF SUPPLY AND DESCRIPTION OF GOODS**

.1 The supply, delivery, start-up and commissioning of dewatering equipment for incorporation into the District of Sooke WWTP Upgrades 2019 in Sooke, BC. This consists of the following.

.1 Supply of a 30 m^3/hour decanting centrifuge for dewatering aerobically digested SBR waste activated sludge at the Sooke Wastewater Treatment Plant in Sooke, British Columbia.

.2 Supply of a polymer solution preparation and blending system compatible with the proposed decanting centrifuge.

.3 Supply of two (2) progressive cavity sludge feed pumps compatible with the proposed decanting centrifuge.

.4 Supply of an integrated Programmable Logic Control (PLC) system for the control and operation of the new decanting centrifuge, the existing centrifuge, polymer preparation and blending system, sludge feed pumps and dewatered cake screw conveyors (3 total).

.5 Installation support services.

.6 Testing, start-up and commissioning support services

.2 This tender consists of the supply, delivery, start-up and commissioning of a dewatering centrifuge and related equipment, as detailed on the drawings and in the specifications (the "Goods").

.3 Delivery Point: Sooke Waste Treatment Facility, V9Z 0S2.

1.3 **TENDER SUBMISSION**

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

Rob Howat, Director of Development Services
District of Sooke
2205 Otter Point Road
Sooke, British Columbia
V9Z 1J2

Tender Closing Time: **2:00 p.m. local time**
Tender Closing Date: **Friday June 28, 2019**

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 Tender Enquiries and Addenda

3.1 Enquiries should be addressed to the Contact Person: Stantec Consulting Ltd.
Stan Spencer, P.Eng.
Telephone: 250.389.2545
Email: stan.spencer@stantec.com

3.2 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.

3.3 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.

3.4 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.

3.5 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. 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.

Part 4 Inspection of Delivery Point

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.

Part 5 Completion of Tender Documents

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

5.2 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.

5.3 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.

Part 6 Solicitation

6.1 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.

Part 7 Submission of Tenders

7.1 The Tenderer must submit the following completed and executed documentation:

.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.

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

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 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.

7.6 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.

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

7.8 Tenderer must acknowledge receipt of all Addenda.

Part 8 Withdrawal of Tenders

8.1 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 9 Irrevocability of Offer

9.1 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.

9.2 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.

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;

.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.

10.2 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.

10.3 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.

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

10.5 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 accept a Tender with some, all or none of such optional items.

Part 11 Successful Tenderer Requirements

11.1 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.

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

.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 Disclaimers/Limitations of Liability

13.1 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.

13.2 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.

Part 14 **Novation Agreement**

14.1 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.

END OF SECTION

TENDER FORM

Contract: SUPPLY AND DELIVERY OF DEWATERING 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 DEWATERING 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.

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.

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 Dewatering Centrifuge and full dewatering system PLC summarized in Section 46 76 00 drawings as part of this Tender package.	1	LS	$	$
2	Supply and delivery of Dewatering Centrifuge feed pumps summarized in Section 43 23 85 and drawings as part of this Tender package.	2	LS	$	$
3	Supply and delivery of Polymer System package summarized in Section 46 80 00 and drawings as part of this Tender package.	1	LS	$	$
4	Shop drawing submittal Not to exceed 10% of items 1 to 5	1	LS	$	$
5	Startup, commissioning and training of supplied equipment. Assume 5 days/ 1 trip Not to exceed 10% of items 1 to 5	1	LS	$	$
7	Optional[1] : Annual service Contract (5 year term)[2]	year	$/year	**$**	**$**
				GST (5%) of total	$
				Total	$

[1] The tender assessment is based on the total price of items 1 to 5. However, optional items will only become a part of the contract upon written notice from the Contract Administrator. No claims for lost profit will be allowed from any tenderer if the optional items do not become part of the contract.

[2] A Service Contract Agreement is provided in Schedule 4.

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.

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 March 31st, 2020.

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

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:

SCHEDULE 4 – XXX CENTRIFUGE SERVICE AND MAINTENANCE AGREEMENT

This Service and Maintenance Agreement, dated as of XXXX XX, 2020, between **XXXXXXXXXXXXXXXXXXXX** (Supplier) having its principle office at XXXXXXXXXXXX, XXXXXXXXXXXXXXXX and **District of Sooke**. (Owner) having its principle office at 2205 Otter Point Road, Sooke, British Columbia V9Z 1J2.

In consideration of the mutual covenants herein contained, Supplier and Owner hereby agree to enter into an extended Preventive Maintenance Agreement for a **period of 5 years or completion of 15,000-hours service**. This Agreement incorporates the attached Exhibits 1, 2, 3 and 4.

1. Scope of Work

Supplier agrees to provide a Factory Technician to conduct preventative maintenance on the Owner's Centrifuge based on the attached Scope of Work (Exhibit 2) and Preventative Maintenance Schedule (Exhibit 3).

2. Labor, Tools and Supplies

Owner is responsible to provide additional labor, as required, and any specialized tools and lubrication fixtures. Owner will make available the use of an overhead crane where required or provide suitable lifting assembly when necessary for lifting components.

3. Manufacturer Service Contact

Supplier maintains standard business hours of 8:00 AM to 5:00 PM XT. After business hour service is provided 24 hrs/day by dialing 1-xxx-xxx-xxxx. After hours calls are distributed to on-call individuals that will respond via phone to help assess service requirements and ship parts.

4. Service Reports

At the completion of each visit, the technician will provide a report covering the details of the service provided. This will include any recommendations or observations that require future service by the Owner. Owner will be responsible to sign and date report acknowledging that he/she understands the service provided and is aware of potential service issues. A copy of this report will be sent to the Owner after it is reviewed by the Service Manager with additional comments if needed.

5. Safety Requirements

Supplier provides all technicians with basic safety equipment such as steel toe boots, safety glasses, hardhat and gloves. Owner is responsible to provide a safe working area and notify Supplier of any additional safety requirements prior to servicing equipment. If the environment is determined to be unsafe, it is the Owners responsibility to correct prior to any equipment servicing or to provide specialized safety equipment and applicable training.

6. Contract Renewal

At the expiration of the Agreement, the Owner and Supplier can mutually agree to renew said Agreement.

7. Terms and Conditions of Sale

The attached (Exhibit 4), Terms and Conditions of Sale, shall apply to this Agreement.

8. Sales and Use Tax

All applicable sales and use taxes are to be paid by the Supplier direct to the applicable tax authority.

9. Agreement Offering

Supplier offers this Agreement for a lump sum price of $XX,XXX.XX Dollars to be paid in 5 payments based upon equal payments. Year 1 through Year 5 = $X,XXX.XX each year. Payment is due prior to first visit and will initiate contract start date.

10. Entire Agreement

This Agreement contains the entire and only agreement between the parties with respect to the subject matter hereof and supersedes all prior oral and written understandings between Owner and Supplier concerning the parts and/or services specified herein, and any prior course of dealings or usage of the trade not expressly incorporated herein.

11. Representations

Each, the Supplier and Owner, represent and warrant that it has duly authorized the execution and delivery of this agreement; that this agreement as has been executed and delivered by it and that this agreement constitutes its legal, valid and binding obligation enforceable against it in accordance with its terms.

IN WITNESS WHEREOF, the parties hereto have duly executed this Service Agreement on the date first above written.

Supplier:	_____	Owner:	_____
By:	_____	By:	_____
Name:	_____	Name:	_____
Title:	_____	Title:	_____

EXHIBIT 1
OWNER SUPPLIED GUIDELINES

- (1) XXX Centrifuge

- Operating 6 hrs/day, 4 days/week, but no more than 3,000 hours per year for the period of the Agreement based on the originally specified process parameters and limited to a maximum of 30,000 hours.

- Process Parameters Per Proposal:

    - Sludge Type: Aerobically Digested SBR Waste Activated Sludge
    - Hydraulic Loading: 30 m^3/hour
    - Feed Solids: 0.8% Total Solids
    - Hydraulic Loading: 30 m^3/hour
    - Solids Loading: 240 kg/hour
    - Cake Dryness: 18% +/- 2%
    - Capture 95%

- The Centrifuge will be operated by the Owner per the Manufacturer's Operating and Maintenance Manual.

EXHIBIT 2
OWNER SUPPLIED GUIDELINES
SCOPE OF WORK BY SUPPLIER AND OWNER

SUPPLIER

Supplier agrees to provide a Factory Technician to conduct service and preventative maintenance on the supplied Centrifuges. Preventative maintenance is based upon an established level of operating hours and includes scheduled inspections as well as replacement of wear components. This Agreement includes wear parts, lubricants and service for the period specified per the Preventative Maintenance Schedule (Exhibit 3).

Replacement parts other than the specific wear components listed in the Preventative Maintenance Schedule in Exhibit 3 of this Agreement are not included.

In addition to the service specified, the Factory Technician will inspect the operation, train operators, adjust programming and provide system quality control before he leaves the site after a service.

OWNER

Owner to provide basic/routine preventive maintenance. Owner to conduct minimum:

- Daily Performance Optimization
- Hours of operation
- Inspections and checking for leaks
- Daily Operator Checks
    - Centrifuge operation, vibration, abnormal noise
    - Bearing temperature and noise
    - Current consumption of drive motor
    - Change Redex Pulley break-in oil at 200 hrs of operation
    - Check torque readings
    - Check for grease leaks at cyclo unit
    - Check product leakage at pillow blocks

Owner must supply overhead or mobile crane for disassembly of the machine. Minimum load is 3 tons.

EXHIBIT 3
MAINTENANCE SCHEDULE

SCOPE OF SERVICES

Preventive Maintenance service consists of planned maintenance services which will be executed according to specifications given in the Operator Manual and the Repair Procedures for the supplied equipment.

The activities included are below indicated with an "✓".

☐ **Intermediate Service**
Executed as a service with the intervals of 3000 operating hours or 12 calendar months according to specifications.

☐ **Major Service**
Executed as a service with the intervals of 6000 operating hours or 24 calendar months according to specifications.

☐ **Gear Box Service**
Executed as part of Major Service according to specifications.

	Intermediate Service	Major Service	Gear Box Service
Rotating Parts			
Visual inspection for wear on rotating assembly, conveyor	✓	✓	
Exchange of main bearings for small and large end hub, conveyor bearings		✓	
Bearing noise main motor / back drive motor	✓	✓	
Seal rings, O-rings exchange	✓	✓	
Check wear of discharge bushing, discharge saddle	✓	✓	
Cleaning of polymer zone, feed zone for blockages	✓	✓	
Inspection of all screws & their mating threads for damage, stress		✓	
Inspection of Protective tube, Feed tube and V-belts	✓	✓	
Inspection of Lubricating nipples and passages, GS coupling		✓	
Hydraulics (if applicable)			
Exchange of oil filter and oil	✓	✓	
Inspection of oil level	✓	✓	
Stationary Parts			
Inspection of foundation, frame, cover, vibration dampers, casing lower part, inlet pipe, torque arm switch	✓	✓	
Check whether ventilation is open at both ends	✓	✓	
Wear check of bowl bearing housing, small end hub, bowl bearing housing, large end hub		✓	

Inspection of vibration dampers, vibration motor (if applicable)		✓	
Lubrication of all bearings	✓	✓	
Other			
Inspection of Brake, main electrical motor (back drive motor)		✓	
Performance review of centrifuge with Operators and recommendation of Operation Optimization	✓	✓	
Check points and vibration test			
Tiles, hard surfacing	✓	✓	
Operation dry – wet & production (if available)		✓	
Pt-100 check on main bearings, dry – wet & production		✓	
Vibration analysis of all rotating elements	✓	✓	
Measurement of torque back drive motor – dry – wet & production		✓	
Overload device, working test		✓	
Hydraulics idle, production (if applicable)		✓	
Working test of vibration sensor, Emergency stop		✓	
Gear box			
Check Oil level and change of oil if required			✓
Only valid for direct drive Gear Boxes: Change of Gear Box lip seals and Sun wheel shaft bearings - At Major Service, or if needed			✓
Only valid for planetary Gear Boxes: Change of Gear Box lip seals and wheel shaft bearings - At a Major Service, after 3 years of operation			✓

A formal handover of the equipment, from the Customer to the Supplier, shall be done before any work starts.

After the service is executed the Supplier will hand over the Equipment to the Customer by hand over a signed Service report on site with maintenance remarks and recommendations, including status of the equipment, actions undertaken during the visit and indication of future actions from both sides. If further remarks or recommendations are needed, it will be sent to the Customer latest 14 days after the last service day. The customer is expected to witness the proper function of the decanter during the test run.

The spare parts required and undertaken within this Agreement are as follows:

Part Number	Description	Quantity per visit
XXXXXX-XX	Intermediate Service Kit Main Bearings	X
XXXXXX-XX	Intermediate Service Kit Conveyor Bearings	X
XXXXXX-XX	Major Service Kit Main Bearings	X
XXXXXX-XX	Major Service Kit Conveyor Bearings	X
Only included if the decanter has a planetary gear box and if “Gear Box Service” is selected		

XXXXXX-XX	Ball Bearing	X
XXXXXX-XX	Lip Seal	X
XXXXXX-XX	O- Ring	X
Only included if the decanter has a direct drive gear box and if "Gear Box Service" is selected		
XXXXXX-XX	Sun wheel shaft Service kit	X

During this service, if the Service Technician deems that further spare parts or repair work is required, the Customer will be informed so as to decide the necessary course of action.

SERVICE AND EQUIPMENT ACCESSABILITY

Expected total down time of the equipment is X hours for the Intermediate Service and X hours for the major Service, after that the Supplier has access to the Equipment. The Customer shall ensure that the Supplier has access to the Equipment at the agreed or notified time for the service described in this Appendix.

Cleaning of the decanter parts is expected to be provided and done with assistance from customer staff.

WORKING HOURS

Unless otherwise agreed, the service shall be carried out during the Supplier's normal working hours, 8 hour per weekday. Any time worked over 8 hours will be invoiced at Supplier's normal overtime rates.

LUBRICATIONS AND CLEANING AGENTS

If the Customer provides the Supplier's recommend lubricants, it should be accessible for the Supplier in advance of the service and stored in accordance with the manufacture's instruction.
The Customer undertake the disposal of used lubricants and cleaning agent if nothing else is agreed upon by both parties.

MINIMUM REQUIREMENTS

To be able for the Supplier to perform the Services, the Customer shall provide the Supplier with following information:

- Equipment documentation
- Maintenance history (for maintenance not done by Alfa Laval Service)
- Specific Customer log sheets

EXCLUSIONS

Control Panel Electrical components replacement cost are not included as part of the service agreement. Supplier will assist in establishing required replacement components, installation and programming as required to return the equipment to operation. The cost to travel to the site to install replacement components and return the equipment to operation is not included in this Maintenance Agreement.

All goods and services - that are not explicitly included in and covered by the charges are excluded there from and shall be invoiced and paid for separately.

EXHIBIT 4
TERMS AND CONDITIONS

Part 1 **General**

In this Service and Maintenance Agreement, Conditions, the term "Agreement" means the Service and Maintenance Agreement and all appendices attached thereto and "General Conditions" means the general conditions attached to the Service and Maintenance Agreement.

Part 2 **Delays**

2.1 **Supplier's delay**

If the Supplier fails to carry out the Services, or deliver parts, at the agreed time and such delay is not due to circumstances on the part of the Customer or Force Majeure as defined in Section 6, the following shall apply: (a) In case of delays in the Services the Customer shall fix a final period within which the Supplier shall have carried out the Services and if the Supplier has not carried out the Services within this time the Customer may carry out the Services himself or employ others to do so, in which case the Supplier shall reimburse the Customer for any additional costs incurred by the Customer for such Services and repay to the Customer an amount corresponding to the Services in question not performed by the Supplier; and (b) In case of delays in delivery of parts the terms and conditions of the General Condition shall apply.

2.2 **Customer's delay**

The Customer shall without delay notify the Supplier if he cannot let the Supplier carry out the Services or take delivery of parts or the repaired Equipment or parts thereof at the agreed time. The Supplier's prices are calculated on the basis of the Customer fulfilling its obligations specified in the Agreement. In case the Supplier is prevented from performing the Services and making deliveries due to the Customer's failure to fulfil its obligations, the Customer shall reimburse the Supplier for the extra costs incurred by the Supplier as a result thereof, including but not limited to waiting costs, extra work, travel and lodging costs and storage costs.

Part 3 **Liability for defects and limitation of liability**

3.1 **Liability for Services**

The Supplier shall perform the Services in accordance with the provisions of this Agreement and with the skill and care required by customarily accepted good professional and technical practices and which the Customer has reason to expect of Supplier.

The Supplier shall re-perform any services that are not in conformity with the required degree of skill and care as stated above, provided that the Customer notifies the Supplier of any alleged deficiency within 30 days after handing-over. Such re-performance of services is the Customer's sole and exclusive remedy for services that fail to meet the foregoing standards

The Supplier's liability for defects in performed Services is limited to defects which appear within a period of three (3) months from the performance of the Services and is limited for parts used in performed Services only.

The Customer shall without undue delay notify the Supplier in writing if the Customer becomes aware that the Services are defective. If the Customer fails to give notice without undue delay it shall lose its rights in respect of the defect, except where the defect is such that it should have been apparent to the Supplier.

If the Supplier fails to fulfil its obligations under the aforementioned paragraphs of this Section 3.1 within a reasonable time, the Customer may, after having notified the Supplier thereof in writing, undertake itself or employ a third party to undertake necessary remedial work at the risk and expense of the Supplier, provided that the Customer proceeds in a reasonable manner not exceeded 2% of the current yearly contractual value.

If defects in the Services risk causing damage, the Customer shall take any immediate measures, which are necessary to prevent or mitigate such damage. The Supplier shall reimburse the Customer for the necessary costs incurred by the Customer when undertaking such measures.

3.2 **Liability for Parts**

The defects liability period on each part is twelve (12) months after its shipment. Notwithstanding the foregoing the Supplier assumes no liability for defects in supplied wear and tear parts.

3.3 **Limitation of liability**

The Supplier's liability under Section 3 above does not cover defects or damage due to circumstances out of the Supplier's control or circumstances for which the Supplier otherwise cannot reasonably be held responsible, such as incorrect operation or the Customer's Equipment, incorrect care or faulty maintenance by the Customer. From the Supplier's liability is furthermore excluded the spare parts replaced on equipment which have been modified or repaired without the Supplier's prior written consent.

The Supplier shall have no liability for defective Services, works or parts or otherwise for its negligence except as stated in this Service and Maintenance Agreement Conditions and the General Conditions.

In no event shall the Supplier be liable for any special, indirect or consequential damages or losses or purely financial losses of any kind such as, but not limited to, loss of revenue, loss of use, loss of production, costs of capital or costs connected with or arising out of the Supplier's performance or failure to perform any of its obligations under the Agreement. In no event whatsoever shall the Supplier's cumulative liability under or in relation to the Agreement, whether payable as damages, indemnity or under any other legal theory during a year, exceed an aggregate amount equal to fifteen (15) percent of the total price for the Services performed during that year.

The limitations of liability set forth in this Section 3 shall not apply if and to the extent any damage is caused by any grossly negligent act or omission or wilful misconduct attributable to the Supplier.

Part 4 **Termination**

Without prejudice to any remedy either party may have against the other for breach or non-performance of the Agreement, either party shall have the right to terminate the Agreement with immediate effect, if the other party should materially breach any of the provisions or conditions of the Agreement, and should fail to discontinue and make good such breach within thirty (30) days after receipt of notice in writing from the complaining party.

Without prejudice to any remedy either party may have against the other party for breach or non-performance of the Agreement, either Party shall have the right to terminate the Agreement with immediate

effect in the event of voluntary or compulsory winding-up, bankruptcy, or more generally, in the event of insolvency of the other party.

Part 5 **Confidentiality**

Each party undertakes that it shall not disclose, in whole or in part, to any third party, or use for other purposes than envisaged in the Agreement, without the other party's consent, such information made available under the Agreement regarding the other party's business operation or technology which may be considered as business or professional secrets, except to the extent necessary for the performance under the Agreement. The confidentiality undertaking shall not apply to information already in the public domain or known to the other party, or to the extent a party is required to disclose confidential information by law or regulation or pursuant to any order of court or other competent authority or tribunal.

Part 6 **Force Majeure**

Either Party shall be entitled to suspend performance of its obligations to the extent that such performance is impeded or made unreasonably onerous by Force Majeure defined as any of the following circumstances: industrial disputes and any other circumstances beyond the control of the Parties such as fire, war, extensive military mobilization, insurrection, requisition, seizure, embargo, restrictions in the use of power, currency, export or travel restrictions or sanctions, epidemics, natural disasters, extreme natural events, terrorist acts and defects or delays in deliveries by sub-contractors caused by any such circumstance referred to in this Section 6. The Party claiming to be affected by Force Majeure shall notify the other Party in writing without delay. Regardless of what might otherwise follow from the Agreement, either Party shall be entitled to terminate the Agreement by notice in writing to the other Party if performance of the Agreement is suspended under this Section 6 for more than six (6) months.

Part 7 **Amendments**

All amendments and/or additions to the Agreement shall be made in writing and duly signed by authorized representatives of both parties to be valid.

Part 8 **Assignment**

Neither Party may assign the Agreement or any of its rights thereunder without the prior written consent of the other Party.

Part 9 **Governing law**

The Agreement shall be governed by the substantive laws of British Columbia and Canada.

Part 10 **Arbitration**

Any disputes arising out of or in connection with the Agreement shall be finally settled under the Rules of Arbitration for British Columbia by one or more arbitrators appointed in accordance with the said rules.

The place of arbitration shall be British Columbia.

TENDERERS NAME

This Tender is hereby submitted by:

_____

Date

_____

Name of Tenderer (please print)

_____

_____

Address of Tenderer

_____ _____

Telephone Number of Tenderer Facsimile Number of Tenderer

_____

E-mail address of Tenderer

_____ _____

Title of Contact Print Name of Contact

_____

Signature

(the "Tenderer")

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_____, 2019.

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_____, 2019.

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.

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 late 2019).

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: _____

END OF SECTION

Part 1 **General**

1.1 **DEFINITIONS**

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

"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.

1.3 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.

.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.

1.4 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 District-Supply Contractor Relations

2.1 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

2.2 RESPONSIBILITIES OF THE SUPPLY CONTRACTOR

.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.

2.3 DISTRICT - SUPPLY CONTRACTOR CO-ORDINATION

.1 Notice

.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 debard 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.

Part 3 Specifications and Drawings

3.1 INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

.1 General

.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.

3.2 CONFLICTING PROVISIONS, ERRORS AND OMISSIONS IN CONTRACT DOCUMENTS

.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.

Part 4 Material, Equipment and Workmanship

4.1 GENERAL

.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

.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.

4.4 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 Dewatering 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.

5.2 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.

.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.

Part 6 **Shipment of Goods/Damage to Goods**

6.1 **SHIPMENT OF GOODS**

.1 Delivery of Goods

.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.

Part 7 Progress and Completion

7.1 CONTRACT TIME

.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.

7.2 TERMINATION

.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.

Part 8 **Payment**

8.1 **PAYMENTS TO SUPPLY CONTRACTOR**

.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.

.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 Dewatering 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;

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.

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: _____

[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

Part 1 **General**

1.1 **SCOPE**

.1 Work specified in this section includes the design, supply, fabrication, assembly, performance testing at the manufacturer's facility, delivery to the Delivery Point of the Goods, testing, commissioning and operations training of Dewatering Equipment, including dewatering centrifuge, centrifuge feed pumps, polymer dosing system and full dewatering system PLC, as described elsewhere in the Specifications.

.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 dewatering 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.

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 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 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 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 co- ordinated, 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 FORMATOF 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 on 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 4 **General**

4.1 **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.

4.2 **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.

4.3 **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.

4.4 **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 5 **Products**

Not applicable to this Section.

Part 6 **Execution**

6.1 **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.

6.2 **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

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, 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 Division 17 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 All units of measurement shall be in Imperial units.

.3 Where a component or piece of equipment is manufactured using the International Systems of Units (SI units), the SI units should be shown as the primary dimensions, with the Imperial equivalent shown in brackets.

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)
CSA	Canadian Standards Association ***(all electrical equipment shall bear the CSA label)***
API – RP551	American Petroleum Institute, Process Measurement Instrumentation
ANSI/ISA-7.0	Quality Standard for Instrument Air
ANSI B16.36	Steel Orifice Flanges

.2 In the absence of a specific standard, the original manufacturer's recommendations will prevail subject to approval by the Engineer.

.3 Quality control is in accordance with the applicable International Standards Organization (ISO) standard.

.4 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 CONFLICTS BETWEEN DOCUMENTS

.1 Conflicts between referenced documents shall be identified to the Engineer in writing for resolution. In general, the order of precedence is:

.1 Diagrams and Schedules

.2 Specifications (equipment) and Data Sheet

.3 Purchase Order

.4 This specification

.5 Referenced applicable standards

.2 In the event of any conflict between the Purchase Order, Specifications, Codes and Standards or lack of clear definition as to the applicability of any specification or standard, Supplier shall obtain a written clarification from the Owner before proceeding. The Owner's response and / or instructions shall subsequently form part of this Specification.

1.6 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.

1.7 DOCUMENTATION

.1 Provide drawings / data as referenced in the subsections below.

1.8 LOCATION 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:

.1 Piping Plans and Elevations; and

.2 Location Drawings.

1.9 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 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.

.3 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.

.4 Provide standard catalogue data (including technical specifications, wiring details, and instructions for maintenance, operation, and installation) for all equipment provided. Highlight information relevant to the actual instrument being used.

1.10 EQUIPMENT NUMBER AND TAGGING

.1 Label all field equipment 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 equipment with drive pins or stainless steel wire in such a manner that it need not be removed for installation of the equipment.

.2 Follow Owner standards (available upon request).

.3 Wire numbering: Consistent with nomenclature used in available sample drawings.

1.11 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 Alberta.

.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.

1.12 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.

1.13 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.

.5 Provide a testing program and site services to implement the testing of the 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 six training sessions for operations staff (4 hours per session, three in total) and maintenance staff (4 hours per session, three in total). A classroom environment will be provided for the operations staff. Hands on training to be included in part of each sessions.

1.14 MATERIALS

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

1.15 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 equipment, both fabricated in a shop and modified in the field during construction.

1.16 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.

.6 Content

.1 Shop drawings submitted title sheet.

.2 Data shall be specific and technical.

.3 Identify each piece of equipment with appropriate tag as per equipment identification list or schedule.

.4 Information shall include all scheduled data.

.5 Advertising and commercial presentation literature will be rejected.

.6 The project and equipment designations shall be identified on each document.

.7 Information shall be given in S.I. units.

.8 The shop drawings/product data shall include as a minimum:

.1 Dimensioned construction drawings with plans and sections showing size, arrangement and necessary clearances, with all equipment weight's and mounting point loads.

.2 Mounting arrangements showing clearances were needed

.3 Detailed drawings of bases supports and anchor bolts.

.4 Control explanation and internal wiring diagrams.

.5 A written description of control sequences relating to the schematic diagrams.

.6 Detailed bill of materials.

.7 Submission format:

.1 Black line prints 216 mm x 280 mm [letter size] or 280 mm x 430 mm [tabloid] for control schematics.

.2 Larger drawings may be submitted on reproducible single sheet media (ie not bound) with space for stamps and signatures - master set plus one working copy.

.3 Bill of Quantities for related components, identified by model number, listed on the front cover with item identification numbers.

.8 No. of copies:

.1 Provide number of copies indicated in Section 01 33 00 with a minimum of two (2) copies to be retained by the Engineer.

.2 Preferred mode of shop drawing distribution is in electronic format (pdf file).

1.17 CARE, OPERATION AND START-UP

.1 Provide for instructing The District's operating personnel in the operation, care and maintenance of supplied equipment as specified as follows:

.1 Provide for the services of the manufacturer’s factory service engineer to participate in and supervise the start-up of the supplied equipment installation, and to check, adjust, balance and calibrate components.

.2 Provide these services for standard period, as necessary to put equipment in operation, and including training for operating personnel for all aspects of its care and operation. Include daily rates for any additional time Supplier would be required for completion of installation and commissioning beyond standard period.

1.18 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with these specifications.

.2 Equipment and materials shall be CSA certified.

.3 Factory assemble the control compartments and component assemblies.

1.19 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.

1.20 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.

1.21 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.

1.22 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.

1.23 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: Red for Positive.
(except for loop) Black for Negative.

Loop (analog): White for Positive.

.7 Black for Negative.

1.24 WIRING TERMINATIONS

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

1.25 MANUFACTURERS AND CSA LABELS

.1 Visible and legible after equipment is installed.

1.26 GENERAL TESTING AND INSPECTION

.1 The equipment shall undergo factory acceptance testing in accordance with this specification.

.2 A factory acceptance Inspection and Test Plan (ITP) shall be submitted for The District review and approval. Do not proceed without an approved ITP.

.3 The equipment shall satisfactorily withstand the tests specified.

.4 The records of all tests and all relevant certificates shall be provided as required in the requisition document and these specifications.

.5 Electronic devices shall be completely tested and burned-in before being assembled into the supplied panel or gear.

.6 All factory testing shall be coordinated and scheduled in advance with The District, Engineer and Contractor. The Supplier shall give at least two months' notice prior to any test commencement.

.7 The Supplier shall ensure that all required documentation has been collated prior to the final inspection and testing.

.8 Acceptance inspection and testing shall be carried out by the Supplier on the entire assembly and witnessed by The District and the Engineer.

1.27 FIELD QUALITY CONTROL AND EQUIPMENT TESTING

.1 The Supplier shall provide a factory service representative for participation and supervision of equipment testing and quality control on site.

.2 Furnish manufacturer's certificate or letter confirming that supplied equipment has been installed to manufacturer's instructions.

.3 Include in the tendered price all costs for the attendance of the factory service representative at the site for the times and durations required to fully complete their responsibilities for participation and quality control of the site equipment testing.

1.28 COORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings. Overcurrent trip settings for main, tie, and feeder breakers located in the MCCs will be provided by the Engineer.

Part 2

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 stocked 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.

.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 Current Imbalance

.1 Do not exceed the values tabulated below when the motor is operating at any load within its service factor rating and is supplied by a balanced voltage system:

.1 Under 37.5 kW: 15 percent

.2 37.5 kW and above: 10 percent

.2 Base imbalance criteria upon the lowest value measured.

.11 Winding Over-temperature Protection

.1 Provide stator winding over-temperature protection on all motors rated 45 kW and larger. Motors rated less than 45 kW to have stator winding over-temperature protection when required by the specific equipment specification section or if recommended by the driven equipment Manufacturer.

.2 Over-temperature protection for motors rated 45 kW and larger and other motors, where specified, to be NEMA MG1-12.53, Type 1, winding running and locked rotor over-temperature protection. One temperature detector shall be provided per phase. Detectors to be positive thermal protection (PTC) thermistor type, with leads brought out to a terminal strip in a NEMA 4x enclosure for Type 2 motors and a NEMA 7C or 9 enclosure for Type 3 motors.

.12 Motor Frame

.1 Use a minimum of grade 25 cast iron, aluminum, or steel for frame, end brackets, fan cover, and conduit box. Refer to motor classifications.

.2 Provide two bronze automatic breather drains at the lowest point in the motor frame.

.3 On frames sizes greater than 180, provide removable lifting eyes at the balance point of the motor, with a design safety factor greater than 10. Vertical motors require two eyes, one on each side of the frame.

.4 Use stainless steel hardware.

.13 Motor enclosures shall be:

Motor Rating	**Enclosure**			
	Non-Hazardous		**Hazardous**	
	Process	**Non-Process**	**Class I, Zone 1**	**Class I, Zone 2**
0 to 0.75kW	TE	TE or ODP	TEXP	TEXP
1 to 186kW	TEFC	TEFC	TEXP	TEFC
> 186 kW	TEFC or WPII	TEFC or WPII	TEXP	TEFC

.14 Motor Terminal Box

.1 Incorporate an oversized terminal box with a volume greater than NEMA requirements, rotatable in 90° increments. Provide gaskets between the terminal box and frame and between the terminal box and cover.

.2 Provide diagonally split, gasketted NEMA 4X terminal boxes complete with threaded hub for conduit entry for ODP and TEFC motors.

.3 Provide adequately sized, diagonally split, gasketted NEMA 7 terminal boxes complete with threaded hub for conduit entry for explosion-proof motors.

.4 Provide a ground connection and lugs in the terminal box.

.5 Provide a separate terminal box for all motors required to have internal monitoring devices c/w terminal blocks.

.15 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.

.16 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.

.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 ±10%; and,

.2 Ensuring complete compatibility of the drive's current limit protection with the motor thermal withstand capability.

2.4 ALTERNATE SUPPLY OF VARIABLE FREQUENCY DRIVES

.1 If the Supplier decides to supply VFDs instead of wiring to VFDs supplied by the Contractor, the following clauses apply.

.2 Approved VFD make and model is ABB ACS800. No alternates.

.3 The Individual drives will be contained in a skid-mounted cabinet 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.

.4 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 ±10%; and,

.2 Ensuring complete compatibility of the drive's current limit protection with the motor thermal withstand capability.

.5 Filters shall be provided on the incoming line and on the load side of the VFD.

.6 Controlled acceleration and deceleration times, separately adjustable, shall be provided.

.7 Separately adjustable minimum and maximum frequency limits shall be provided.

.8 The drive shall be capable of regulating the frequency to a ±1% of the set point over the full input voltage and ambient temperature operating range.

.9 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.

.10 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.

.11 The drive input shall be protected to withstand surges as defined in ANSI Std. C37.90.1 - Guide for Surge Withstand Capability (SWC) Tests.

.12 The drive enclosure shall meet the requirements of panels and enclosures, detailed within this specification, based on the area to be installed.

.13 The drive shall be complete with cable compartments for connection of incoming and outgoing cables.

.14 When auxiliary cooling is required, the drive shall have fans and the required controls for proper operation.

.15 The drive shall have, as a minimum, circuits within the drive for connection of remote signals via Profibus DP 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.

.16 Alarms must be latched in with first-out indication.

.17 The diagnostic system shall monitor each alarm and shutdown function and shall display the status of each point on the front panel interface module.

.18 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;

.19 The drive shall provide at least two isolated 4-20 mA analog outputs that are programmable to frequency, speed, current, torque, or power factory 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.

.20 Terminal blocks for controls, alarms, metering and diagnostics shall each be readily accessible, grouped and shall be segregated from power devices, for personnel safety.

.21 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.

.22 When the equipment is exposed to corrosive gases, the equipment shall be protected against corrosion from the gases by the use of proper coatings and material selection. The use of bare copper or silver or their alloys should be avoided.

.23 The shop drawing shall state what corrosion protection is provided.

.24 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 ±10% 3Ø, 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 ½ 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.

.11 The VFD shall include transient voltage suppression to allow reliable operation encountered in an industrial power distribution system.

.25 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.

.26 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.

.27 The VFD shall be equipped with voltage sag ride-through for the following:

.1 0% voltage for 1 cycle.

.2 60% voltage for 10 cycles.

.3 87% voltage continuous.

.28 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.

.29 The drive must be programmable to attempt a flying start to recover from power brown out conditions and allow the restart of a load before it comes to a complete stop.

.30 The VFD shall have the capability of being restarted with a remote signal from either the CTG/HRSG control system or the DCS control system.

.31 The VFD shall not be affected by radio frequencies emitted by portable radio transmitters.

.32 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

.33 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.

.34 VFD output faults and short circuit faults shall be manual reset at unit HMI.

.35 Integrate a motor temperature monitoring system, including power and space within the VFD cabinet and install within the front door the VFD Cabinet if a display is provided. Control unit shall interlock the drive from operating in Manual or Automatic.

.36 Built-in-network communication (Profibus DP).

.37 Diagnostics – device, warning, and trip status, time to overload trip, history of last trips, and time to reset.

.38 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.

.4 VFD's shall be provided with the ability to run from three separate locations: from a field-mounted control panel, from keypad (HMI) mounted on MCC/VFD door, and remotely via the CTG/HRSG control system (Remote).

.5 The VFD shall shut down in a controlled fashion when the local operator station is disconnected or Hand-Off-Auto switch is in "Off" position.

.6 Speed control mode selection as follows:

.1 Field HOA in "Hand": Speed set point from field-mounted 0-10VDC (or 4-20 mA) speed selector on local control panel.

.2 Field HOA in "Auto" and VFD Remote/Local in "Local": Speed set point from VFD HMI keypad setting.

.3 Field HOA in "Auto" and VFD Remote/Local in "Remote": Speed set point hard-wired from the CTG/HRSG control system.

.7 Intended Control Functionality (VFD supplier to confirm meets intent):

.1 Field HOA set to "Auto" and VFD keypad set to "Remote" enables the motor to be started, stopped and speed controlled by the CTG/HRSG control system. By default, this control will be via hard wired.

.2 Field HOA set to "Hand" and VFD keypad set to "Remote" enables motor to be started, stopped and speed controlled from the field operator panel.

.3 Field HOA set to "Auto" and VFD keypad set to "Hand" enables the motor to be started, stopped and speed controlled from the VFD HMI.

.4 When the field HOA set to "Hand" and VFD keypad set to "Local", the field "Hand" input will disable the VFD keypad start/stop and speed control functions and the VFD will only be controlled from the field control panel.

.39 VFDs shall support and include the appropriate communication module for remote monitoring and control via Profibus DP. All remote control and monitoring by the CTG/HRSG control system shall occur using hard wired signals. The supplier shall provide a Profibus DP data map at the time of shop drawings based on the signal requirements for the specific project.

2.5 ALTERNATE SUPPLY OF MOTOR STARTERS (NON-VFD)

.1 If the Supplier decides to supply starters instead of wiring to those 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 Intelligent type motor controllers shall be used for all non-VFD driven three phase motors complete with embedded wired overload protection, ground fault detection, motor current monitoring and other programmable electrical protection features required for the controlled equipment.

.7 Where intelligent type motor controllers are not practical, starters shall as a minimum have ambient temperature compensated thermal overload protective element in each phase, and status wired back to the CTG/HRSG control system, to be monitored by the plant DeltaV control system.

.8 Where thermistors are used, tripping or alarming due to windings overheating shall be performed within the starter structure.

.9 The equipment enclosure shall meet the requirements of panels and enclosures, detailed within this specification, based on the area to be installed.

.10 External reset buttons shall be provided for thermal overload devices.

.11 Overload relays, circuit breakers and contactors shall be sized based on the load requirements.

.12 Ensure contacts are maintained with a voltage drop up to 35% of contactor coil rated voltage applied.

.13 Include a control station complete with HOA selector switch and indicating devices mounted within sight for all motors.

.14 Provide a red drive running indicator light mounted on the panel or starter.

.15 For reversing motors provide a red (forward) and separate red (reverse) indicating lights mounted on the panel or starter.

.16 Provide a green 'Stop' indicating light mounted on the panel or starter.

.17 Provide, at minimum, hard-wired signals between starters and the CTG/HRSG 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 Summarized fault (global alarm)
  - .2 Remote/Local mode selected
  - .3 System running indication

.18 For critical motors provide:

- .1 Ready input (to control system)
- .2 HOR Selected input (Hand and Remote positions to control system)
- .3 Overload Tripped input (to control system)
- .4 Running input (two inputs for reversing motors)
- .5 Run Command output (two outputs for reversing motors).

.19 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.

.20 Various HP rated FVNR (and FVR) NEMA size starters accommodating, magnetic contactor, solid state smart overload, motor circuit protector or shunt trip circuit breaker/disconnect, compartment door mounted LED lights for status indication, and control devices.

.21 All starters shall conform to EEMAC E14-1, half size starters not acceptable.

.22 All starters of size, type rating as indicated with components as follows:

- .1 Contactor solenoid operated, rapid action type.
- .2 Smart motor electronic overload protective device in each phase, manually reset from outside enclosure.
- .3 All power and control wiring to be terminated on terminals in each individual starter cubical.
- .4 Each starter wiring and schematic diagram located inside starter cubical in visible location.
- .5 Starters shall contain RTD / thermistor control relay and accessories, where shown on the drawings.
- .6 All full voltage starters (reversing and non-reversing) shall be intelligent (IT) type and connected and programmed to communicate on the facility Profibus DP network.

.23 Digital – Intelligent Starters

.1 Provide electromechanical type motor starters with coil control and overload integrated into a single or dual microcontroller.

.2 The motor starter shall operate over a temperature range of -40°C to 65°C and shall meet or exceed the following Standards and Certifications: ULC, CSA, NEMA ICS1, ICS2, ICS5. Devices shall meet Electromagnetic Compatibility (EMC) Requirements per EMC IEC 61000-4.

.3 Provide user selectable overload Trip Class of 10, 20 and 30 on each smart motor electronic overload protective device. To adjust factory defaults, Trip Class shall be manually adjustable.

.4 Provide a microcontroller with the following features:

.1 Monitors user control inputs (i.e., permissive, forward, reverse, force-to-remote, local reset, remote reset, test/test to trip). Control inputs shall be rated 24 VDC (3 - 5 mA) with a plug and unplug lockable control connector. Starters shall be provided with a 120 VAC relay interface for controls from field and DCS panel, where required and/or indicated on drawings.

.2 Operates an LED indicator which displays a flash sequence for thermal capacities over 70%, test button depression, trip indication, class setting, phase enablement/disablement, and microcontroller reset condition.

.3 Monitors 3-phase current into a common node. Provides Thermal Memory which shall be saved to non-volatile memory for safety purposes in the event of a power loss or removal and restore event.

.4 Controls an alarm output which shall be a solid-state open collector or emitter type output at 24 VDC, 250 mA and trip relay.

.5 Solve a first order differential equation for the actual motor heating model to calculate trip points.

.6 Provides an “alarm only” or “alarm without trip” mode for critical must run applications.

.7 Control Voltages: The starter control voltage shall be nominal 24 VDC from 20 to 28 VDC.

.8 Motor starters shall have replaceable fixed and movable contacts, Size 1 through 5.

.9 Motor starters shall accommodate auxiliary contacts per various maximum combinations of single and dual auxiliaries. Maximum number of circuits shall be six (6) for Size 1 through 4 and twelve (12) for Size 5 starters.

.24 Front mounting in section sized for the application. Circuit breaker, contactor, overload and through bus to be sized as indicated on drawings and specified herein.

.25 Class II, Type B, wiring.

.26 Monitoring must be accessible via the network bus: Profibus DP. Alternate method of monitoring is to hard wire to the CTG/HRSG control panel and allow access to this information through the communication link between the CTG/HRSG control panel and the DeltaV system.

.27 Built-in communications shall allow immediate access to status information, motor performance data, and diagnostics, as well as performing motor control functions. Diagnostic information to include: device, trip, warning status, time to trip/time to reset (thermal overload) and history of past trips.

.28 The vertical wireways for load and control conductors, extending full height of vertical sections, to be equipped with cable tie supports.

.29 Installation and wiring to units accessible with doors open and units in place.

.30 Motor circuit interrupter, motor protection type circuit breaker with operating lever on outside of enclosure and provision for:

.1 Locking in “OFF” position with up to 3 padlocks.

.2 Locking in “ON” position.

.3 Provision for preventing switching to “ON” position while enclosure door open.

.31 For each remote mounted power factor correction capacitor connected on the load side of the motor contactor provide outgoing terminals, where shown on the drawings.

.32 Smart Motor Overload protective device in each phase, manually reset from outside enclosure.

.33 Provision for remote electrical reset shall also be provided.

.34 Control transformer complete with primary and secondary fusing of sufficient VA to handle operating coil and associated controls.

.35 Identify each wire and terminal for external connections, with permanent number marking identical to diagram.

.36 Certification:

.1 The Supplier’s representative shall attend the commissioning of the combination starter and provide the Engineer with written certification that the smart overload has been properly installed and adjusted.

.2 After receipt of substantial performance certification, the warranty period shall commence.

.3 Cost of commissioning and certification to be included with the starter supply.

.37 Integration:

.1 Integrated starters in MCC structures shall match the MCC manufacturer’s standard line of starters. The starters shall be included in the supply package with the MCC and shall be factory assembled and tested prior to shipment to site.

.38 The device must be resettable everywhere – manual, remote, by the device level bus and automatic. Smart Motor Overload protective device must support and be able to provide diagnostics for the following types of starter circuits:

.1 Direct (non-reversing) starter.

.2 Reversing starter.

.39 The device must support all inputs and outputs shown on the drawings. Provide expansion modules as required to meet all I/O requirements. Device must support run time checks that can be set for the starting or stopping of motors. All controls and diagnostics to be accessible via the device level bus.

.40 Control and Signaling: If the field HOA switch is set to “Hand” position (manual operation), or if local control is selected by means of a local/remote switch, the network control commands must be ignored and the load can now be exclusively controlled via the local control station.

.41 The smart motor protection device must also have the capability to operate and function with the device level bus disconnected, on reconnection the device must become live on the network with all information available to the DCS, and this must be done without interruption to the process.

.42 The device to continuously inform the operator about the current operating state:

.1 Actual phase current in %.

.2 ON / OFF (Running/Stopped).

.3 Warning/Alarm.

.4 Faults (This includes device fault, and each external interlock fault, separately monitored).

.43 Settable current limits: to be supported, these current limits are to inform the operator about critical states in the system. For example, a current which is below the lower current limit setting could mean a dry pump situation. The overloading of a conveyor, for example, can be quickly detected by the display of ‘upper current limit exceeded’. To avoid an overload trip of the machine, the operator can take precise steps to change the working process, such as reducing the amount of material in the conveyor.

.44 The device is to be self-monitoring and if there is a fault, the device must switch to the safe state (OFF or be able to maintain operating state - monostable or bistable behavior).

.45 The device must have the capability to be checked during running – without switching off of the motor. The device must support graphical software for setup and further diagnostics, this to be included with the device, vendor to provide details on licensing and amount of copies to be permitted, all costs to be included.

.46 Current sensor or equivalent: Sized for each application, (single conductors).

.47 Mount in cubicle section and wire as per drawings.

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 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 CURRENT TRANSFORMERS (CTS)

.1 One current transformer is to be supplied and installed on each phase, by the turbine supplier.

.2 Secondary wiring of the current transformers shall be wired to a shorting block installed in the control cabinet of the turbine.

.3 CTs shall have short-circuit rating not less than 40kA at 4160V. They shall be capable of carrying the rated primary current for a period of one minute with the secondary windings open-circuited as specified in CAN/CSA-C61869-1/2/3standard. CTs must be sized such that they do not saturate at fault levels equivalent to 40kA.

2.10 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 an 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.

2.11 PANELBOARDS

.1 If required within the design and supply of the proponent, panelboards may be installed on the electrical skid equipment is terminated to this board by the factory.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements, manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.3 Allow for area class requirements in this specification.

.4 Allow for off-skid power feeders to directly wire to the panelboard(s).

.2 600 V panelboards: bus and breakers rated for 35000 A symmetrical interrupting capacity or as indicated.

.3 250 V panelboards: bus and breakers rated for 10000 A symmetrical interrupting capacity or as indicated.

.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.6 Two keys for each panelboard and key panelboards alike.

.7 Tin plated copper bus with neutral of same ampere rating as mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked grey enamel.

.11 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation for panelboards.

.12 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.13 Nameplate for each panelboard type 1 engraved as indicated in Technical Specification 01180.

.14 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.12 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.

2.13 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.

2.14 CABLE TRAY

.1 Not included in this supply package.

2.15 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 Provide pressure type terminals and marking strips.

.8 Group terminal blocks according to instruments, control and voltage levels.

.9 Provide shorting type terminals for CT secondary wiring.

.10 Except for outgoing connection terminal blocks for wiring to The District's equipment, 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.

.11 No more than one wire to be connected to a terminal designated for external wiring.

.12 Wiring colour codes to comply with the following:

Cable / Wire Function		At Supply Label	At Equipment Label	Colour
LV AC supplies	Phase	A	U	Red

	Phase Phase	B C	V W	Black Blue
	Neutral	N	N	White
	Ground	PE	PE	Green
Control AC supplies	Active	L1	L1	Black
	Neutral	N	N	White
	Ground	PE	PE	Green
DC supplies	Positive	+	+	Red
	Negative	-	-	Black
Instrument loop signals	Positive	+	+	Black
	Negative	-	-	White
	Ground	PE	PE	Green / Yellow striped

.13 All terminals are to be numbered in accordance with wiring diagrams.

.14 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.

.15 Provide ferrules on each end of all wires for control.

.16 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.

.17 Instrument intrinsic cable to be black sheathed with blue marking stripe as per ANSI/IEC standards.

.18 All conductors to be stranded, 98% conductivity copper, with 600V RW90 XLPE insulation, unless specified below. No aluminum conductor permitted.

.19 Branch Circuit Wiring: conductors smaller than No. 12 AWG not permitted for 120 Volt lighting, power or motor branch circuits.

.20 BX cable is not permitted.

.21 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.

.22 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.

.23 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.

.24 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.

2.16 ANTI-CONDENSATION HEATERS

.1 Anti-condensation heaters rated at 120 VAC will be provided with all motors rated 75 kW and above.

.2 Anti-condensation heaters rated at 120VAC will be provided for control panels and distribution boards located in process areas. Heaters will operate on thermostat or with power down relay.

.3 Operation of these heaters shall be from NC auxiliary contacts of the Supplier's motor starter.

.4 The rating of the heater such as wattage and current drawn shall be specified on the nameplate.

2.17 EQUIPMENT NAMEPLATE

.1 All electrical enclosures, equipment and devices to be identified with nameplates.

.2 Operating handles, meters, control stations, limit switches, proximity switches, sensing elements and other like devices to be provided with nameplates.

.3 Reference Specification 01 60 12 for further direction on nameplate requirements.

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 VISUAL INSPECTIONS

.1 The following mechanical and visual inspections shall be performed by the Engineer:

.1 Quality of workmanship;
.2 Surface finish;
.3 Conformity with the approved Shop Drawings and Purchase Orders;
.4 Conformity and completeness of the data on the nameplate;
.5 Degree of protection of enclosure;
.6 Degree of protection within compartments with a view to safety;
.7 Insulation of the bus-bar system;
.8 Creepage distances and clearances;
.9 Correct mounting of components;
.10 Internal wiring and cabling system;
.11 Suitability of clamping, grounding and terminating arrangements for incoming, outgoing and auxiliary cables;
.12 Correct labelling for circuits and interlock systems;
.13 Grounding system.

.2 The Engineer may request additional tests to verify the integrity of supplied equipment

3.6 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 Thermal relays shall be tested to verify Manufacturer’s final factory test results.

.6 Care shall be taken that panel(s) grounds and if applicable, neutral grounding, are appropriate for the connection of restricted or unrestricted ground leakage protection.

.7 Following all the above-mentioned tests the panel(s) and components shall be examined to ascertain whether any components have been damaged and that all parts are in satisfactory operating condition.

.8 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).

.9 The Engineer reserves the right to attend other tests which may be agreed upon and to visit the Manufacturer's work site at any time, during normal working hours for inspection of the works.

.10 To facilitate the Engineer's attendance at the acceptance tests, the Manufacturer shall:

.1 Give the Engineer a complete detailed program for the tests, four (4) weeks prior to commencement of tests;

.2 At the same time fully described precise details as to how these tests shall be conducted and documented. Engineer shall approve the tests or direct such changes as are necessary within one (1) week;

.3 Confirm not less than 48 hours prior to the referenced factory tests that they are scheduled for execution; and

.4 The Engineer and the Manufacturer shall agree upon the format of documentation for the tests. They shall in any case be fully documented, related to detailed schematic drawings, and be sufficient to show without question, that the specified tests have been applied to all equipment.

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 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 All units of measurement shall be in Imperial units.

.3 Where a component or piece of equipment is manufactured using the International Systems of Units (SI units), the SI units should be shown as the primary dimensions, with the Imperial equivalent shown in brackets.

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/ISA-7.0	Quality Standard for Instrument Air
ANSI B16.36	Steel Orifice Flanges

.2 In the absence of a specific standard, the original manufacturer's recommendations will prevail subject to approval by the Engineer.

.3 Quality control is in accordance with the applicable International Standards Organization (ISO) standard.

.4 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 CONFLICTS BETWEEN DOCUMENTS

.1 Conflicts between referenced documents shall be identified to the Engineer in writing for resolution. In general, the order of precedence is:

.1 Diagrams and Schedules

.2 Specifications (equipment) and Data Sheet

.3 Purchase Order

.4 This specification

.5 Referenced applicable standards

.2 In the event of any conflict between the Purchase Order, Specifications, Codes and Standards or lack of clear definition as to the applicability of any specification or standard, Supplier shall obtain a written clarification from the Owner before proceeding. The Owner's response and / or instructions shall subsequently form part of this Specification.

1.6 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.

1.7 DOCUMENTATION

.1 Document software or 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.

1.8 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.

1.9 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.

1.10 LOCATION 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.

1.11 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 Plan Drawing Reference;
.10 Installation Detail;
.11 Specification;
.12 Setpoint;
.13 Instrument ranges;
.14 Power Supply;
.15 Hazardous Area; and
.16 Calibration range.

1.12 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 Ensure that all instrumentation provided, that is directly wetted by process or utility fluids and is subject to pressure has a valid Pressure Registration Number.

.6 Provide instrument air usage requirements in m3/hr for each device requiring air. Use volume of air for a complete valve stroke closed to open.

.7 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.

.8 Supplier graphics and Control Objects functionality to comply with The Owner's standards (will be provided on request).

1.13 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 Follow Owner standards (available upon request).

.5 Wire numbering: Consistent with nomenclature used in available sample drawings.

.6 All PLC I/O module wiring: Numbered according to I/O point base/slot/point assignments.

1.14 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.

1.15 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.

1.16 ACCEPTABLE MANUFACTURERS

.1 Where the equipment Supplier is not providing an independent Integrated Control System (ICS) with the Supplier's equipment, The Owner will determine the structure of the control system and the provider of the control system. The equipment Supplier is required to integrate this system into his equipment. Integration includes providing drawings,

documentation and any engineering assistance to The Owner's control system Supplier to allow for this integration.

.2 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.

1.17 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.

1.18 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 six training sessions for operations staff (4 hours per session, three in total) and maintenance staff (4 hours per session, three in total). A classroom environment will be provided for the operations staff. Hands on training to be included in part of each sessions.

1.19 **MATERIALS**

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

1.20 **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.

1.21 **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.

1.22 **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 one (1) centrifuge to dewater sludges at a municipal wastewater treatment plant. The centrifuge is to dewater wastewater sludge derived from aerobic digestion of SBR waste activated sludge.

.2 Provide PLC based control system to allow fully automatic unsupervised control of centrifuge and all ancillary components. Control system must be capable of interfacing

with Plant Control System (PCS) via hard wired interface for primary control (start/stop, run and common alarm status) and Ethernet/IP for secondary feedback (system specific alarms).

.3 Supply products modified as necessary by the manufacturer to provide the specified features and to meet specified operating conditions.

.4 Provide centrifuge capable of dewatering the feed sludge as described in 2.3.1.

.5 Provide centrifuge with scroll with adequate hydraulic and solids loading capacity to accommodate the sludge characteristics described in 2.3.1.

.6 The unit is to dewater continuously, or intermittently, without spillage of sludge or water beyond the machine envelope.

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

		Supply Label	Equipment Label	Wire Color
	Negative Pr #2	-	WHT/ORG	White/Orange
Fibre Optic	Jacket		WHT	Orange

2.6 SIGNAL LEVELS

.1 Pneumatic signals shall be 3 – 15 PSI(g) or 5-30 kPa(g).

.2 Analog instrument and control device signals shall be 4-20 mA DC with HART protocol.

.3 Analog instrument and control device signals between packaged equipment and the plant control system shall be 4-20 mA DC.

.4 It is preferred that all instruments are loop powered when suitable instruments are available. If external power is required, the preference is 120 VAC. External power requirements shall be communicated to The Owner.

.5 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.

.6 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).

.7 Solenoids shall be ‘low power’ type, 4 watts or less.

.8 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 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.

.3 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.

.4 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.

.5 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 INSTRUMENT AIR SUPPLY

.1 The maximum number of users downstream shall determine the instrument air header line size, including 20% spare. The chart below states the size of the header versus the number of users.

.2 Air Header Size and Number of Users:

.1 12 mm (1/2 inch NPS) maximum 4 users
.2 19 mm (3/4 inch NPS) maximum 10 users
.3 25 mm (1 inch NPS) maximum 25 users
.4 40 mm (1-1/2 inch NPS) maximum 80 users

.3 Provide a single point of connection for instrument air for each skid. From this point, an air header shall be run around the skid. Individual take offs will be run to within 24 inch of every instrument and include an isolation valve at the instrument. Each take-off from the header is to have an isolation valve.

.4 Every instrument requiring instrument air at a lower pressure than 120 PSI(g) to have its own filtered pressure regulator. If the Supplier prefers to use a single regulator to serve multiple users via a header, this regulator shall be dual redundant with individual isolation. In case of a common regulator, a pressure gauge and a relief valve are required on the low-pressure header.

.5 The main air header shall contain two pressure regulators in parallel, complete with parallel filters, a 114 mm (4½") pressure gauge with block valves but no bypass, and with a relief valve. The regulators and filters shall be valved so that one may be removed without interrupting service to the panel.

.6 Tubing to each instrument which is not equipped with a self-sealing disconnect valve shall be provided with a block valve and test tee for calibration purposes.

.7 Process leads to pressure instruments – 12 mm (½" OD) x 1.2mm (0.049" W.T.) 316 SS seamless tubing shall be used with Swagelok 316 SS fittings. Special materials may be required depending upon process conditions.

.8 Instrument air signal tubing shall be 6mm (¼" OD) x 0.8 mm (0.035" W.T.) 316 SS seamless with Swagelok fittings. Where instrument in question is subject to frequent maintenance or high vibration, vibration loops may be used or alternate tubing (e.g. Flexible armoured Teflon or Multi-Purpose hose such as Swagelok PB Series Push-On multi-Purpose Hose).

2.10 UNITS OF MEASUREMENT

.1 All engineering units used on the project shall be in Standard US units unless otherwise specified. This will apply to all calculations, drawings, data sheets, etc.

2.11 PRESSURE

.1 All pressure instruments shall be provided with a 19 mm (¾" NPT) x 12mm (½" NPT) isolation valve.

.2 Pressure instruments in steam service shall be provided with a 12mm (1/2 inch NPS), ANSI CL 800, globe type isolation valve with socketweld inlet connection and FNPT outlet connection.

.3 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.

.4 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.

.5 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.

.6 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

.7 Local pressure gauges for process services shall meet ASME B40.100. Further specifications shall be as follows:

.8 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 Gauges used in steam service shall be supplied with steam siphon to protect the gauge from heat damage.

.10 Movements shall be constructed of stainless steel. Movements shall be of the quadrant and pinion design or the helicoid arm and roller design.

.11 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.

.12 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.

.13 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.

.14 Process gauges for low pressure application shall be as described in the preceding except that they shall have diaphragm sensing elements.

.15 Pressure gauge connections on vessels shall be flanged.

.16 Pressure gauge connections associated with heat exchangers shall be on the piping, not on the exchanger nozzles.

.17 In addition to the piping supplied isolation valve, each pressure gauge shall have a block and bleed calibration valve.

.18 Cooling fins shall be considered to reduce high process temperature effects on the gauges.

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

2.12 DOOR SWITCHES

.1 A mechanical limit switch shall be installed on each exterior door to detect if each individual door is opened. All the contacts are to be wired and connected to inputs of the area PLC.

.2 Switches may be a magnetic type that is sensitive to a ferrous metal target. This alternate device shall be model 11-12110-00 as manufactured by Topworx.

.3 Alternative models from Topworx that are more convenient to mount or have better delivery are acceptable, but switches from other manufacturers are not acceptable. The targets are to be fabricated in the field.

2.13 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.

2.14 MOISTURE DETECTION

.1 Provide moisture detection as required and to meet local code requirements.

2.15 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.

2.16 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 with120VAC 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.

2.17 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:

FUNCTION	COLOR	FUNCTION	COLOR
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.

2.18 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.

2.19 INSPECTION AND TESTING

.1 Refer to Division 16 for specification of 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 Primary 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

Description	Preferred	Alternate
PLC	Allen-Bradley – ControlLogix L71 RS5000 Version 20.04	Allen Bradley MicroLogix 1400 (1766-L32BXBA), (small systems only)
Control Valves	Emerson(Fisher)	Samson Controls/Flowserve/ Metso (Neles-Jamesbury) / SVF Flow Controls/ DeZurik / Pratt / Milliken / Valmatic / Kennedy
Automatic On/Off Valves	Emerson	DeZurik / Pratt / Milliken / Valmatic / Kennedy Clarkson / Metso (Neles-Jamesbury) / SVF Flow Controls
Analysis	YSI or Hach	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 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)
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 400)	Rosemount 8750W, 8712E, Sparling Instruments, Bailey-F&P, Foxboro
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	Sensidyne SensAlert ASI	MSA Ultimax XE
Combustible Gas Strobe	Killark SHBG-2-23R (C1D1)	

Description	Preferred	Alternate
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 SCOPE

.1 This section includes the general requirements for the supply, delivery and installation, testing and placement into operation of two progressive cavity pumps appurtenances as specified herein and as shown on the drawings. The progressive cavity pumps shall be suitable to feed sludge into the dewatering centrifuge.

1.2 SUBMITTALS

.1 Submit shop drawings and information in accordance with section 01 33 00 – Submittals.

.2 Pump data to include:

- .1 Manufacturer's name, type, model, year, capacity and serial number.
- .2 Manufacturer's specifications for all equipment supplied.
- .3 Performance curves, including differential head, capacity, efficiency, NPSHr, and brake horsepower.
- .4 Outline and arrangement drawings.
- .5 Cross-sectional drawings.
- .6 Materials of construction.
- .7 Details of operation, service and maintenance.
- .8 Recommended spare parts list with names and addresses of suppliers.
- .9 Manufacturer to provide spare parts for minimum service life target of 20 and 25 years for solids-bearing pumps and motors respectively.

.3 Motor data to include:

- .1 Manufacturer's name, type, rating, model, year and serial number.
- .2 Manufacturer's specifications for all equipment supplied.
- .3 The load, efficiency, speed, torque, current and power factor curves.

1.3 OPERATIONS AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 39 – Operating and Maintenance Data.

.2 Data to include:

- .1 Manufacturers name, type, model, year, capacity and serial number.
- .2 Details of installation, operation, service, lubrication and maintenance.

.3 Recommended spare parts list with names and addresses of suppliers.

Part 2 Products

2.1 GENERAL

.1 General

.1 Pumps shall be of the positive displacement, progressive cavity type, with a single helical metallic rotor rotating in a double helical elastomeric stator of twice the pitch length.

.2 Rotor and Internal Drive

.1 A single helical rotor, of circular cross section and fabricated from 316 stainless steel shall be driven in its eccentric path by either:

.1 A positively sealed universal joint and lubricated pin-joint fabricated from high strength steel with replaceable bushings. A 316 stainless steel shell shall cover the universal joint assembly to protect the elastomeric sleeve from damage by pumped material. The joint will be designed to ensure that no eccentric loads are imparted on the shaft seal.

.2 A sealed gear joint design utilizing a splined connecting rod and ball gear. The gear joint shall be enclosed and protected by a wire-reinforced elastomeric seal. The joint will be designed to ensure that no eccentric loads are imparted on the shaft seal. The joint shall be pre-lubricated.

.2 Stator and End-Cover

.1 Stator shall be of double-helix design and be chemically bonded to the inside of a carbon steel tube.

.2 Stator shall be of Buna-Nitrile construction, with a minimum Shore A durometer of 70.

.3 Stator shall be designed to prevent pumped material from contacting the stator bonding and tube.

.4 Stators shall be manufactured to size. Stators manufactured in long lengths and cut to size are not acceptable.

.5 Pumps are to be designed to pass 6 mm solids or larger.

.3 Casing

.1 The casing shall include 150# (ANSI B16) flanged connections for suction and discharge. The suction and discharge casings shall each be provided with at least one (1) drilled, tapped and plugged port, 13 mm (1/2 in.) diameter, for gauge or accessory connections.

.2 The casing shall be painted and constructed of thick-walled cast iron, free of defects.

.4 Seals

.1 All pumps to be provided with bearing isolators.

.2 Mechanical seals are to be designed for operation of pump between full vacuum (0 kPa absolute) up to 200% of the maximum expected operating pressure.

.5 Gear Reducer

.1 Reduce the shaft speed by means of a close coupled gear reducer mounted on the pump, Eurodrive, Nord or approved equal.

.6 Baseplates

.1 Pump shall be mounted on a fabricated, painted steel baseplate.

.2 Baseplate to have minimum 6 drilled holes for mounting to floor.

.7 Finishes

.1 All equipment shall be factory finished.

.2 Sub-contractor to prime and touch up damaged finishes to match original finish.

.3 Restore to new condition finishes which have been damaged too extensively to prime and touch up.

.8 Motors

.1 Provide all progressive cavity pumps with motors equipped with anti-reversal holdback gearing for prevention of backflow through standby pump.

.2 All motors to be rated for 24-hour continuous duty.

.9 Accessories

.1 Run Dry Protection:

.2 .1 The stator shall be fitted with a sensor sleeve and thermistor sensor. A controller shall also be provided and shall be installed by the contractor in the motor control center. The controller shall monitor the stator temperature and activate a shutdown and alarm sequence if the stator temperature reaches the adjustable limit on the controller. The controller shall include a manual local and remote reset function. Input to the controller shall be 1x115VAC/60 Hz.

.3 Over-Pressure Protection Switch:

.4 .1 Each pump unit shall be supplied with a silicone-filled isolation ring with a dual mounted gauge and single point pressure switch. The pressure ranges for the switch and gauge shall be selected specifically for each specified service. The isolation ring shall be mounted between ANSI flanges, be sized according to the discharge pipe as shown on the plans and be constructed with a carbon steel body and fittings with a Buna sleeve. The switch shall be SPDT, NEMA 4.

.10 Acceptable Manufacturers

.1 Seepex.

.2 Wangen.

2.2 DEWATERING CENTRIFUGE FEED PUMPS

.1 Design Criteria

Number of Units	Two (2)
Pump Names	Centrifuge Feed Pumps 1 & 2
Liquid	SBR Municipal Residual Solids
Temperature (Deg C)	10 - 40
Specific Gravity	1.00
Solids Conc. (mg/L)	15,000
Apparent Viscosity Range (cP)	< 500
Normal Operating Flow Range (L/s)	8.3
Normal Operating TDH (m)	TBC
Drive Type	Variable speed
Power (kW / hp)	TBC
Motor Data (V / ph / hz)	TBC
Nominal Suction Diameter (mm)	TBC
Suction Connection Position	TBC
Nominal Discharge Diameter (mm)	TBC
Seal Type	TBC

Part 3 Execution

3.1 INSTALLATION

.1 Sub-contractor will supply necessary parts, labour and tools for complete installation of pumps.

.2 Competent personnel shall install equipment in strict accordance with the manufacturer's instructions. The Sub-contractor will not commence installation until such instructions have been received.

3.2 EQUIPMENT TESTING

.1 When equipment installation has been completed to the standards required by these specifications, the Sub-contractor shall arrange for the services of the equipment manufacturer's technical representative for a minimum of three (3) days.

.2 The equipment manufacturer's technical representative shall inspect the installation to ensure that the equipment has been installed in accordance with the manufacturer's requirements. If the installation is not in order, the Sub-contractor shall correct the deficiencies identified by the manufacturer's representative. The manufacturer's representative shall advise the Contractor's Consultant in writing that the installation has been checked and has been installed in accordance with the manufacturer's requirements.

.3 The cost of the equipment manufacturer's representative shall be borne by the Sub-contractor.

3.3 FINAL INSPECTION

.1 The Contractor's Consultant shall make final inspection only after the manufacturer's representative has advised the Contractor's Consultant in writing that the system may be operated.

.2 The Sub-contractor will, at his own expense, repair any irregularities or discrepancies identified during the examination. Costs associated with additional trips required by the manufacturer's representative for re-testing due to faulty installation shall be borne by the Sub-contractor.

3.4 TRAINING

.1 In addition to the time provided for equipment testing, the Sub-contractor shall provide for a minimum of eight (8) hours of on-site, formal training. The training shall cover all aspects of operation and maintenance of the equipment, including a full demonstration of rotor and stator disassembly / assembly.

END OF SECTION

Part 1 General

1.1 WORK INCLUDED

.1 The supply, delivery, installation support, testing and commissioning of one (1) horizontal, solid bowl, continuous feed, scroll type, high solids centrifuge, complete with electric motors, local control panel, auxiliary equipment, and accessories as specified herein.

.2 Provide a dewatering system complete with:

- .1 Centrifuge machine
- .2 Main drive
- .3 Back drive
- .4 Vibration isolation and seismic restraint systems
- .5 Sludge cake and centrate discharge chutes
- .6 Sludge cake and centrate sampling ports
- .7 Spare parts and special tools
- .8 Flexible pipe connection at sludge inlet and dewatered sludge outlet
- .9 Local control panel complete with but not limited to variable frequency drives, disconnect switches, line and load reactors, PLCs, ethernet switches, 24 VDC power supply and operator interface terminal. The control panel will include the control of the centrifuge, PC pumps and polymer system.
- .10 All other components required, and ancillary devices required for a complete and operable installation

1.2 DESIGN AND REGULATORY REQUIREMENTS

.1 All supplied equipment shall be CSA approved.

1.3 SUBMITTALS

.1 Submit shop drawings, including electrical power and control schematics, instrumentation loop drawings and panel layouts in accordance with Section 01 33 00.

.2 Provide a list of components and materials which will be shipped pre-assembled, and parts list for the other components and materials. Weights and physical dimensions shall be indicated for each part, assembly, and/or package to be shipped.

.3 Provide descriptive literature for all ancillary items of equipment including the following:

- .1 Drawings showing connection points for feed sludge, flushing water and cooling water, and required field routing of piping to connection points indicated.
- .2 Details of the vibration isolation and seismic restraint systems demonstrating compliance with Clause 2.5.9
- .3 Empty and operating weights.
- .4 Location and height of centres of gravity for all components mounted on separate bases.

.5 Certification that the centrifuge vibration isolation system meets the performance requirements of Clause 2.5.9

.6 Parts list with recommended list of spare parts.

.7 Factory test results.

.8 Control schematics showing interfacing to controls and motor control centre equipment.

.9 Electrical Motors

.10 Engineered Shop Drawings for all Local Control Panels

.11 VFDs

.12 PLC components

.13 Operator Interface Terminal

.14 Line and Load Reactors

.15 24 VDC Power Supplies

.16 Terminals, Relays, Circuit Breakers and Fuses

.17 Ethernet Switches

1.4 COORDINATION

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

1.5 SHIPMENT, PROTECTION AND STORAGE

.1 Ship all equipment pre-assembled, to the degree practicable.

.2 Provide complete storage instructions indicating specific requirements necessary to prevent any weathering, corrosion, contamination, mechanical damage, freezing, or any other deterioration of components.

Part 2 Products

2.1 DESCRIPTION

.1 Provide one (1) centrifuge to dewater sludges at a municipal wastewater treatment plant. The centrifuge is to dewater wastewater sludge derived from aerobic digestion of SBR waste activated sludge.

.2 Provide PLC based control system to allow fully automatic unsupervised control of centrifuge and all ancillary components (valves, feed pumps and polymer system). Control system must be capable of interfacing with remote located pumps controls and Plant Control System (PCS).

.3 Supply products modified as necessary by the manufacturer to provide the specified features and to meet specified operating conditions.

.4 Provide centrifuge capable of dewatering the feed sludge as described in 2.3.1.

.5 Provide centrifuge with scroll with adequate hydraulic and solids loading capacity to accommodate the sludge characteristics described in 2.3.1.

.6 The unit is to dewater continuously, or intermittently, without spillage of sludge or water beyond the machine envelope.

2.2 ACCEPTABLE MANUFACTURERS

.1 The Owner will preselect the centrifuge equipment from one of the following vendors and notify the Contractor which equipment to procure under the General Contract.

.1 Alfa Laval Inc. (Alfa Laval)

.2 Andritz Separation Technologies Inc. (Andritz)

.3 Centrisys Corporation (Centrisys)

2.3 CAPACITIES AND PERFORMANCE

Provide centrifuge equipment capable of optimum performance within the following:

Number of Units		One (1)
Operating Period	h/d	6
	d/wk	2.5
	h/wk	15
Design Conditions		
Solids Feed Rate	kg/h	240
Maximum Volumetric Feed Rate:		
Sludge	L/s	8.3
Dilute Polymer Solution	L/s	0.65
TOTAL	L/s	8.95
Thickened Waste Activated Sludge - % VSS/TSS (by weight)	%VSS/TSS	75%
Stabilization Prior to Dewatering		Aerobic digestion
Chemical Precipitation		None
Performance Requirements		
Minimum Hydraulic Retention Time in Cylindrical Section of Bowl (*excluding conical section, based on maximum sludge feed rate only*)	seconds	21
Maximum Weir Depth		60% of bowl diameter
Minimum L:D		4
Minimum Solids Capture at peak solids loading and/or peak flow, each	%TSS	95%
Minimum Cake solids by weight	%DS	18%
Maximum dry polymer usage at peak solids loading and/or maximum flow, each	kg/TDS	10.0

.1 For the purpose of this specification, solids capture is defined as:

$$C(F - E)/F(C - E) \times 100$$

Where: C = percent dewatered cake solids (TS)
F = percent feed solids (TSS)
E = percent centrate solids (TSS)

.2 For the purpose of this specification, solids loading rate is defined as the peak solids production fed to a single centrifuge over a 6-hour period.

2.4 MATERIALS

.1 All wetted parts unless otherwise specified: AISI Type 316 stainless steel.

.2 Bowl shell: AISI Type 316/317 stainless steel.

.3 Scroll: AISI Type 304 stainless steel, as a minimum.

.4 Feed and discharge compartment walls: Polyurethane lining or sprayed carbide.

.5 All bolts, nuts, washers: AISI Type 304 stainless steel.

2.5 EQUIPMENT COMPONENTS

.1 General

.1 Provide centrifuge as a completely integrated unit designed for continuous and intermittent operation.

.2 Centrifuges shall be counter-current design.

.3 Polymer, in diluted form, will be pumped into the centrifuge feed sludge by variable speed positive displacement pumps.

.4 Dynamically balance each centrifuge prior to shipment.

.2 Bowl

.1 Provide solid bowl type centrifuges.

.2 The centrifuge bowl is a solid horizontal cylinder with a conical beach extension into which a scroll conveyor fits concentrically.

.3 Design the bowl to withstand all centrifugal forces encountered at the maximum bowl speed, with an adequate safety factor.

.4 Inspect all centrifugally cast components for cracks, shrinkage, porosity, or other defects by means of a liquid penetrant test.

.5 Certify that liquid penetrant tests were performed and the castings free of defects.

.6 Configure the centrifuge such that the pool depth is readily adjustable through the use of weir plates located at the large diameter end of the bowl.

.7 Design the weir plates to be readily accessible without the need to remove the centrifuge case top.

.8 Protect the bowl from wear by means of either a replaceable ribbed liner or longitudinal bowl strips. Material of construction to be AISI type 304 or type 316 stainless steel.

.3 Main Bearings

.1 Design the centrifuge to be supported by two main bearings.

.2 Main bearings to be spherical or cylindrical roller bearings.

.3 Main bearings to be grease or oil lubricated.

.4 Design main bearings for an ABFMA L-10 rating life of at least 100,000 hours.

.5 House main bearings in one-piece or split-type pillow blocks.

.6 Bearings shall be complete with 0.25% accuracy 100-ohm platinum RTDs.

.4 Conveyor

.1 Independently mount scroll conveyor concentrically within the centrifuge bowl.

.2 Equip the scroll conveyor with helical flights protected from abrasion by the following:

.1 Protect the edge and face of the conveyor against abrasion from the solids discharge end of the conveyor through the feed port area.

.2 Provide sprayed on tungsten carbide on edges of scroll over a width of 30mm.

.3 Design abrasion protection for the conveyor flights for a minimum of 15,000 hours of operation before refurbishment or replacement is required.

.3 Design the scroll conveyor to rotate at a slight differential speed to the bowl.

.4 Support the scroll conveyor by grease lubricated ball or roller bearings.

.5 Design the scroll conveyor bearings for an AFBMA L-10 rating life of at least 100,000 hours.

.5 Conveyor Backdrive

.1 Drive the scroll conveyor by a squirrel cage induction motor operated by either a variable frequency controller rated for constant-torque operation through a gear reducer or a hydraulic drive.

.2 Mount the backdrive system on a base separate from the centrifuge base or mounted in-line below the gearbox/speed reducer.

.6 Backdrive: Constant-Torque Rated Variable Frequency Controller Operated Squirrel Cage Induction Motor Backdrive Unit

.1 The backdrive system is to consist of a squirrel cage induction motor EEMAC torque rated for the load requirements, gear reducer, integral machine controls, and all appurtenances required to provide a complete, mechanical system.

.2 Gear Reducer

.1 Equip each centrifuge with a two-stage planetary gear / cyclo speed reducer that controls the differential speed between the centrifuge bowl and the scroll conveyor.

.2 Design the gear/speed reducer units with a torque capacity required to meet the specified service conditions with an adequate factor of safety.

.3 Select appropriate gear reduction ratio as required to perform under the specified service conditions.

.4 Design gears in accordance with AGMA Class 10 and Class 11 quality requirements.

.5 Case harden and grind the sun and planetary gears.

.6 Provide self-contained gear lubrication using high performance gear oil.

.7 Balance the gear box/speed reducer independently of the centrifuge.

.8 Provide the gear reducer with independent protection from high torque overload.

.9 A thermal overload protection system on the drive motor does not provide sufficient protection and is not acceptable for independent protection of the gear reducer.

.3 Design the backdrive system to provide infinite speed variation between the scroll conveyor and the bowl of the centrifuge.

.4 Allow for operation of the backdrive system in conjunction with the operation of the centrifuge in either a manual or automatic control mode.

.5 Provide monitoring of the backdrive torque loading and initiate shutdown of the centrifuge feed pumps upon detection of excessive torque, allowing a flushing and/or clearing of the internal solids inventory.

.6 The centrifuge feed pumps are manually restarted after a flushing cycle. Controls to allow feed pump to start automatically after a flushing cycle and initiate a shut-down sequence if flushing cycle occurs 4 times within a 60-minute period.

.7 In the event torque continues to increase, provide for centrifuge and feed system shutdown. Apply a brake to the pinion shaft to increase the conveyor's differential speed to a maximum to scroll the excess solids from the centrifuge as it coasts down.

.8 Mount the backdrive system controls in the centrifuge Main Motor Control Panel.

.9 Backdrive system controls consist of the pinion speed and torque indicators, speed adjustment potentiometers, and a forward/reverse direction selection switch.

.10 Design the backdrive control system to be capable of full four-quadrant control and operation, and rapid switching between modes to maintain the specified speed requirements.

.11 Backdrive Motor

.1 Provide TEFC energy efficient, horizontal, severe service duty backdrive motor rated for continuous operation at 480 VAC, 3 phase, 60 Hz.

.2 Motor rated for Supplier's standard speed at an altitude of 350m at 40°C ambient.

.3 Provide a tachometer generator rated at 50 VDC per 1000 rpm, or as normally provided by the Supplier compatible with the PLC input requirements.

.4 Provide motors with grease lubricated anti-friction ball bearings with a minimum AFBMA L-10 rating life of 60,000 hours.

.5 Connect backdrive motor to the pinion shaft of the differential gearbox through a V-belt drive or a cog belt.

.6 Backdrive shall be started by means of a variable frequency drive.

.7 Main Drive Motor

.1 Provide TEFC energy efficient, horizontal, main drive motor rated for continuous operation at 600 VAC, 3 phases, 60Hz.

.2 Main Drive Motor will be started by means of a variable frequency drive.

.3 Equip the Main Drive Motor stator windings with a minimum of three 0.25% accuracy platinum RTDs.

.4 Motor rated for Supplier's standard speed at an altitude of 350 m at 40°C.

.8 V-Belt Drive

.1 Configure the centrifuge main drive to be V-belt driven.

.2 Design the V-belt drive to allow for relative movements caused by the vibration isolation of the main drive base and the centrifuge base if separate equipment bases are used.

.9 Vibration Isolation

.1 Provide each centrifuge decanter and main drive with vibration isolators.

.2 Centrifuge decanter and main drive can be mounted on a common base and provided with vibration isolation or mounted on separate bases and isolators. Common base configuration is preferred.

.3 Provide 95% isolation efficiency.

.4 Provide vibration isolation equipment and devices by a single manufacturer with the exception of vibration isolators that are factory installed and standard equipment with the machinery.

.5 Size isolators at the manufacturer's optimum recommended loading. Do not load isolators above the limit specified in the manufacturer's literature.

.6 Provide a balanced set of isolators for each piece of equipment. Select all isolators in accordance with equipment weight distribution to provide the minimum static deflections stated above.

.7 Meet the minimum static deflection specified in the final installation, with each isolator having no less than 80% of the static deflection specified.

.8 Mark code numbers and colours on shop drawings, on each isolator, and on each base to ensure proper placement. Clearly tag all springs to show undeflected height and static deflection.

.9 If more than one type of neoprene element is used, clearly identify the durometer of each.

.10 Provide spring mounts complete with leveling devices, minimum 6mm thick neoprene sound pads, and zinc chromate plated hardware.

.11 Size neoprene sound pads for a minimum deflection of 1mm. Use dynamic stiffness for sizing elastomers and do not exceed 50 durometers.

.12 Maintain a nominal 50mm clearance below the equipment and the bases.

.13 Provide flexible piping connectors meeting the operating requirements, including nature of material, temperature, and pressure conditions, as well as the following requirements for vibration isolation:

.1 Provide flexible piping connectors as per manufacturer's standard for the intended service.

.2 Mould and cure flexible piping connectors in hydraulic rubber presses.

.3 No steel wires or rings are allowed as pressure reinforcement.

.4 Provide straight connectors with two spheres. Neoprene elbows manufactured with a single sphere forming the corner of the joint itself.

.5 Provide specification data and shop drawings for proposed alternate connectors for approval, if the requirements of this clause cannot be met due to the nature of the material conveyed.

2.6 CONTROLS AND CONTROL PANEL

.1 General

.1 Provide the dewatering centrifuge system with its own Local Control Panel (LCP), EEMAC 12 rated, including a programmable logic controller (PLC) and operator interface terminal (OIT). Components of the control system, operator interface and control panel to meet requirements stated in specifications 01 60 12 and 01 70 12.

.2 The centrifuge PLC shall have an Ethernet communications port and use the TCP/IP protocol.

.3 Control of the centrifuge and ancillary equipment shall be accomplished using a local vendor-supplied PLC located in the LCP. The use of separate controllers or processors for drive control operation is not acceptable

.4 PLC program shall be stored within an EEPROM or similar technology memory device on board the PLC. In the event of a failure or loss of memory of the PLC the control program shall be automatically restored from the memory module on power up of the PLC. Original copies of the PLC program code is to be provided on 3 CD's with a hard copy of the PLC programs and mapping of the memory registers.

.5 Design the control panel to provide control and monitoring functions for all related ancillary equipment for the dewatering process including but not limited to solenoid flush valves. Control of sludge feed pumps, polymer feed pumps, dewatered sludge conveyor will be provided by the Plant Control System (PCS) in response to remote requests from the centrifuge PLC.

.6 Motor starters (supplied by others) for the dewatered sludge screw conveyor shall be located inside the plant MCC. Isolated dry contacts for the start and stop of this conveyor shall be provided on the centrifuge's LCP (to be used if required). The LCP shall be capable of accepting inputs from the conveyor motor starter, to confirm its run status, and slow speed switch (SSL), to confirm rotation. These inputs shall be used for suitable interlocks in the centrifuge's LCP / PLC.

.7 Variable Frequency drives (supplied by others) for two (2) sludge feed pumps and one (1) polymer feed pump shall be located inside the plant MCC. Isolated dry contacts for the start and stop of the sludge feed pumps and polymer feed pump (i.e. "feed permissive" contacts) shall be provided on the LCP.

.2 Electrical Control Panel

.1 The centrifuge control panel shall be an EEMAC 12 freestanding enclosure. The panel shall include a through the door operated main disconnect that can be locked in the off position. Main power components shall consist of variable frequency drive controllers with short-circuit and overload protection for bowl and scroll motors. It shall include a common DC Bus to utilize regenerated energy from the

scroll motor for powering the bowl motor. The panel shall operate from a 480V AC, 3 phase, 60 Hz service and shall also include a control power transformer for auxiliary components. Main control components shall consist of programmable logic controller, control relays, and terminal points for interconnection with ancillary equipment. A phone modem shall be included in the panel and connected to PLC for remote diagnostics, data transfer and online analysis. Door mounted components shall consist of illuminated selector switches, mushroom head maintained emergency stop, and operator interface terminal (OIT).

.2 Provide phase loss and lightning/voltage surge protection device for each panel.

.3 Control voltage shall be 120V AC.

.4 Provide selector switches, pilot lights, pushbuttons, potentiometers and similar pilot devices for ease of operation and trouble shooting.

.5 Provide a local mushroom head-maintained emergency stop for the centrifuge wired in series with the panel emergency stop.

.6 The panel shall be constructed to UL 508 requirements, designed and built to provide the necessary components to safely run and control the centrifuge, three feed pumps, one polymer pump and one conveyor.

.7 An elapsed time meter shall be supplied and will be of six (6) digit, non-reset, register type with the last digit reading in tenths of an hour for the main motor and scroll motor suitable for panel door mounting.

.8 Provide all motor controllers for AC induction motors with integral thermal overload protection and motor circuit protection.

.9 All components in the control panel will be completely factory wired. All external control connection points will terminate on a terminal strip. There will be a minimum of 10% spare terminal connections supplied.

.10 Pushbuttons and pilot lights will be watertight, corrosion resistant supplied in accordance with specification Sections 01 70 12.

.11 Provide the panel with fault monitoring and alarm annunciation system complete with interlocks to related systems for system shutdown and run enable functions.

.12 Pilot lights will be supplied with appropriate colored lens caps.

.13 Control wire will be #14 AWG minimum: will conform to U.L. standards and will be type THW or MTW. Power wiring will be sized as required.

.14 Control wiring to be supplied in accordance with specification Sections 01 70 12 and 01 60 12.

.15 A ground lug will be supplied on the panel.

.16 Each wire segment will be numbered at each end in accordance with specification Sections 01 60 12.

.17 Nameplates will agree with the wiring diagram and be supplied in accordance with specification Sections 01 60 12 and 01 70 12.

.3 Control System Operation

.1 The operational procedure of the centrifuge shall be engineered such that minimal operator interaction is required. Each function shall be initiated with the push of its own button. Under alarm or "emergency stop" conditions, the

shutdown sequence shall be automatically triggered. The following is a step-by-step description of the sequence of operations.

.2 The centrifuge will be enabled / disabled by the PCS via a dry contact closure signal (relay or through PLC).

.3 The centrifuge will be started by depressing the centrifuge “START” button, thereby flashing the centrifuge "starting/running" light. The polymer and feed systems will be interlocked with the centrifuge controls to prevent their operation at this time.

.4 During start-up, the back-drive will be automatically set to a minimum speed to provide maximum scrolling of residual solids from the bowl. After a preset, timed interval, during which the bowl has reached full operating speed, the "starting/running" light will stop flashing and come on solid. The system checks the bowl speed and indicates that it is ready for operation assuming that no fault conditions exist.

.5 “Feed permissive” dry contact closure (relay or through PLC) signals will be provided to permit the Operator to initiate sludge and polymer feed to the centrifuge through the PCS. As process requirements vary, the backdrive speed will be infinitely adjustable via the touch pad on the "Operator Interface Terminal (OIT)" unit, which will maintain the set speed utilizing a closed loop under differential speed feedback system.

.6 The PLC monitors the operation of the centrifuge and provides a digital display of bowl speed, scroll speed, differential speed and torque, as well as other operational parameters on the OIT. The differential speed will be controlled either by a differential speed set point or a torque set point. While operating with a torque set point, the differential speed is automatically adjusted to maintain a constant torque; thereby, compensating for varying feed characteristics while optimizing residence time and separation. Set points for the differential speed and torque are entered via a numeric key pad/touch screen. In the fixed differential speed mode, the back-drive speed will be maintained while the torque is allowed to vary as process parameters change.

.7 After stable operation has been achieved, the auto-torque mode may be selected. In this mode, the back-drive torque will be maintained while the speed is allowed to vary, within preset limits, in order to maximize residence time. If torque begins to rise above the set point, the differential speed will be increased to scroll solids out of the bowl at a faster rate, thereby lowering the torque back to the set point.

.8 The shutdown sequence shall be triggered either with a single push of the "STOP" button, via a fault condition or via the centrifuge enable/disable contact used by the PCS. In any case, the system will disengage the sludge feed and polymer feed systems (using the “feed permissive” contacts), initiate the automatic flush cycle and disengage the main motor. The flush cycle shall consist of flushing the bowl with plant water during the coast down of the bowl. Concurrently, the scroll continues to convey solids to the discharge ports and out of the bowl.

.9 Provision shall be made for a pause mode of operation where the centrifuge will continue to run while the sludge and polymer feed pumps are stopped, and where the conveyor will stop after a specified time delay. This mode of operation will allow the cake receiving truck to be changed (approximately a 15-minute delay).

.10 Provision shall also be made for a programmed shutdown based on sludge production target achieved or set timer/ time.

.11 The back-drive will automatically be de-energized at the end of the coast down by a shutdown timer.

.12 Controlled Shutdown Sequence will consist of:

.1 Sludge feed pumps and polymer feed pump stopped.

.2 Main motor shut off allowing bowl to begin decelerating

.3 Water flush system timer started.

.4 Water flush system on.

.5 Timer for `scroll motor to stop' initiated.

.6 Water flush timer times out.

.7 Water flush system off

.8 Bowl decelerates to stop.

.9 Timer for “scroll motor to stop” times out.

.10 Scroll motor shuts off allowing scroll to decelerate and stop.

.13 Emergency Shutdown:

.1 The Emergency Shutdown (initiated either by the Emergency Stop push-button or by system alarms) will shut down the equipment simultaneously without going through the controlled shutdown sequence. After the condition is cleared and emergency stop push-button de-energized, the system shall require a safety-check and restarting by the operator.

.14 Equipment alarms:

.1 High Torque, high current, high vibration or high bearing temperatures will stop the polymer feed system and sludge feed pumps, alarm at panel and start bowl flush timer sequence. The scroll differential speed is also increased to maximum. When torque high alarm clears, bowl flush water sequence stops and the scroll differential speed resumes normal operation. Polymer feed system and sludge feed pumps can then be restarted.

.2 Torque high-high, high-high vibration or high-high bearing temperature will initiate the controlled shut down sequence and alarm at panel. After condition is cleared, operator to clear alarm via alarm reset push-button

.3 Equipment failure at the cake sludge conveyor will cause the sludge feed pumps and polymer feed pump to stop (using the “feed permissive” contacts) and start bowl flush timer sequence. Flush water timer to time out. After condition is clear, polymer feed system and sludge feed system can be restarted.

.4 Speed indication low will initiate controlled shutdown and alarm at control panel.

.5 Low relative/differential speed will initiate controlled shut down sequence and alarm at panel, after condition is cleared, operator to clear alarm via alarm reset push-button

.6 Thermal overload trip on main motor will initiate controlled shut down sequence and alarm at panel. After condition is cleared, operator to clear alarm via alarm reset push-button.

.7 Thermal overload trip on scroll drive will initiate Emergency shut down (all pieces of equipment simultaneously). After condition is cleared, operator to clear alarm via alarm reset push-button.

.8 High-high current on the back-drive will initiate Emergency shut-down. After condition is cleared, operator to clear alarm via alarm reset push-button.

.4 Control functions on front of control panel shall, as a minimum, include:

.1 Start/Stop, on/off controls of:

.1 Panel/Remote mode select
.2 Automatic Start-up
.3 Automatic Shutdown
.4 Centrifuge Drives
.5 Wash water Solenoid Valve
.6 Screw Conveyors
.7 Alarm Reset
.8 Bin Change mode
.9 Acoustic Alarm

.2 OIT status indication for:

Status

.1 Automatic Start-up "Starting up in Auto"
.2 Automatic Shutdown "Shutting down in Auto"
.3 Centrifuge "Running"
.4 Wash water Solenoid "Open/Closed"
.5 Polymer System "Running"
.6 FPS Feed Pump "Running"
.7 TWS Feed Pump "Running"
.8 Cake Conveyor "Running"
.9 Polymer Feed Pump "Running"

Alarms

.10 Emergency Stop "Fault"
.11 Bowl Drive VFD "Fault"
.12 Bowl Drive Motor Thermal "Fault"
.13 Back Drive VFD "Fault"
.14 Back Drive Motor Thermal "Fault"
.15 Back Drive High Torque "Warning"
.16 Back Drive High Amps "Warning"
.17 Back Drive High-High Torque "Fault"
.18 Back Drive High-High Amps "Fault"

.19 High Vibration "Warning"
.20 High-High Vibration "Fault"
.21 Low Relative/Differential RPM "Fault"
.22 Bowl Locked "Fault"
.23 Polymer System "Fault"
.24 Sludge Feed Pumps "Fault"
.25 Polymer Feed Pump "Fault"
.26 Screw Conveying System "Fault"
.27 High Bearing Temperature "Warning"
.28 High-High Bearing Temperature "Fault"
.29 Low/No Sludge Flow rate "Fault"

.3 Provide bypasses for all the above alarms in a password protected screen. Each by-pass must be automatically reset after a certain amount of time programmable through the OIT. This is to avoid any accidental permanent bypasses.

.4 Set point and measured parameter display of:

.1 Bowl Speed "RPM"
.2 Back Drive Speed "RPM"
.3 Back Drive Torque "Percent"
.4 Relative/Differential Speed "RPM"
.5 Bowl Speed Set Point "RPM"
.6 Back Drive Torque Set Point "RPM"
.7 Relative/Differential Speed Set Point "RPM"
.8 Vibration "mm/sec"
.9 Centrate side main bearing temperature Deg. C"
.10 Cake side main bearing temperature "Deg. C"
.11 Main Drive Current "Amps"
.12 Back-drive Current "Amps"
.13 Back-drive temperature "Deg. C"

.5 Alarms:

.1 Alarm conditions shall be indicated with flashing red indicators on the OIT alarm screen and shall cause alarm horn to sound and beacon to flash. Operator acknowledge pushbutton will silence horn and cause indicator lights and beacon to be steady on until alarm condition is cleared. Operating reset button will clear latched alarms. When no alarms remain present system start-up shall be allowed. When no alarms are present the OIT shall be indicate so by displaying alarm indicator text in green.

.2 Following conditions shall immediately shutdown the complete system in auto or manual:

.1 Emergency stop
.2 Bowl drive VFD fault
.3 Bowl motor thermal overload

.4 Back drive VFD fault
.5 Back drive motor high temperature
.6 Back drive high-high torque
.7 Back drive high-high current
.8 High-High vibration
.9 Low relative/differential speed
.10 Bowl lock
.11 High-High bearing temperatures

.3 Following conditions shall shutdown polymer and sludge feed in auto mode:
.1 High vibration
.2 Back drive high torque
.3 Back Drive high current
.4 Main drive high current
.5 Polymer system fail
.6 Sludge feed system fail
.7 Conveyor system fail
.8 High bearing temperature
.9 Bin change mode

.4 High vibration, high torque or high back-drive conditions will initiate a flush sequence the duration of which is operator adjustable through the OIT. If three consecutive high vibration, high torque or high back-drive current alarms occur within a one-hour time limit an auto shutdown sequence shall be initiated.

.6 Clean-In-Place (CIP):

.1 Provide a clean-in-place cycle that is manually initiated from the local control panel.
.2 Clean-in-place cycle includes provisions for rotating the scroll conveyor in either or both forward and reverse directions at timed intervals.
.3 During the cleaning cycle, flushing water is automatically introduced at high rates.
.4 An auto top shall automatically initiate the CIP.

2.7 PROTECTIVE COATINGS

.1 Shop prime and paint all equipment in accordance with Sections 46 90 00.

2.8 SPARE PARTS

.1 Provide the following spare parts for each centrifuge:

.1 One set main bearings and seals
.2 One set scroll bearing
.3 One set O-rings
.4 One thrust bearing
.5 One thrust bearing seal and lockwasher

.6 One spare set of belts of each size required

.7 Lube oil/grease for one year

.2 Provide the following special tools:

.1 One set disassembly tool

.2 One bearing puller

.3 Bowl/conveyor lifter and all special maintenance tools

Part 3 Execution

3.1 MANUFACTURER'S REPRESENTATIVE

.1 Arrange for a technically qualified Manufacturer's Representative to attend the installation work, train operating and maintenance staff and undertake the testing of the system for sufficient periods to ensure the equipment is installed, operated, and maintained in accordance with the Manufacturer's recommended procedures.

.2 The minimum periods of site attendance are identified in the following table along with the Form to be completed on each of these trips. A "day" is defined as eight working hours on site.

Item	Description	No. of Days per Trip	Form
1	Witnessing of Equipment Installation	1	100, 101,102
2	Operator and Maintenance Training (combined with Items 2 and3)	1	T1
3	Equipment Performance Testing	1	103
4	Equipment Performance Commissioning	1	104
5	Process Performance Testing	1	105
6	Follow-up Inspection (Optimization)	1	-
7	End of Warranty Inspection	1	-

.3 The total number of trips will depend on the Contractor's schedule. The cost of additional trips, to be determined by the Engineer, will be borne by the Contractor.

3.2 INSTALLATION

.1 The Supplier's Representative shall verify satisfactory delivery of the equipment by completing Form 100, illustrated at the end of Section 46 76 00.

.2 The Supplier's Representative shall instruct the Contractor in the methods and precautions to be followed in the installation of the equipment. Certify the Contractors' understanding by completing Form 101, illustrated at the end of Section 46 76 00.

3.3 INSTALLATION WITNESSING

.1 The Contractor shall ensure the equipment is installed plumb, square and true within the tolerances specified by the Supplier and as indicated in the Contract Documents.

.2 The Contractor shall ensure that the equipment is installed as required to provide satisfactory service.

.3 The Supplier's Representative shall cooperate with the Contractor to deliver a successful installation as documented by Form 102 illustrated in Section 46 76 00.

3.4 PERFORMANCE TESTING

.1 The Supplier's Representative shall ensure the equipment, including all component parts, operates as intended. The testing procedure is set out in Section 3.5.

.2 The Supplier's Representative shall cooperate with the Contractor to test the equipment as documented by Form 103, illustrated in Section 01 65 00.

3.5 EQUIPMENT PERFORMANCE TESTING PROCEDURE

.1 Startup

.1 Submit a detailed start-up procedure for approval.

.2 Provide site services of the centrifuge Supplier's Representative for the tuning, monitoring, inspecting, and starting of the centrifuge during the entire start-up procedure.

.3 Startup Procedure:

.1 Tune and adjust the centrifuge to begin initial start-up.

.2 Unless otherwise specified, sludge, polymer, water, and electric power will be provided for the start-up period.

.3 Subsequent to proper tuning, perform an initial thorough inspection of all system components, including electrical and instrumentation controls.

.4 Recommend suitable liquid polymer for the given sludge conditions.

.5 Subsequent to initial inspection and check-out, operate the centrifuge for a minimum period of 18 hours of continuous operation (3 days at 6 hours/day), or as feasible with the sludge inventory in the plant.

.6 The initial start-up procedure is deemed complete if no malfunctions occur during the 18 hours of continuous operation.

.7 If malfunctions occur during the 18 hours of continuous operation, perform and complete corrective action within 48 hours and restart the centrifuge for a minimum of 18 hours of additional continuous operation.

.8 The start-up procedure is then deemed complete if no malfunctions occur during the 18 hours of continuous operation. Form 102 will be signed upon the successful completion of the 18-hour test period.

.9 If malfunctions occur during the 18 hours of continuous operation, terminate the start-up period and perform and complete corrective action within 48 hours prior to requesting an additional start-up test.

.10 If an additional start-up is necessary, follow the procedures outlined above

.2 Testing

.1 Submit a detailed procedure and schedule for approval

.2 Begin testing only after completing the start-up procedure.

.3 Unless otherwise specified sludge, polymer, water, and electric power will be provided for the testing period.

.4 The procedure for testing is as follows:

.1 Operate the centrifuge for 6 continuous hours per day for a period of 5 consecutive calendar days.

.2 Demonstrate that the centrifuge performance during the testing period meets or exceeds the minimum performance requirements defined in these specifications.

.3 In the event of unacceptable performance, perform any supplemental testing, analysis, equipment adjustments, modifications, changes, or additions and request a retest of the unacceptable system at no additional cost.

.3 Sampling and Analysis

.1 Samples will be collected by the Supplier and analyzed by independent testing lab and District of Sooke staff during the testing period. Samples will be tested in accordance with the following:

.1 Centrifuge feed sludge: Total suspended solids (TSS); Volatile suspended solids (VSS); and Total solids (TS)

.2 Centrate: TSS

.3 Dewatered sludge cake: TS

.2 Representative samples will be collected for analyses everyone hour during the testing.

.3 In addition, centrifuge feed sludge instantaneous and cumulative flow rates, polymer usage, power usage, torque, and any other parameters necessary to demonstrate compliance with the performance requirements specified will be recorded.

.4 Submit a report summarizing the operating parameters assessed during the test period, recommending optimal setpoints and listing final testing data in concise tabular form at the conclusion of the test period.

.5 Upon the successful completion of the testing procedure, form 103 will be signed.

3.6 COMMISSIONING AND TRAINING

.1 A field service technician or start-up engineer of the Centrifuge Supplier shall commission the dewatering equipment.

.2 Local manufacturer’s representatives are not acceptable to perform these tasks unless authorized by the centrifuge Supplier.

.3 The field service technician shall certify that all equipment is properly installed and that the plant operators have been trained on proper operation and maintenance procedures

.4 The minimum recommended man-days / trips for installation inspection, system commissioning, and operator training shall be as follows:

.1 Inspection of installation: typically a minimum of one (1) man-day / one (1) trip.

.2 Start-up/system commissioning: typically a minimum of three (3) man-days

.3 Operator training: typically a minimum of three (3) man days

.5 Contractor and Manufacturer's Representative to be in attendance during commissioning of the process system that includes the equipment specified in this section to ensure the equipment functions as intended in the process system as documented by **Form 104**. Cooperate with the Commissioning Team in developing the Commissioning Plan for this equipment. Provide assistance as required for system programming, start-up and troubleshooting.

.6 The Supplier's Representative shall provide training to the Owner's Designated Staff in the proper operation and maintenance of the equipment as documented by **Forms T1**

3.7 FOLLOW-UP INSPECTION (OPTIMIZATION)

.1 After a period designated by the Owner (approximately 6 months after commissioning), a qualified Supplier's Representative shall visit the site to assist the plant staff in optimizing the centrifuge performance.

3.8 END OF WARRANTY INSPECTION

.1 After a period designated by the Owner (approximately 24 months after commissioning), a qualified representative will provide a follow-up inspection of the centrifuge installation.

.2 During this period, the following services will be performed by the centrifuge manufacturer's technical representative at their expense in the presence of designated plant staff:

.1 Replace the main bearings;

.2 Remove the scroll for inspection; and

.3 Optimize and adjust the centrifuge, as requested by Owner's Designated Staff.

END OF SECTION

CERTIFICATE OF EQUIPMENT DELIVERY
FORM 100

We certify that the equipment listed below has been delivered into the care of the Contractor. The equipment has been found to be in satisfactory condition. No defects in the equipment were found.

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

Print Name	Signature	Date

(Authorized Signing Representative of the Contractor)

Print Name	Signature	Date

(Authorized Signing Representative of the Supplier or Manufacturer)

Print Name	Signature	Date

(Authorized Signing Representative of the Engineer)

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

I certify that I have received satisfactory installation instructions from the equipment Manufacturer or Supplier.

_____ _____

_____ _____

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

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

_____ _____

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

CERTIFICATE OF SATISFACTORY SYSTEM OPERATIONAL TESTING
FORM 103

We certify that the Major Equipment listed below has been operated for at least three (3) successful days (with the last three (3) days to be consecutive) and that the equipment 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

CERTIFICATE OF SATISFACTORY COMMISSIONING
FORM 104

We certify that the Sooke WWTP Centrifuge has been operated, tested and commissioned as per the Contract Documents for at least three (3) successful days (with the last three (3) days to be consecutive) and that the equipment meets its operational and performance criteria, including fully automatic controls. The treatment equipment is therefore classed as “conforming”.

PROJECT: _____

FACILITY: _____

_____

_____

_____

_____ _____

Print Name Signature Date

(Authorized Signing Representative of Contractor)

_____ _____

Print Name Signature Date

(Authorized Signing Representative of the Engineer)

_____ _____

Print Name Signature Date

(Authorized Signing Representative of The Town)

CERTIFICATE OF SATISFACTORY PERFORMANCE AND/OR GUARANTEED PERFORMANCE TESTING
FORM 105

We certify that the equipment listed below has been tested and meets the Performance and/or Guaranteed Performance Testing requirements as set out in the Work.

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)

Print Name	Signature	Date

(Authorized Signing Representative of The Town)

END OF SECTION

CERTIFICATE OF SATISFACTORY TRAINING
FORM T1

We certify that the Sooke WWTP designated Staff has received satisfactory training in the proper operation and maintenance of the equipment listed below.

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)

Print Name	Signature	Date

(Authorized Signing Representative of The Town)

END OF SECTION

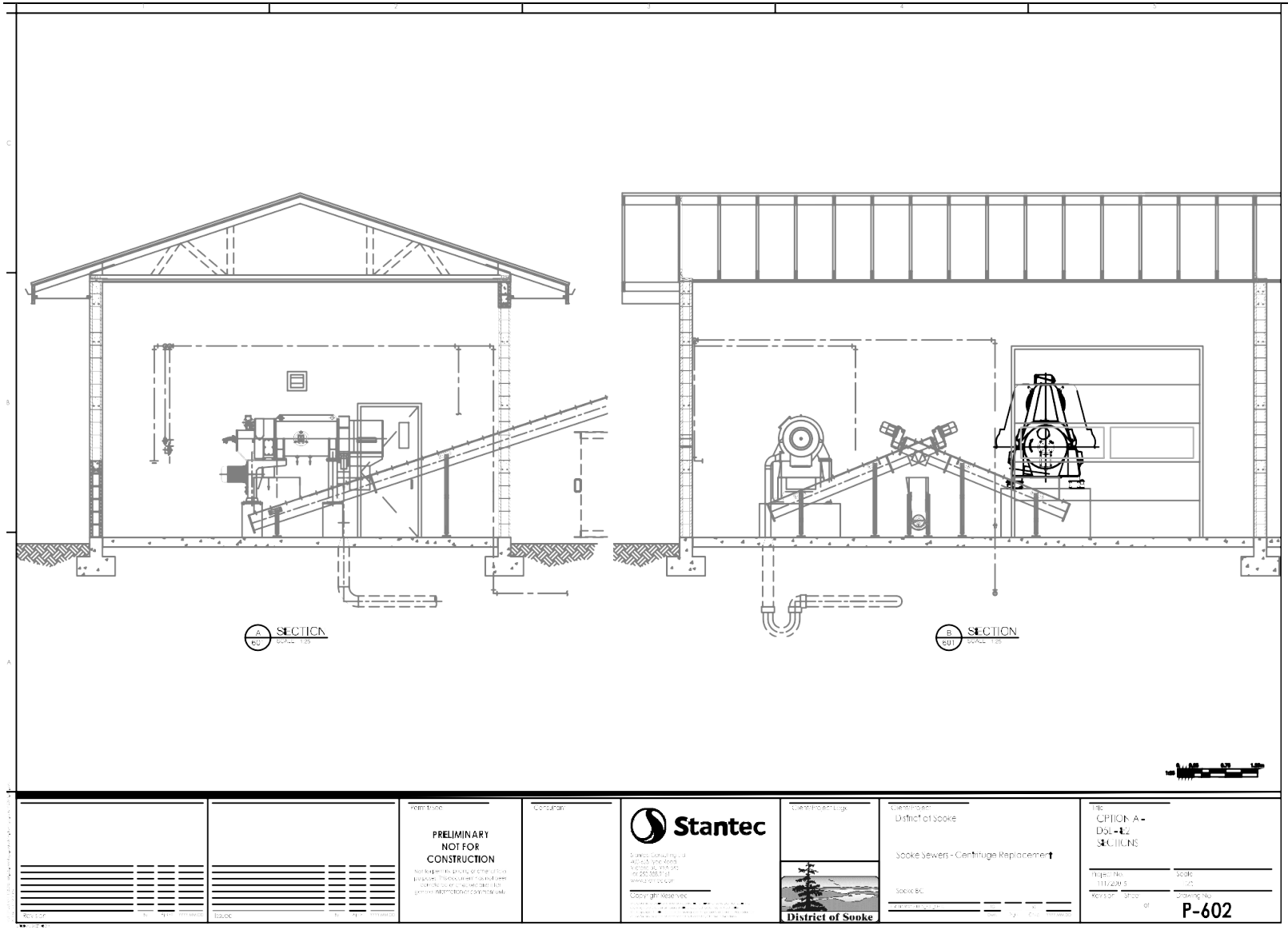

Figure 1. Dewatering Centrifuge drawing - E2 Sections

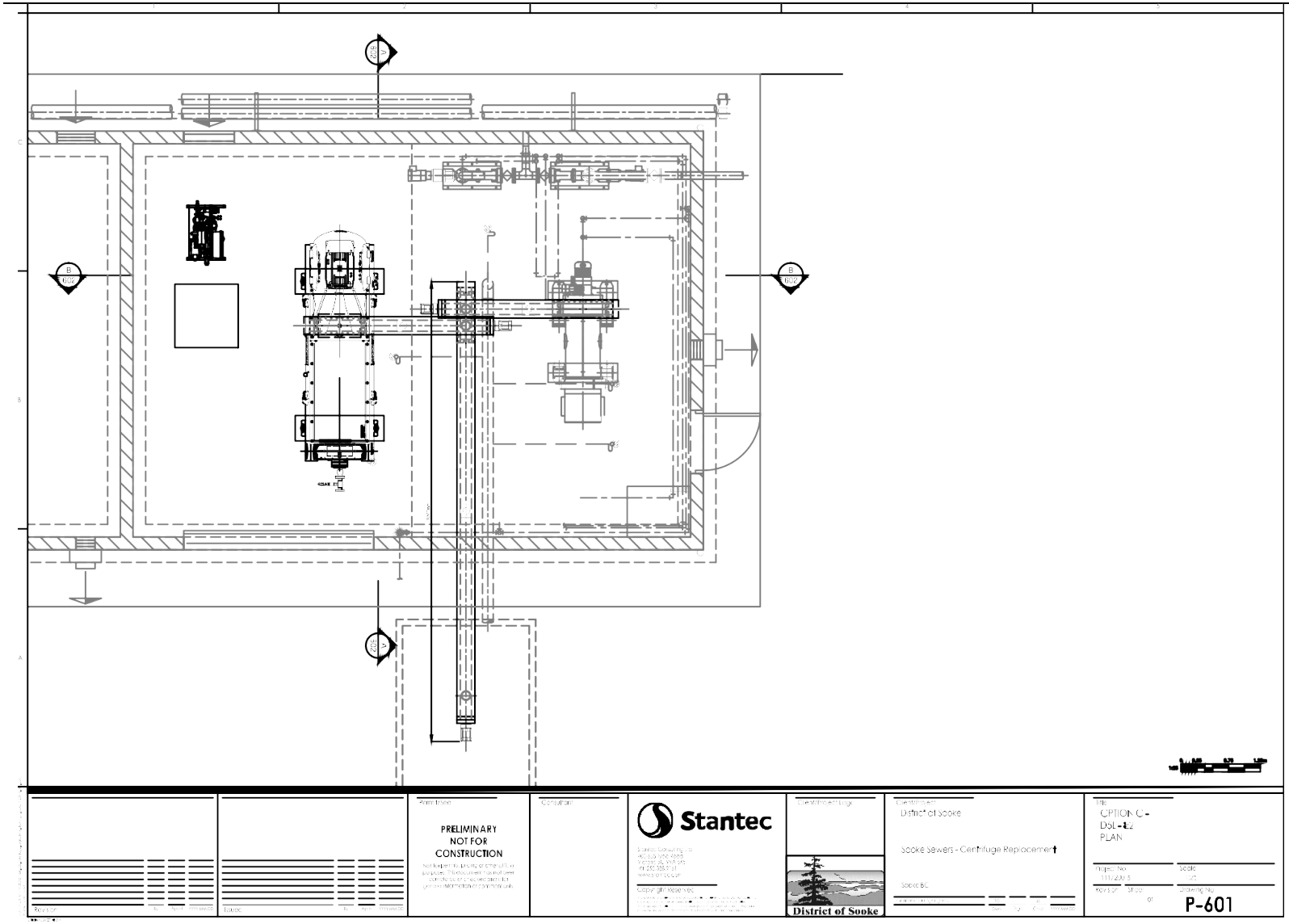

Figure 2. Dewatering Centrifuge Drawing - E2 plan

Part 1 General

1.1 DESCRIPTION

.1 This section includes the general requirements for the supply, delivery and installation, testing and placement into operation of one (1) Sludge Dewatering Polymer feed system, and appurtenances as specified herein. The liquid polymer feed system 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 Sludge Dewatering Polymer Feed System:

.1 One liquid polymer blending unit consisting of a progressive cavity pump to transfer neat liquid polymer emulsion or dispersion from a tote to the blending chamber and feed to the sludge dewatering flocculator. The polymer blending unit controls shall be integrated with the centrifuge supplier PLC.

.2 All interconnecting piping, valves, wiring, and accessories to connect the liquid polymer blending unit, totes and the pump assembly together to form a complete and workable chemical feed system.

1.2 RELATED WORK

.1 Division 1 – General Requirements

.2 Section 46 76 00 – Centrifuge Dewatering System

.3 Division 01 60 12 – General Electrical Requirements

1.3 SUBMITTALS

.1 Submit information for sludge dewatering polymer feed system, and as specified in the following Sections:

.1 Section 11 33 00

.2 Submit information for sludge dewatering polymer blend and feed system as follows:

.1 General layout, construction details, materials of construction and recommended spare parts list for the polymer blending unit.

.2 Polymer blending unit data as required in the following list:

.1 Rated capacity (GPH) of polymer blender

.2 Dilution water requirements (GPH)

.3 Suction and discharge pipe sizes (inch)

.4 Motor power

.5 Control system

.3 Dimensioned layout of polymer blending unit.

.4 Control panel details for polymer blender and metering pumps.

.5 Certified shop test results for the polymer feed system.

.6 Submit installation manuals before shipment of any equipment.

.7 Submit as part of the bound, indexed manual for all equipment, the installation, operation and maintenance manuals, 30 days prior to start up.

1.4 **MANUFACTURERS**

.1 The liquid polymer blending 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 liquid polymer blending unit shall be VeloBlend Model VM-2P-300 as manufactured by Velodyne, Promix as manufactured by ProMinent, Acrison Model 580 or reviewed equivalent.

Part 2 **products**

2.1 **DELIVERY AT PLACE (DAP)**

.1 The polymer system should be delivered at place (DAP) according to the following rules.

.2 The seller is responsible for arranging carriage and for delivering the goods, ready for unloading from the arriving conveyance, at the named place. (An important difference from Delivered At Terminal DAT, where the seller is responsible for unloading.)

.3 Risk transfers from seller to buyer when the goods are available for unloading; so unloading is at the buyer's risk.

.4 The District (buyer) is responsible for import clearance and any applicable local taxes or import duties.

.5 This rule can often be used to replace the Incoterms 2000 rules Delivered at Frontier (DAF), Delivered Ex Ship (DES) and Delivered Duty Unpaid (DDU)

2.2 **SERVICE CONDITIONS**

.1 The polymer feed systems shall be provided to feed polymer solution to the application point.

.1 The diluted sludge dewatering polymer solutions will be injected into the thickened sludge at upstream of the sludge flocculation tank to assist the centrifuge dewatering process. The polymer feed rate is normally determined based on the sludge flow rates and sludge density.

.2 Sludge dewatering polymer will be delivered in 275-US gallon (1,141 L) totes supplied by the chemical supplier and stored in the polymer room and sludge dewatering room.

2.3 GENERAL

.1 The sludge dewatering polymer system shall be supplied with one polymer blending units adjacent to the storage totes.

.2 The polymer system shall be an integrated package, pre-piped and pre-wired as specified herein.

.3 The metering pumps for polymer shall be capable of pumping polymers with apparent viscosities of up to 45,000 cps.

.4 The system electrical requirement shall be 120 VAC.

2.4 SLUDGE DEWATERING POLYMER SYSTEM

.1 The neat polymer will be transferred to the dilution blender by the metering pumps. Water will be supplied to the dilution blender simultaneously in proportion to the chemical flow to dilute the polymer solution to a concentration of 0.1 to 0.5 %. The dilution ratio shall be adjustable from the control panel of the blending system.

.2 The polymer feed equipment shall be skid mounted and shall include diaphragm metering pumps and polymer dilution blenders as specified below, and complete with piping, accessories, and instrumentations.

.3 Piping design shall allow the system to bypass the dilution blender and feed the neat polymer directly to the injection point.

.4 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.

.5 The dilution blender shall have a stainless-steel 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.

.6 A flow sensor shall be provided for each system to shut down the polymer make down system and centrifuge dewatering system upon water flow interruption.

.7 Controls:

.1 A control panel integral to the systems frame shall be provided. The enclosure shall be rated NEMA 4X and constructed of FRP. The control panel shall consist of all digital displays, potentiometers, switches, lights, relays, and other control devices required for a complete operable system. The control panel and all components shall be industrial duty. All skid mounted electrical components interconnected to the control panel shall terminate at numbered and labeled terminal blocks. The terminal blocks shall be sized for 14 ga. wire. Wires shall be neatly run through wire race-way and numbered with shrink tubing type labels. Adhesive labels shall not be used. The control panel shall be positioned such that there are no obstructions in front of the control panel per related NFPA requirements.

.2 Power: 120 VAC, 1Ph, 60/50 Hz. A circuit breaker on the main control circuit and on each motor shall be provided as manufactured by Allen Bradley or equal. Fuses shall not be used for circuit protection.

.3 Operator Interface – Discrete Selector Switch:

.1 System ON / OFF (reset) / Remote

.2 One-Turn Potentiometer – Mixer Speed

.3 Stroke Length / Stroke Speed Adjustment (located on diaphragm metering pump)

.4 Status / Alarm Indicators:

.1 Main Power ON

.2 System running

.3 Display of Metering Pump Rate (located on diaphragm metering pump face)

.4 Low Water Differential Pressure Alarm

.5 Low Polymer Flow Alarm

.5 Inputs (signals by others):

.1 Remote Start / Stop (discrete dry contact)

.2 Pacing Signal Based on Process Flow (4-20mA)

.6 Outputs:

.1 System Running (discrete dry contact)

.2 Remote Mode (discrete dry contact)

.3 Common Alarm (discrete dry contact)

.8 Rp Ratio Controller

.1 The controller shall be PLC based with a minimum 5.7" TFT touch screen. Systems that rely on microprocessors and or alphanumeric displays shall not be considered.

.2 Operator Interface – 5.7" Minimum TFT touch screen with the following features as a minimum:

.1 LOCAL / REMOTE start/stop mode select:

.1 LOCAL start/stop mode: System shall run based on operator input from touch panel start/stop push-button.

.2 REMOTE start/stop mode: System shall start and stop according to the state of remote dry contacts (closed = run, open = stopped).

.3 MANUAL / WATER MASTER / PACED POLY RATIO operational mode select.

.1 MANUAL mode: The desired water flow is set manually using increase/decrease push-buttons on touch panel. The desired polymer flow is set manually using increase/decrease push-buttons on touch panel. Solution concentration defined by water and polymer settings.

.1 MANUAL mode run screen features:

.1 Water control increase/decrease push-buttons.

.2 Water flow rate (GPH) display.

.3 Polymer control increase/decrease push-buttons

.4 Polymer flow rate (GPH) display.

.5 Solution concentration (% poly) display.

.6 Total solution flow rate (GPH)

.2 WATER MASTER mode:

.1 Desired water flow is set manually using increase/decrease push-buttons on the touch panel.

.2 Polymer flow adjusts automatically to maintain operator desired solution concentration. Desired solution concentration is adjusted manually using increase/decrease push-buttons on touchpanel.

.3 WATER MASTER mode run screen features:

.1 Water control increase/decrease push-buttons.

.2 Water flow rate (GPH) display.

.3 Polymer flow rate (GPH) display.

.4 Solution concentration control increase/decrease push-buttons.

.5 Solution concentration (% poly) display.

.3 PACED POLY RATIO mode:

.1 Water flow adjusts automatically to maintain operator desired solution concentration.

.2 Polymer flow paced by remote 4-20mA (supplied by others).

.3 Desired solution concentration adjusted manually using increase/decrease push-buttons on touch panel.

.4 PACED POLY RATIO mode run screen features:

.1 Water flow rate (GPH) display.

.2 Remote pacing signal level (mA)

.3 Polymer flow rate (GPH) display.

.4 Solution conc. Control increase/decrease push-buttons.

.5 Desired solution concentration (% poly) display.

.6 Solution concentration (% poly) display.

.4 Help Screens:

.1 For each mode of operation

.5 Alarm screen features:
- .1 Indication of alarm
- .2 Description of recommended corrective action
- .3 Reset
- .4 Alarm history
- .5 Set-up screen features:
- .6 Semi-auto pump calibration
- .7 System flush settings
- .8 Auxiliary alarm user programming mode

.6 Discrete Selector Switch & System Indicator:
- .1 Main Power ON /OFF Switch
- .2 Main Power ON indicator

.7 Inputs (signals by others):
- .1 Remote Start / Stop (discrete dry contact)
- .2 Pacing Signal Based on Process Flow (4-20mA)

.8 Outputs:
- .1 System Running (discrete dry contact)
- .2 Remote Mode (discrete dry contact)
- .3 Common Alarm (discrete dry contact)
- .4 Polymer Pump Rate (4-20mA)

.9 System Skid:

.1 The system's frame shall be of rugged 304 stainless steel construction. No mild steel shall be used. All piping shall be rigidly supported.

.2 Under no circumstance shall the pump suction exceed 125mm from the bottom of the skid for progressive cavity pumps and 300 mm from the bottom of the skid for diaphragm pumps.

.10 Accessories:

.1 Tote Accessories

.1 Provide a polymer tote pump suction assembly. The assembly shall include quick disconnect cam-lock fittings, a 25 mm full port ball valve, and 5 m of 25 mm braided PVC hose.

.2 Provide a polymer tote truck designed to transport up to 375-gallon totes and tilt the tote when in service to drain entire contents. Polymer totes shall be positioned on tote truck using a fork-lift or overhead crane. Tote truck shall include two fixed wheels and two swivel wheels. Swivel wheels shall be lockable. The tote truck shall be constructed of powder coated steel and rated for #4000 pounds.

Part 3 **execution**

3.1 **SHOP TESTING**

.1 The polymer feed system shall be fully shop tested prior to shipment.

3.2 **SITE TESTING**

.1 The polymer feed system shall be subjected to a mechanical, electrical and pump delivery site test by a qualified technical representative of the pump manufacturer.

3.3 **MANUFACTURER'S FIELD SERVICES**

.1 Provide the services of a qualified field service technician to inspect and certify the installation, start-up the equipment, trouble shoot any problems that may arise and providing complete and thorough training of operator personnel.

.2 Field services shall consist of one (1) eight (8) hour day, exclusive of travel time.

.3 For commissioning and training, refer to Dewatering Centrifuge section 46 76 00, part 3.6.

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 SUBMISSIONS

.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 cleanness 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.

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