Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

REQUEST FOR PROPOSALS

City of Port Alberni

Wastewater Lagoon Facility Upgrades
UV Equipment Supply
RFP 015-18

April 2018

CANADA'S BEST MANAGED COMPANIES Platinum member

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PAGES

END OF DOCUMENT

DRAWINGS APPENDED

Drawing No.	Title	
2972-00-D-151	UV Plan	Rev. B
2972-00-D-351	UV Sections	Rev. B

END OF DOCUMENT

CONTRACT SPECIFICATIONS

FOR

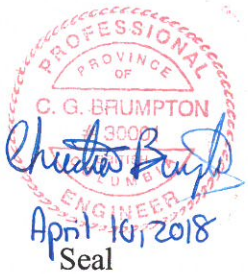
CITY OF PORT ALBERNI

WASTEWATER LAGOON FACILITY

UV EQUIPMENT SUPPLY

RFP 015-18

APRIL 2018



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ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature.....
Date.....

Prepared by Associated Engineering (B.C.) Ltd.

CITY OF PORT ALBERNI

REQUEST FOR PROPOSALS ("RFP")
WASTEWATER LAGOON FACILITY
UV DISINFECTION SYSTEM

Proposals in a sealed package clearly marked for above Supply Contract, will be received at the offices of City of Port Alberni, 4850 Argyle Street, Port Alberni, B.C., V9Y 1V8, up to exactly 4:00 p.m., local time, May 7, 2018. Please use the above RFP description on all correspondence.

It is the sole responsibility of the Proponent to ensure that its proposal is received at the specific physical location indicated, by the stipulated time. Proposals received at the specific location after the stipulated time shall be returned to the Proponent unopened.

The Proposals shall be for furnishing all equipment, material, software, and on-site services except material supplied by the City of Port Alberni, for the supply of one (1) UV disinfection system including in-vessel UV disinfection systems, necessary control and instrumentation devices, programmable logic controllers (PLCs) and other system appurtenances necessary for complete and functional operation. Services will include design, supply, commissioning, and operator training. Installation of the equipment will be by others. Delivery is critical for the project and will be a key consideration in the evaluation of quotations.

The lowest cost or any proposal will not necessarily be accepted. The City reserves the right to accept or reject any or all proposals in whole or in part. Proponents may be required to provide supplementary information after the closing date to support their Proposal.

Technical inquiries may be directed to Christian Brumpton, at Associated Engineering, Telephone: (604) 293-1411 or Email: brumptonc@ae.ca

Christian Brumpton, M.Eng., P.Eng.
Associated Engineering
#500 – 2889 East 12th Avenue
Vancouver, BC V5M 4T5

Scott Smith, City Planner
Planning and Development
City of Port Alberni
4850 Argyle Street
Port Alberni, BC V9Y 1V8

END OF DOCUMENT

Part 1 General

1.1 SCOPE

.1 The City of Port Alberni requests proposals for the supply, delivery, and related support services for one UV disinfection system consisting of in-vessel UV reactors, control panels, and related systems and services (the "Goods"). Upon the completion of review of proposals, it is the intent of the City of Port Alberni (the "Owner") to enter into a contract and issue a purchase order for the supply of the "Goods" as part of the Wastewater Treatment Upgrade Project.

.2 The UV disinfection system will be installed by others in a new facility. The equipment is to be fabricated, delivered and supplied such that it will fit in the space provided in accordance with the drawings appended.

.3 Capacity and operating conditions are specified under Section 46 66 16 – Low Pressure High Intensity UV Disinfection Equipment.

1.2 DESCRIPTION OF SUPPLY

.1 This RFP is for the supply and delivery of the UV disinfection system and related systems to the FOB Point including design, equipment, controls, software, training, testing, start-up, and system support. The Goods supplied under the proposed contract will be installed by others during the construction stage. The Goods supplied under the proposed contract shall include, but are not necessarily limited to the following:

.1 Supply of five (5) in-vessel UV disinfection units, necessary control and instrumentation devices, programmable logic controllers (PLCs) and other system appurtenances necessary for complete and functional operation.

.2 Factory testing of the equipment.

.3 Provision of all necessary instruction to ensure satisfactory off-loading storage, and installation at the Port Alberni lagoon site and testing of the Goods supplied. The City will provide all necessary labour, plant and equipment to the off-load position and install the Goods.

.4 Completion of site testing and commissioning of the equipment.

.5 Training of the Owner's personnel.

.6 As required, and at no cost to the Owner, modification and/or replacement of the equipment to ensure that performance guarantees provided in the Proponent's Proposal are met.

.7 Provision of technical support for and repair of all defects to the equipment, at no cost to the Purchaser, during the Warranty Period.

.8 Delivery of the Goods freight pre-paid to FOB point:

City of Port Alberni
Wastewater Lagoon – Treatment Building
(former Catalyst lagoon located at 49° 15' 3.9024" N 124° 49' 24.8520" W
(accessed via Mission Road))

.9 Delivery of the Goods to the FOB Point shall not be later than the dates indicated by the Vendor on the Schedule of Supply and Delivery as the Vendor's date of delivery of the Goods to the FOB Point (Section 004386.01) unless agreed with the City of Port Alberni in writing. Installation and testing of the Goods shall be at such time as stipulated by the Owner.

.10 Coordination of the supply and installation of the Goods with the General Contractor retained by the City of Port Alberni.

1.3 CLOSING DATE FOR PROPONENTS RESPONSE

.1 The City of Port Alberni will accept one (1) hard copy and one (1) digital copy of the Proponent's Proposal, each in a sealed package, at the following specific physical location not later than exactly 4:00 p.m. local time on May 7, 2018 (the "Proposal Closing"):

City of Port Alberni
4850 Argyle Street
Port Alberni, BC V9Y 1V8

.2 It is the sole responsibility of the Proponent to ensure that its proposal and any amendments are received at the specific location indicated, by the Proposal Closing. Proposals received at the specific location after the Proposal Closing will not be considered and will be returned to the Proponent unopened.

.3 Bidders may submit the executed offer electronically.

.1 Submit one pdf copy of the Proponent's Proposal, signed with original signature(s) and corporate sealed where applicable, together with the required Supplements to Bid Form via email. Email to be sent to the City of Port Alberni at purchasing@portalberni.ca and Associated Engineering at brumptonc@ae.ca. The email subject line should read "Request for Proposal RFP 015-18 Lagoon UV Disinfection System".

.2 Proponents submitting the executed offer electronically must also send the paper copy of the offer. The paper copy of the executed offer must be received at the offices of the City of Port Alberni by Tuesday, May 9, 2018 at 4 pm.

.3 Electronic and original paper copies must be identical.

.4 The submission of a proposal constitutes the agreement of the Proponent to be solely responsible for any and all costs and expenses incurred by it in preparing and submitting its proposal, including any costs incurred by the Proponent after the Proposal Closing.

1.4 PROPOSAL DOCUMENTS

.1 Proponents are advised to read and respond appropriately to all sections of the RFP; an incomplete proposal may be rejected.

1.5 VALIDITY OF PROPOSAL

.1 The Proposal submitted by the Proponent shall be valid for a period of 60 days from the Proposal Closing, whether another Proposal has been accepted or not.

1.6 ENQUIRIES AND ADDENDA

.1 Enquiries should be addressed to:

Christian Brumpton, M.Eng., P.Eng.
Project Manager
Associated Engineering
#500 – 2889 East 12th Ave.
Vancouver, B.C., V5M 4T5
Telephone: (604) 293-1411
Email: brumptonc@ae.ca

.2 Any requests for explanations, interpretations or clarifications made by Proponents must be submitted in writing to the Engineer not less than three (3) working days prior to the Proposal Closing.

.3 Any explanations, interpretations or clarifications will be made in the form of Addenda.

.4 All Addenda issued by the City of Port Alberni shall be incorporated into and become part of the RFP Documents.

.5 If a Proponent finds any errors, omissions or discrepancies in the RFP Documents, it shall immediately notify the Engineer in writing.

.6 No oral explanation, interpretation or clarification of the RFP Documents by any person whatsoever shall bind the City of Port Alberni in the interpretation of the RFP Documents.

1.7 COMPLETION OF PROPOSAL

.1 The Proponent should submit a Proposal that meets the requirements and specifications of the RFP. If the Proponent wishes to submit a Proposal that varies from the requirements or specifications furnished here, it shall declare in detail in the Proposal where and how its Proposal varies from the requirements and specifications. The Proponent should submit a complete Proposal as required by Article 1.9 of this Section.

.2 The Proponent shall complete all applicable RFP Documents in ink or in type.

.3 Unit prices, in Canadian currency, shall be shown for each item specified and shall include all packing, crating, freight, cartage, shipping charges, cost of unloading supplies at destination, and all tariffs, excise taxes and duties.

.4 The City of Port Alberni may exclude certain items and services listed in the Schedule of Proposal Prices after the Proposal Closing. Award of the Equipment Supply contract is subject to funding approval.

.5 The Proponent shall carefully review the RFP Documents and all Addenda issued by the City of Port Alberni.

.6 The Proposal shall be in accordance with the terms and conditions contained in the RFP Documents. Any Proposal received which materially changes these terms and conditions

by, for example, including the Proponent's standard terms of sale may be subject to disqualification.

.7 If a Proposal contains a defect or fails in some way to comply with the requirements of the RFP Documents, which in the sole discretion of the City of Port Alberni is not material, the City of Port Alberni may waive the defect and accept the Proposal.

1.8 SOLICITATION

.1 If any director, officer, employee, agent or other representative of a Proponent makes any representation or solicitation to any director, officer or employee of the City of Port Alberni with respect to the Proposal, whether before or after the submission of the Proposal, the City of Port Alberni shall be entitled to reject or not accept the Proposal.

1.9 SUBMISSION OF PROPOSALS

.1 No oral transmitted Proposals or amendments to Proposals will be considered.

.2 The City of Port Alberni will not accept an amendment to a previously submitted Proposal unless:

.1 It is in writing.

.2 It is received at the specific physical location set out in Article 1.2, prior to the Proposal Closing in a sealed envelope or package on the exterior of which shall be indicated the name of the Proponent, the name of the Contract and the RFP Number.

.3 It indicates changes to a Proposal already submitted.

.4 It is signed by the person or persons who signed the original Proposal.

.3 Proponents shall be solely responsible for the completion and delivery of Proposals and any amendments in the manner and time specified

1.10 REQUIRED PROPOSAL FORMAT

.1 The Proponent shall submit to the Engineer the following completed and executed documentation:

.1 Proposal Form, Section 00 42 00, including all Schedules.

.2 Acknowledgment of Receipt of Addenda (Schedule P of Section 00 42 00).

.3 Schedule of Supply and Delivery, Section 00 43 86.01.

.2 Bid Bond

.1 Every Proposal shall be accompanied by a bind bond in an amount not less than 10% of the total amount of proposal.

1.11 EVALUATION

.1 All responsive proposals will be evaluated by the Engineer and the City of Port Alberni. Evaluation criteria include:

.1 Compliance with Proposal requirements.

.2 The qualifications and experience of the Proponent.

.3 Compliance with the prescribed requirements, and any alternatives.

.4 The technical merit and performance data.

.5 Demonstration of Proponent's previous success at delivering comparable Goods.

.6 Total cost.

.7 System support capability.

.8 Delivery of Goods.

.2 The proposals will receive further evaluation that may include visits by staff for the City of Port Alberni and Engineer at their expense to the Proponent's factory or field installations to observe successful high rate clarification and gravity filtration systems similar to that being proposed.

.3 The Proposal containing the lowest price of any Proposal will not necessarily be accepted. The City of Port Alberni reserves without restriction, sole discretion in determining best value and whether or not any proposal received provides the necessary level of value to the City of Port Alberni result in the award of a contract.

1.12 CHANGES TO PROPOSAL WORDING

.1 The Proponent shall not change the wording of the proposal after the Proposal Closing and without restricting the generality of the foregoing, no words or comments shall be added to the proposal, the terms and conditions, if any, or the Specifications unless requested by the City of Port Alberni or the Engineer for purpose of clarification.

1.13 OWNERSHIP OF PROPOSALS

.1 All responses to this RFP become the property of the City of Port Alberni.

1.14 OWNER'S RIGHT TO MODIFY TERMS

.1 The City of Port Alberni in its sole discretion, reserves the right to modify the terms of the RFP at any time, both before and after the Proposal Closing.

1.15 SUBCONTRACTING

.1 Utilizing a subcontractor (who must be clearly identified in the Proposal) is acceptable. This also includes a joint submission by two proponents having no formal corporate links. However, in the case of a joint submission, the Proposal must include a joint and several undertaking that one of these Proponents must be prepared to take overall responsibility for successful interconnection of the two services. This must be defined in the Proposal to the satisfaction of the City of Port Alberni.

1.16 ACCEPTANCE OF PROPOSALS

.1 Notwithstanding any other provision in the RFP Documents or any practice or custom in the industry, the City of Port Alberni, in its sole discretion, shall have the unfettered right to:

.1 Accept any proposal.

.2 Reject any proposal.

.3 Reject all proposals.

.4 Accept a proposal which is not the lowest priced proposal.

.5 Reject a proposal even if it is the only proposal received by the Engineer.

.6 Negotiate contract terms with any proponent.

.2 Acceptance of any proposal is subject to funding approval.

.3 The City of Port Alberni will notify the successful Proponent in writing that its proposal, including any subsequent negotiations and agreement, has been accepted (the "Notice of Acceptance"). The Notice of Acceptance is subject to the terms and conditions of the Contract. Upon the receipt of the Notice of Acceptance the successful Proponent shall commence Shop Drawing preparation.

1.17 ACCEPTANCE OF TERMS

.1 The submission of a proposal constitutes the agreement of the Proponent that all the terms and conditions of this RFP are accepted by the Proponent and incorporated in its proposal, except those conditions and provisions which are expressly excluded by the Proponent's Proposal.

.2 General Conditions which will be part of this Contract are included for the Proponents' information in Section 007200 and Section 007300.

1.18 NEGOTIATION

.1 Subsequent to the submission of proposals, interviews and negotiations may be conducted with any of the proponents, but there shall be no obligation on the City of Port Alberni to receive further information, whether written or oral, from any proponent nor to disclose the nature of any proposal received.

1.19 CONFIDENTIALITY

.1 The following conditions apply:

.1 The RFP Documents or any portion thereof, may not be used for any purpose other than submission of proposals.

.2 The successful Proponent must 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 carrying out its duties or performing its services.

.3 It is the City of Port Alberni's policy to maintain confidentiality with respect to all confidential information related to Proposals, subject to the requirements of the Freedom of Information and Protection of Privacy Act. IF THE PROPONENT CONSIDERS THAT ANY OF ITS INFORMATION IS CONFIDENTIAL, THE PROPONENT SHALL IDENTIFY THAT CONFIDENTIAL INFORMATION AND ADVISE THE CITY OF PORT ALBERNI IN ITS PROPOSAL.

1.20 DISCLAIMERS/LIMITATIONS OF LIABILITY

.1 Neither acceptance of a proposal nor execution of an Agreement shall constitute approval of any activity or development contemplated in any proposal that requires any approval, permit or license pursuant to any federal, provincial, and local laws, regulations and ordinances. It is the responsibility of the Vendor to obtain such prior to commencement of the services under the anticipated contract.

.2 THE CITY OF PORT ALBERNI, ITS DIRECTORS, OFFICERS, SERVANTS, EMPLOYEES, AGENTS AND CONSULTANTS EXPRESSLY DISCLAIM ANY AND ALL LIABILITY FOR REPRESENTATIONS, WARRANTIES EXPRESS OR IMPLIED OR CONTAINED IN, OR FOR OMISSIONS FROM THE RFP DOCUMENTS OR ANY WRITTEN OR ORAL INFORMATION TRANSMITTED OR MADE AVAILABLE AT ANY TIME TO A PROPONENT BY OR ON BEHALF OF THE CITY OF PORT ALBERNI. NOTHING IN THE RFP DOCUMENTS IS INTENDED TO RELIEVE A PROPONENT FROM FORMING THEIR OWN OPINIONS AND CONCLUSIONS IN RESPECT OF THIS RFP.

1.21 AWARD

.1 The City of Port Alberni will notify Proponents in writing when a contract award has been made.

.2 No information with regard to an award of a contract will be made available between the time of opening proposals and when a contract award has been made.

1.22 AGREEMENT

.1 The City of Port Alberni shall not be obligated in any manner to any Proponent whatsoever until a written agreement has been duly agreed to by the parties relating to an accepted Proposal.

.2 The Proponent shall within 10 days of the City of Port Alberni issuing a Notice of Acceptance, execute and deliver the Agreement, in triplicate, to the City of Port Alberni.

1.23 NOVATION AGREEMENT

.1 The Owner will assign the Contract arising from acceptance of a Proposal hereunder to a General Contractor for the project when such General Contractor has been selected. The Supplier under this Contract (Supply Contract) will be required to join in a Novation Agreement in the form set out in Section 005261.

.2 The Proposal shall be accompanied by a letter of consent from the Proponent's surety confirming that it will issue new bonds in favour of the General Contractor upon the execution of the Novation Agreement and the surrender of the original bonds.

.3 The terms of the Supply Contract, including the price and payment terms, wil be included in the proposed information for the Construction Contract and the Contract Price for the Construction Contract, as defined therein, will include the price of the Supply Contract.

END OF SECTION

Part 1 General

1.1 PROPONENT'S NAME

.1 This Proposal for supply of UV disinfection system including in-vessel reactors, control panels, and related systems and services at City of Port Alberni Wastewater Lagoon Facility is hereby submitted by:

_____
Name of Proponent

_____

_____

_____
Address of Proponent

_____
Telephone Number of Proponent

_____
Proponent's Representative's Name

_____
Proponent's Representative's Email Address

1.2 PROPOSAL DOCUMENTS

.1 The Proposal Documents for this Contract include the following:

.1 All documents listed in Section 00010 - Table of Contents.

.2 Addenda.

.3 Drawings.

1.3 PROPONENT'S OFFER

.1 The Proponent offers to supply the Goods to the Port Alberni Wastewater Lagoon Facility for the Total Proposal Price of (fill in blank):

TOTAL BID PRICE: (excluding GST):	$	_____
Goods and Services Tax:	$	_____
TOTAL BID PRICE (including GST):	$	_____

To be completed by Proponent. All prices to be in Canadian dollars.

1.4 PROPONENT'S DECLARATIONS

.1 The Proponent declares that it has read and understood and agrees to be bound by the RFP Documents.

.2 The Proponent declares that it has fulfilled and complied with all of those obligations and requirements under the RFP Documents which are required to be fulfilled by the Proposal Closing.

.3 The Proponent confirms, represents and warrants that all information which it has provided or will provide to the City of Port Alberni is true and accurate in every respect.

.4 The Proponent also agrees:

.1 The Owner is in no way obligated to accept this Proposal.

.2 The Owner may, at Owner's discretion, accept other than the lowest Proposal.

.3 Should the Proposal Form be improperly completed or be incomplete, the Owner shall have the right to disqualify and/or reject this Proposal.

.4 That this bid is made without knowledge of the Proposal prices to be submitted for this work by any other company, firm, or person.

.5 This bid is made without any connection or arrangement with any other company, firm, or person submitting a Proposal for this work.

.6 This bid is made without any undisclosed connection or arrangement with any other company, firm, or person having an interest in this Proposal or in the proposed Contract.

.7 The Proponent hereby submitted itemized prices as required by the specifications and agrees that these prices will be used for payment of work 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.

.8 The Proponent confirms that the itemized prices quoted include all necessary costs including but not limited to supply, fabrication and finishing, conveyance and delivery to Site, packing, crating, freight, cartage, shipping charges, unloading, installation, drafting charges, overhead, profit and all tariffs, duties and taxes, excluding the GST.

.9 That this Proposal is irrevocable for sixty (60) days after the closing date for receipt of Proposal and that Owner may at any time within such period accept this Proposal whether any other Proposal has previously been accepted or not and whether notice of award of a contract has been given or not.

.10 To execute the Contract Agreement within ten (10) days of the date of the Notice of Acceptance of the Contract, such time limit being extended only on the written approval of Owner.

.11 To commence and proceed actively with the work promptly following receipt of the Notice of Award, and to deliver Goods to site no later than October 1, 2018.

.12 To compensate the Owner in accordance with the Contract Documents if the work is not completed within the Contract Time.

.13 To do all extra work not reasonably inferable from the specifications or drawings but called for in writing by the Engineer and to accept as full compensation therefore payment in accordance with the provisions of the General Conditions.

.14 That payment for the work done will be made on the basis of the prices shown in the Proposal Form which shall be compensation in full for the work done under the terms of the Contract, exclusive of GST payable by Owner.

.15 That the estimate of quantities shown in the Proposal Form serves only to provide a basis for comparing bids and that no representations have been made

by either the Owner or Engineer that the actual quantities will even approximately correspond therewith, and further, that the Owner has the right to increase or decrease the quantities in any or all items and to eliminate items entirely from the work.

.16 If the Proponent, for any reason whatsoever, fails or defaults, in the opinion of the Engineer, in respect of any matter or thing which is an obligation of the Proponent in the Terms of this Proposal, the Owner at its opinion may either:

.1 Consider the Proponent has abandoned the offer made or the Contract if the offer has been accepted, whereupon the acceptance, if any, of the Owner shall be null and void;

and

.2 Further, the Proponent will fully indemnify and save harmless the Owner, its officers, employees and agents from all loss, damage, liability, cost, charge and expense whatever which it, they or any of them may suffer, incur or be put to by reason of such default or failure of the Proponent.

.17 The proponent agrees to join in an assignment and Novation Agreement in the form set out in Section 005261, as soon as the contract between the Owner and the Contractor has been signed.

1.5 SUPPLEMENT TO PROPOSAL FORM

.1 Schedules

.1 The Proponent shall complete all of the Schedules attached.

.2 The completed Schedules shall form part of the Proposal Documents.

.2 Reference Installations

.1 Provide a listing of similarly sized installations of high rate clarification systems.

.2 Provide a listing of similarly sized gravity filtration systems, with preceding high rate clarification systems.

Part 2 Products

.1 Not Used.

Part 3 Execution

3.1 EXECUTION BY PROPONENT

This bid is executed under seal at _____

this _____ day of _____, 2018.

_____
Name of Firm

_____
Address

For Individual or Partnership:

SIGNED, SEALED AND DELIVERED by

_____ _____
Bidder (please print) Signature

IN THE PRESENCE OF:

_____
Title

_____
Name

_____
Address

_____ Seal
City/Prov/PC

_____
Occupation

For Limited Company:

The Corporate Seal of

_____
Bidder (please print)

WAS HEREUNTO AFFIXED IN THE PRESENCE OF:

Seal

_____
Authorized Signing Officer

_____
Authorized Signing Officer

NOTE: If the bid is by joint venture, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

INDEX

Clause Title **Page No.**

Schedule A
Price Breakdown

.1 The total of the unit prices plus GST must agree with the total tender price identified in Clause 1.3 of the Proponent's Offer. We certify that the following is an accurate and balanced breakdown of our lump sum price(s). Work required, but not specifically mentioned, is included in the item with which it is most closely associated. Prices for specified items F.O.B. Jobsite Port Alberni, BC (itemize on separate sheet if applicable).

1.0 PRICES

Item	Description	Canadian Funds
1.1	Shop drawing preparation – Issued for Construction	$
1.2	UV Disinfection Equipment	$
1.3	Firm freight charges to project location, Port Alberni, BC (including transit insurance)	$
1.4	Installation and pre-start-up assistance, and initial performance testing	$
1.5	Commissioning and start-up assistance	$
1.6	Operations and maintenance manuals	$
1.7	Operator instruction and training services	$
1.8	Total of Required Spare Parts (see Schedule D)	$
Total Bid Price (excluding GST)		$

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule B

Not used.

Schedule C

Not used.

Schedule D

List of Spare Parts, Consumables, Prices, Delivery Time and Storage Location

Provide quantity of required spare parts and special tools as outlined in the Technical Specifications, complete with prices current at the time of submission of the proposal, standard delivery time and estimated frequency of replacement and dispatch location for all parts that have been proposed. The unit prices shall include all applicable custom duties, shipping charges to site and federal sales tax.

In addition to the required spare parts, the Proponent may also recommend additional spare parts.

Required Spare Parts

Description	Qty.	Unit Price (CDN $)	Standard Time Delivery	Frequency of Replacement	Dispatch Location
Subtotal of Required Spare Parts					

Recommended Spare Parts

Description	Qty.	Unit Price (CDN $)	Standard Time Delivery	Frequency of Replacement	Dispatch Location
Subtotal of Recommended Spare Parts					

Total of Required and Recommended Spare Parts				

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule E

Additional Prices

1.0 COMMISSIONING / TESTING / INSTRUCTION / TRAINING SUPPORT

The Proponent agrees that the days stipulated in the Specifications for site services are not necessarily concurrent and are at the discretion of the Engineer. If additional or fewer person days are required for site services, the Total Price will be adjusted upward or downward respectively, in accordance with the following unit rates as applicable.

The unit rate per eight (8) hour person day shall be inclusive of all payroll burdens, overhead, profit and other relevant costs.

The costs, if any, for additional person days required to correct faulty designed or manufactured equipment and materials shall be borne by the Supplier.

1.1 WORK HOUR RATES:

	Engineer	**Service Technician**	**Other (Specify)**
Number of days included in quoted price	_____	_____	_____
Number of trips included in quoted price	_____	_____	_____
Hours per standard working day	_____ h	_____ h	_____ h
Regular charge-out rate	$ _____ /h	$ _____ /h	$ _____ /h
Premium (% mark-up) for hours in excess of standard working day, weekends or holiday	_____ %	_____ %	_____ %
Standby or layover rates (if applicable)	$ _____ /h	$ _____ /h	$ _____ /h

1.2 TRAVEL TIME

Travel and living expenses, for additional work approved by Purchaser, will be reimbursed Local travel, meals and lodging will be paid at cost. Copies of invoices must be submitted.

Service and technical personnel will be dispatched from:

_____

Provide the location from which operator instruction and training personnel will be dispatched from:

_____

2.0 SHOP RATES

Provide hourly rates for shop re-work.

	Drafting/ Engineering	**Shop Floor Personnel (Specify Trade)**	**Other (Specify)**
Hours per standard working day	h	h	h
Regular charge-out rate	$ /h	$ /h	$ /h
Premium (% mark-up) for hours in excess of standard working day, weekends or holiday	%	%	%
Standby or layover rates (if applicable)	$ /h	$ /h	$ /h

3.0 STORAGE RATES

The intention is to manufacture and deliver equipment in a timely manner. In the event this does not occur, please provide a daily rate for storage at the point of manufacturer.

$_____/d

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule F
Equipment Delivery Schedule

The Proponent shall note the following and provide the information required on Delivery Period for the equipment.

Note: the Goods are required to be delivered to site no later than October 1, 2018.

Delivery of detailed shop drawings following the Notice of Acceptance
(in calendar days): _____.

Review and return of one copy of shop drawings will be accomplished within fourteen (14) calendar days of receipt by the Engineer of shop drawings submission.

Delivery of Goods to FOB point following final Engineer's review of shop drawings
(in calendar days): _____

Liquidated damages for delay of contract completion resulting from failure to complete the Work or meet the specified delivery: refer to Section 007200, Article 6.1.11.

The Proponent is encouraged to suggest alternative approaches to scheduling, manufacturing, storage of and payment for equipment which may reduce costs for the Owner.

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule G
Site Storage Requirements

The Proponent shall state the minimum storage requirements for the equipment on site. Such storage requirements shall be provided by the General Contractor if the equipment is delivered according to the equipment delivery schedule noted.

_____

_____

_____

_____

State which items require sheltered or heated storage.

Weights and Dimensions
Itemize individual pieces on quotation:

Total shipping weight (kg): _____

Dimensions of largest component (m): _____

Weight of largest component (kg): _____

Dimensions of second largest component (m): _____

Weight of second largest component (kg): _____

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule H

Special Maintenance Requirements During Storage On Site

State any special maintenance required to the equipment whilst in storage on site or off site. Such maintenance shall be provided by the Supplier or its subcontractor. The General Contractor's responsibility will be limited to providing storage as specified in Schedules H and I, including provision of electrical power for motor space heaters, if required by the Supplier or the Engineer.

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule I

Elements Requiring Re-Assembly

State which parts of the equipment, if any, will be dismantled for shipping, and will therefore, require re-assembly by the General Contractor under the supervision of the Supply Contractor, under the General Construction Contracts. Details of the Work involved may be submitted with the detailed shop drawings after the Notice of Acceptance is issued.

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule J

Qualifications of Supplier's Field Support Staff

Provide the name and qualifications of at least two (2) trained, experienced technicians proposed for delivery inspection, installation training, installation witnessing, testing witnessing, commissioning witnessing, guaranteed performance testing and ongoing maintenance of the equipment supplied under this Request for Proposal.

Name No. 1	
Employer	
Home Base	
Qualifications	

Name No. 2	
Employer	
Home Base	
Qualifications	

Provide name and location of nearest Technical Representative (if applicable):

Name	Home Base	Guaranteed Response Time

Attach references of named personnel to the completed Schedule K.

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule K

Training

Provide the name and qualifications of at least two (2) trained, experienced individuals proposed for training Operator Staff in the proper operation and maintenance of the equipment and systems supplied under this Request for Proposal.

Name No. 1	
Employer	
Home Base	
Qualifications and Relevant Experience	

Name No. 2	
Employer	
Home Base	
Qualifications and Relevant Experience	

Attach list of qualifications and relevant experience if additional space is required.

Attach references of the named personnel to the completed Schedule L.

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Schedule L
Quality Management

Part 1 QUALITY CONTROL AND QUALITY ASSURANCE

Provide details of Quality Control and Quality Assurance measures currently in place for the following:

- .1 Design Work:
  - .1 Computational fluid dynamics modeling.
  - .2 Lab testing.
  - .3 Shop drawing control.
  - .4 Design change management.
- .2 Manufacturing:
  - .1 Material control.
  - .2 Material testing.
  - .3 Shop testing.
- .3 Installation:
  - .1 Inspection, monitoring, supervision.
  - .2 Acceptable tolerances.
  - .3 Material testing.
  - .4 Performance testing.

Define QA/QC procedures for commissioning.

Define deliverables for all.

Proponent to list company management system (e.g., ISO 14001).

Additional numbered pages outlining this portion of the Proposal may be attached to this page and/or separate documents listed above may be submitted with these schedules.

Supplement to Bid Form

Use CCDC standard form 220, an example of which follows.

BID BOND

No…… $.....

KNOW ALL MEN BY THESE PRESENTS THAT .....

..... as Principal

hereinafter called the Principal, and .....

a corporation created and existing under the laws of .....

and duly authorized to transact the business of Suretyship in .....

as Surety, hereinafter called the Surety, are held and firmly bound unto .....

..... as Obligee

hereinafter called the Obligee, in the amount of .....

Dollars ($.....)
lawful money of Canada, for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a written tender to the Obligee, dated the .....

day of……, 20…… for .....

.....

.....

.....

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION is such that if the aforesaid Principal shall have the tender accepted within sixty (60) days from the closing date of tender and the said Principal will, within the time required, enter into a formal contract and give the specified security to secure the performance of the terms and conditions of the Contract, then this obligation shall be null and void. Otherwise the Principal and the Surety will pay unto the Obligee the difference in money between the amount of the bid of the said Principal and the amount for which the Obligee legally contracts with another party to perform the work if the latter amount be in excess of the former.

The Principal and the Surety shall not be liable for a greater sum than the specified penalty of this bond.

Any suit under this bond must be instituted before the expiration of six months from the date of this Bond.

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond this .....

…… Day of ……, 20 .....

SIGNED and SEALED
in the presence of

(
(
(
(……(Seal)
Principal

(
(
(
(……(Seal)
Surety

Part 1 General

1.1 SCHEDULE OF SUPPLY AND DELIVERY

.1 Prepare Schedule of Supply and Delivery in the form of a horizontal bar chart.

.2 The Schedule should be the Proponent's best realistic delivery.

.3 Provide horizontal time scale identifying the first work day of each week.

.4 Show delivery dates of submittals and major pieces of equipment.

.5 Submission of shop drawings and product data is to be no later than 42 calendar days from the Notice of Acceptance.

.6 Submit 3 copies of initial schedules within 15 days after award of Contract.

.7 Engineer will review schedule and return reviewed copy within 14 calendar days after receipt.

.8 Resubmit finalized schedule within 7 days after return of reviewed copy.

.9 Distribute copies of the finalized schedule to both the Engineer and Owner.

.10 Instruct recipients to report to Supply Contractor, within 10 days, any problems anticipated by the timetable shown in the schedule.

.11 Revise and resubmit schedule and work plan within 5 days after notification by Engineer that previously reviewed schedule is not being met. Show changes in operations proposed to complete construction work within Contract Time.

.12 If, during course of work, Contract Time is extended, correct construction schedule and work plan to show revised commencement and completion dates of affected parts of work.

.13 No progress payment will be approved until receipt of a schedule acceptable to Engineer.

Part 2 Products

.1 Not Used.

Part 3 Execution

.1 Not Used.

END OF SECTION

THIS AGREEMENT made this __ day of ____, 2018.

BETWEEN:

_____
(Herein called "The Supply Contractor")

OF THE FIRST PART

AND:

THE CITY OF PORT ALBERNI
(Herein called "The Owner")

OF THE SECOND PART

1. The Supply Contractor shall provide all labour, equipment and materials required to supply the Goods, as required by the Contract Documents.

2. The Owner 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:

   (a) The total Proposal Price, as set out in Section 004100, and

   (b) any payments made on account of changes, as may be required by the Contract Documents.

   The Contract Price shall be the entire compensation owing to the Supply Contractor by The Owner for the Goods and shall cover and include overhead, profit, transportation, storage, customs and excise duties or charges, financing costs and all other costs and expenses whatsoever incurred in performing the Contract.

4. The Supply Contractor shall supply all Goods to the FOB Point no later than outlined on the Schedule of Supply and Delivery (Section 004386.01) as the Proponent's date of delivery of goods to the FOB Point.

5. The Contract Documents shall form a part of this Agreement as though recited in full.

6. The Contract supersedes all prior negotiations, representations or agreements, whether written or oral except those expressly listed and is the entire agreement between the Owner and the Supply Contractor with respect to the subject matter of this Agreement. All, or any, previous communications are hereby abrogated and withdrawn and no stipulations, representations or agreements by the Owner or the Engineer or their officers, agents or employees shall be binding on the Owner or the Engineer unless contained in this Contract

and no local, general or trade customs or previous course of dealing or performance shall alter or vary the terms hereof.

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 Owner.

8. No action or failure to act by the Owner or the Engineer 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 Owner and the Supply Contractor and their respective heirs, executors, legal representatives, successors and permitted assigns.

10. Time shall be of the essence of this Agreement.

IN WITNESS WHEREOF the Supply Contractor and the Owner have executed this Agreement as of the _____ day of _____, 2018.

THE CORPORATE SEAL of)
)
)
)
)
)
)
) C/S
was hereunto affixed in the presence of:)
)
)
)
_____)
Authorized Signing Officer Title)
)
)
_____)
Authorized Signing Officer Title)

THE CORPORATE SEAL of)
)
The City of Port Alberni)
) C/S
was hereunto affixed in the presence of:)
)
)
_____)
Davina Hartwell City Clerk)
)
)
_____)
Mike Ruttan Mayor)

END OF DOCUMENT

NOVATION AGREEMENT

BETWEEN:

(OWNER)

AND:

(CONTRACTOR)

AND:

(SUPPLIER)

WHEREAS:

A. Owner entered into a Contract with Supplier dated [____], for the supply of [_____] (Supply Contract), which is annexed hereto as Appendix "A";

B. It is a requirement of the Supply Contract that the Supplier enter into a Novation Agreement with the General Contractor selected by the Owner;

C. Owner 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 Supplier so that Supplier becomes a subcontractor to Contractor;

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

1. The Contractor and Supplier 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 Owner as set out therein.

2. Supplier retains all the rights and obligations set out in the Supply Contract and henceforth accepts the Contractor in place of the Owner.

3. Supplier agrees that henceforth it is a subcontractor to the Contractor in respect of the Construction Contract.

4. Supplier hereby releases the Owner from all of the Owner'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 Owner in writing, and acknowledges that it will henceforth look only to the Contractor for the discharge of the Owner's obligations thereunder and that only the Contractor may exercise the rights of the Owner 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 Supplier; 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 Owner and Supplier agree that the Supply Contract between them has been terminated.

7. It is agreed that as of the date hereof [$ _____] is owing to the Supplier under the Supply Contract.

IN WITNESS WHEREOF the parties have hereunto affixed their hands and seals this _____ day of _____ , 20 _____ .

For Corporate Owner:

The Corporate Seal of:

_____ _____
Owner (please print full corporate name) Seal

was hereunto affixed in the presence of:

_____ _____
Authorized Signing Officer Title

_____ _____
Authorized Signing Officer Title

For Individual Owner:

_____ _____
Owner (please print) Signature

_____
Signature of Witness

_____
Address of Witness

_____
Occupation

For Individual or Partnership:

SIGNED, SEALED AND DELIVERED by:

Contractor (please print) | Signature

in the presence of:

Title

Name

Address

City/Prov/PC | Seal

Occupation

For Limited Company:

The Corporate Seal of:

Contractor (please print)

was hereunto affixed in the presence of:

Authorized Signing Officer | Title | Seal

Authorized Signing Officer | Title

NOTE: If Contractor is a joint venture, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

For Individual or Partnership:

SIGNED, SEALED AND DELIVERED by:

Supplier (please print) | Signature

in the presence of:

Title

Name

Address

City/Prov/PC | Seal

Occupation

For Limited Company:

The Corporate Seal of:

Supplier (please print)

was hereunto affixed in the presence of:

Authorized Signing Officer | Title | Seal

Authorized Signing Officer | Title

NOTE: If Supplier is a joint venture, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

END OF DOCUMENT

Use CCDC standard form 221, an example of which follows.

PERFORMANCE BOND

No…… $ .....

KNOW ALL MEN BY THESE PRESENTS THAT .....

..... as Principal

hereinafter called the Principal, and .....

a corporation created and existing under the laws of .....

and duly authorized to transact the business of Suretyship in .....

as Surety, hereinafter called the Surety, are held and firmly bound unto .....

..... as Obligee

hereinafter called the Obligee, in the amount of .....

…….. Dollars ($ .....)

lawful money of Canada, for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a written tender to the Obligee, dated the .....

day of ……, 20……. for .....

.....

.....

.....

in accordance with the Contract Documents submitted therefor which are by reference made part hereof and are hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION is such that if the Principal shall promptly and faithfully perform the Contract then this obligation shall be null and void; otherwise it shall remain in full force and affect.

Whenever the Principal shall be, and declared by the Obligee to be, in default under the Contract, the Obligee having performed the Obligee's obligations thereunder, the Surety shall promptly remedy the default, or shall promptly:

(1) complete the Contract in accordance with its terms and conditions, or

(2) obtain a bid or bids for submission to Obligee for completing the Contract in accordance with its terms and conditions, and upon determination by the Obligee and the Surety of the lowest responsible bidder, arrange for a contract between such bidder and the Obligee and make available as work progresses (even though there should be a default, or a succession of defaults, under the contract or contracts of completion, arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of Contract price", as used in this paragraph, shall mean the total amount payable by the Obligee to the Principal under the Contract, less the amount properly paid by the Obligee to the Principal.

Any suit under this Bond must be instituted before the expiration of two (2) years from the date on which the final payment under the Contract falls due.

The Surety shall not be liable for a greater sum than the specified penalty of the Bond.

No right of action shall accrue on this Bond, to or for the use of, any person or corporation other than the Obligee named herein, or the heirs, executors, administrators or successors of the Obligee.

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond this .....

…….. day of ……., 20….

SIGNED and SEALED
in the presence of

(
(
(
(……(Seal)
Principal

(
(
(
(……..(Seal)
Surety

Declaration of Wages Paid to Employees

The City of Port Alberni (the City) has a contractual obligation to CUPE Local 118 (the union representing the City's workers) that requires all contractors to pay their employees who are performing work for the City, a minimum of the same hourly rate as the City's workers are paid for performing similar work.

Prior to being awarded a contract to undertake work on behalf of the City, or being engaged to work for the City on an as and when basis, all contractors are required to sign this declaration certifying that they will pay to their employees hourly wages equal to or greater than those identified in the table below, when those employees perform work similar to the positions noted below.

I, _____(name), certify that I am an authorized representative of _____ (the Contractor). As such, I certify that as a condition of being awarded Contract # _____, or providing as and when required work for the City, the hourly wages paid by the Contractor to employees of the Contractor who perform work for the City, will be equal to or greater than those hourly wages identified in the table below, for performing work similar to the noted positions .

POSITIONS & RATES OF PAY		
POSITION	CITY OF PORT ALBERNI WAGE (2018)	CONTRACTOR-PAID WAGE (include where applicable or note as N/A)
Sidewalk Watch	17.73	
Van Driver	22.38	
Maintenance Assistant (Janitorial)	24.58	
Maintenance (Janitorial)	25.84	
Labourer	26.91	
Truck Driver	28.56	
Solid Waste Collector	29.63	
Equipment Operator (General)	29.63	
Sweeper Operator	30.18	
Flail Mower Operator	30.18	
Loader Operator	30.71	
Backhoe Operator	32.34	
Concrete Formsetter / Finisher	32.34	
Grader Operator	32.34	
Excavator Operator	32.91	
Engineering Technician	33.43	
Gardener	34.50	
Mechanic	34.50	
Carpenter	34.50	

On behalf of the Contractor I hereby authorize the City to withhold up to 10% of the total value of the contract until such time as the City is satisfied that the Contractor has complied fully with the commitment noted above. If the City requests payroll records pertaining to the contract (or as and when work) the Contractor will provide such records as requested.

Signed for the Contractor _____ Date: _____

Signed for the City _____ Date: _____

Date of Revision: January 8, 2018

Table of Contents **Page**

PART 1 GENERAL

GC 1.1 DEFINITIONS

The following words and terms, unless the context otherwise requires, in all Contract Documents, shall have the meanings set out below. Words importing the male gender include the female gender and either includes the neuter and vice versa and words importing the singular number includes the plural number and vice versa.

"Act of God" means a cataclysmic phenomenon of nature, including earthquake, flood or cyclone. Rain, snow, wind, high water, or any other natural phenomenon which might reasonably have been anticipated from historical records of the general locality of the Work shall be deemed not to be acts of God.

"Addenda" means the supplemental written conditions, specifications or drawings issued prior to execution of the Agreement which modify or interpret the Contract Documents by addition, deletion, clarification, or corrections.

"Agreement" means the agreement set out in Section 005200.

"Consequential Damages" has the meaning set out in GC 6.1.10.

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

"Contract" means the agreement formed by the Owner's acceptance of the Proponent's Proposal including any and all contract terms negotiated and agreed upon subsequent to the Proposal Closing for completion of the work set out in the Contract Documents.

"Contract Documents" means the following documents:

.1 the RFP Documents
.2 the executed Proposal Form
.3 the executed Bond
.4 the executed Agreement
.5 the General Conditions
.6 the Notice of Award
.7 the Notice to Manufacture and Deliver
.8 Change orders
.9 Such other documents as may be specifically included.

"Contract Price" or **"Contract Amount"** shall mean the amount stated in the Agreement as the contract price for the complete work of the Contract.

"Contract Time" shall mean the date by which the provisions of the Contract require the total performance of all Work, other than the Supply Contractor’s obligations in respect of the performance of the warranty provisions set out herein. The date is either a fixed date as provided in the Contract Documents or may be established by reference to a stated number of

calendar days from the Notice to Manufacturer and Deliver, as provided in the Contract Documents.

"Day" means calendar day.

"Owner" means Owner acting through its duly authorized representatives.

"Drawings" means the drawings included in the RFP Documents together with those prepared by the Owner 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 Owner either as attachments to change orders or as non-modifying supplements to the drawings in the RFP Documents including drawings issued by Addenda;
.3 Drawings submitted by the Owner 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 RFP Documents including drawings issued by Addenda;

"Engineer" means Associated Engineering B.C. Limited or such other person, firm or corporation as may be substituted therefore by the Owner.

"FOB Point" has the meaning set out in Section 002116 Clause 1.2.8 and means the location to which the Goods are delivered by the Supply Contractor.

"Herein" and "Hereof", and similar expressions wherever used in the Contract Documents, shall relate to the whole of the Contract Documents and not to any one (1) paragraph alone, unless the context specifically requires it.

"General Contractor" means the individual, partnership, corporation, or combination thereof, including joint venturers who or which are to install the Goods supplied pursuant to the Contract.

"Goods" means all the labour, materials, equipment, software, licences, supplies, services, accessories, tools, spare parts, maintenance materials and other items necessary for the execution, completion and fulfilment of work set out in the Contract Documents.

"Inspector" shall mean a person or company authorized by the Engineer or the Owner to inspect the work of the Contract or any part thereof.

"Notice of Award" means the notification from the Owner to the successful proponent of the Owner's acceptance of the proponent's proposal or modified proposal, including negotiated adjusts to that proposal, if any. At this point the successful proponent becomes the Supply Contractor.

"Notice to Manufacture and Deliver" means the notification from the Owner to the Supply Contractor after successful piloting of the proposed system, authorizing the Supply Contractor to proceed with the remaining work of the Contract.

"Owner" means the party identified as such in the Form of Agreement.

"Proponent" means the individual, partnership, corporation, or a combination thereof, including joint venturers, who or which execute the Proposal Form.

"Proposal" means the Proponent's proposal in response to the RFP including made in the Proposal Form set out in the RFP Documents.

"Proposal Closing" means the closing for acceptance of proposals, as set out in Section 002116, Clause 1.3.1.

"RFP Documents" means the documents and drawings set out in Section 004200, Clause 1.2.

"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 Engineer in accordance with the Contract and detailed in the Specifications.

"Supply Contractor" or **"Supplier"** means the individual partnership, corporation or combination thereof, including joint venturers who or which execute the Agreement (may also be referred to in the Documents and elsewhere as "Vendor" or "Proponent").

"Subcontractor" shall mean any person, firm, or corporation having a contract with the Supply Contractor for the execution of a part or parts of the work included in this Contract, and a person, firm, or corporation furnishing material called for in this Contract and worked to a special design according to the drawings or specifications but does not include one who merely furnishes material not so worked.

"Substantial Performance" shall have the meaning as described in the current British Columbia Builders' Lien Act with respect to the work of the Supply Contractor and Subcontractors under this Contract.

"Supply Contractor's Plant and Equipment" means the equipment, material, supplies and all other items (except labour) brought onto the Work Site by the Supply Contractor to carry out the work, but not to be incorporated in the Goods.

"Work Site" means the site where the Goods are to be installed at the Owner's facility for which the Goods are being supplied, as stipulated elsewhere in the Contract Documents.

GC 1.2 JOINT VENTURES

If the Supply Contractor is a joint venture of two or more entities, the grants, covenants, provisos and claims, rights, powers, privileges and liabilities of the Supply Contractor shall be joint and several.

GC 1.3 CONTRACT REQUIREMENTS

1.3.1 Successors' Obligations: The Contract shall ensure to the benefit of and be binding upon not only the parties hereto but also their respective successors and permitted assigns.

1.3.2 Assignment of Contract: The Contract shall not be assigned in whole or in part by the Supply Contractor without the prior written consent of the Owner. 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 Owner to terminate the Contract as hereinafter provided.

1.3.3 Waiver of Rights: Except as herein provided, no act or failure to act by the Supply Contractor, the Owner, 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 Owner 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.

1.3.4 Amendment of Contract Documents: The Contract Documents shall not be amended except as specifically agreed in writing signed by both the Owner and the Supply Contractor.

GC 1.4 LAWS, REGULATIONS AND PERMITS

1.4.1 The Supply Contractor shall comply with all federal, territorial, provincial, and local laws, regulations and ordinances affecting the execution of the work.

1.4.2 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 execution 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 Owner.

1.4.3 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 Owner. Before final

payment is made on the account of this Contract, the Supply Contractor shall, if requested by the Owner, 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 Owner, 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 Owner 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 Owner. Approval shall only mean the Owner has no objection to the substitution being utilized at the Supply Contractor's risk. If the Owner refuses to approve the substitution, the Supply Contractor shall pay such royalties and secure such valid licences as may be requisite for the Owner, 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.

1.4.4 All references to money in the Contract Documents shall be interpreted as meaning lawful currency of Canada.

GC 1.5 LOCAL CONDITIONS

1.5.1 The Supply Contractor shall, by personal inspection, examination, calculations or tests, or by any other means, satisfy itself with respect to the local conditions to be encountered and the quantities, quality, and practicability of the work and of its methods of procedure.

GC 1.6 ASSIGNMENT OF CONTRACT

1.6.1 Neither party shall sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portions thereof, or the right, title, or interest therein, or obligations thereunder without written consent of the other party, except for an assignment to a bank of the payments to be received hereunder.

GC 1.7 HEADINGS

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 OWNER - SUPPLY CONTRACTOR RELATIONS

GC 2.1 AUTHORITY OF ENGINEER

2.1.1 The Engineer shall represent the Owner at the Work Site. The Engineer shall have the authority set out in the Contract Documents and such other authority as may be delegated in writing by the Owner. The Owner has delegated authority to the Engineer:

.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 interpretations of the Contract Documents;

2.1.2 The Engineer is in the first instance the interpreter of the Contract and is the sole judge of its performance. The Supply Contractor shall obey, perform, and comply with Engineer's orders or instructions with respect to the Work and the Goods or concerning the conduct thereof, promptly, efficiently and to the satisfaction of the Engineer. However, if the Supply Contractor is of the opinion that such orders or instructions are not authorized under the provisions of the Contract or involve a change for which a Change Order in accordance with the Contract, the Supply Contractor shall so notify the Engineer in writing before proceeding to carry them out and, in any event, within ten (10) days of the receipt of such orders or instructions. If the Supply Contractor does not so notify the Engineer within the time so limited, the Supply Contractor shall not claim at any time thereafter that the orders or instructions were not authorized or should have been subject to a Change Order. Nevertheless, the giving of such notice to the Engineer shall not relieve the Supply Contractor of the obligation to carry out and obey such orders and instructions.

GC 2.2 RESPONSIBILITIES OF THE SUPPLY CONTRACTOR

2.2.1 Attention to Work: The Supply Contractor shall diligently manage the work so that it is executed faithfully, expeditiously and in accordance with the Contract Documents.

2.2.2 The Supply Contractor shall advise the Engineer in writing of the name of the Supply Contractor's authorized representative.

2.2.3 The Supply Contractor shall provide all necessary instruction to the General Contractor for off-loading, testing and installation of goods, within the destination facility AND supervisory personnel to monitor the General Contractor's work with respect to the off-loading, testing and installation of goods, within the destination facility. The Supply Contractor shall, by monitoring, personal inspection, examination or by other means available, satisfy itself that the off-loading, testing and installation work is in strict accordance with the Supply Contractor's requirements.

2.2.4 Shipment: The Supply Contractor shall properly package all Goods for safe shipment to the Work Site and a Notice of Shipment shall be sent by the Supply Contractor to the Owner 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. 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.

2.2.5 Acceptable Delivery: The Supply Contractor will arrange to have the Goods delivered to the FOB Point between 8:00 A.M. and 3:00 P.M, Monday to Friday, statutory holidays excepted. The Owner shall not be responsible for Goods delivered outside the acceptable time for delivery.

2.2.6 Transportation Costs: If the Contract calls for payment of any transportation cost by the Owner, the Owner shall in no event be liable or accountable in excess of the actual costs of transportation. The Supply Contractor shall be accountable for and pay any excess transportation costs arising from the Supply Contractor's failure to make delivery to the F.O.B. Point or to follow shipping instructions furnished by the Owner.

2.2.7 Employee Safety: 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 on the Work Site in connection with the supply of Goods and in compliance with the requirements and regulations of the authorities having jurisdiction.

GC 2.3 OWNER - SUPPLY CONTRACTOR CO-ORDINATION

2.3.1 Notice: Any notice, order, request or other communication (herein the "notice") given by the Engineer or the Owner 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 mailed by first class 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 venturers or partners or any of their officers or employees. Any notice to be given by the Supply Contractor to the Owner or to the Engineer shall be deemed to have been given if sent by first class mail or delivered to both the Owner and the Engineer at the respective addresses of the Owner and the Engineer set out in the Agreement. Any notice sent by first-class mail shall be deemed to have been given two days after the day of mailing.

2.3.2 Work by Owner and Others: Since the Goods are one part of a comprehensive scheme of development being undertaken by the Owner, performance under the Contract may be dependent upon other work by the Owner or other contractors on and about the Work Site during the time the Supply Contractor is performing the work. The Supply Contractor shall fully co-operate and co-ordinate its work with the work of the Owner and other contractors so that work on the entire scheme of development may be performed with utmost speed consistent with good practice.

GC 2.4 DISPUTES

2.4.1 Determination by Engineer: Except as otherwise specifically provided, questions regarding meaning, interpretation and intent of the Contract or Contract Documents shall be referred by the Supply Contractor in writing to the Engineer for its decision. The Engineer

shall, within thirty (30) days, respond to the Supply Contractor in writing with its decision. Failure of the Supply Contractor to notify the Owner in writing of disagreement with the Engineer's decision within fifteen (15) days of receipt of the Engineer's decision shall constitute a waiver of the Supply Contractor's right to thereafter assert a claim resulting from such decision.

GC 2.5 SUBCONTRACTS

2.5.1 No Subcontractor other than those named in the Proposal Form shall be employed by the Supply Contractor without the written approval of the Engineer. Subcontractors named in the Proposal Form and those subsequently approved shall not be changed without the written consent of the Engineer. The Supply Contractor is responsible to the Owner for the acts and omissions of said Subcontractors and of their employees, to the same extent that the Supply Contractor is responsible for the acts or omissions of persons employed by the Supply Contractor. Nothing in the Contract Documents shall create any contractual relation between any Subcontractor and Owner. The Supply Contractor shall bind every Subcontractor to the terms of the Contract Documents.

GC 2.6 ORAL AGREEMENTS

2.6.1 No oral instruction, objection, claim, or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents and none of the provisions of the Contract Documents shall be held to be waived or modified by reason of any act or failure to act whatsoever, other than by a waiver or modification thereof in writing and agreed to by the parties to the Contract.

PART 3 SPECIFICATIONS AND DRAWINGS

GC 3.1 INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

3.1.1 General: The Specifications and Drawings are intended to be explanatory of each other. Work specified on the Drawings and not in the Specifications, or vice versa, shall be executed as if specified in both.

3.1.2 Request for Clarification: If the Supply Contractor requires any clarification concerning the Goods, it shall direct its request in writing for clarification to the Engineer.

GC 3.2 DIVISION OF SPECIFICATIONS AND DRAWINGS

3.2.1 Specifications and Drawings are divided into groups for the convenience of the Owner and the Engineer. These divisions are not for the purpose of apportioning work or responsibility for work among subcontractors, suppliers and manufacturers.

GC 3.3 CONFLICTING PROVISIONS, ERRORS AND OMISSIONS IN CONTRACT DOCUMENTS

3.3.1 Conflicting Provisions: In case of any inconsistency or conflict between the provisions of the Contract Documents, the provisions of such documents and Addenda thereto will take precedence and govern in the following order:

.1 Agreement
.2 Supplementary General Conditions
.3 General Conditions
.4 Specifications
.5 Drawings
.6 Executed Proposal Form
.7 Instructions to Proponent
.8 Request for Proposal (RFP)
.9 All Other Documents.

3.3.2 Errors and Omissions: If the Supply Contractor discovers that there are any errors or omissions in the Contract Documents, it shall immediately notify the Engineer in writing. The Engineer shall promptly forward the notification to the Owner and the Owner 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 Engineer and the Engineer 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 Owner 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 Owner.

3.3.3 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

GC 4.1 GENERAL

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

GC 4.2 DEMONSTRATION OF COMPLIANCE WITH CONTRACT REQUIREMENTS

4.2.1 Inspection:

.1 The Owner 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 Owner 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 Owner 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 Owner or any guarantees, warranties or covenants in favour of the Owner, and the Owner 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 Owner or the Engineer or any inspector or agent had not taken place.

.4 If the Contract Documents, laws, ordinances, or any public regulatory authority requires 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 Owner at the Work Site and if the Goods are to be incorporated into the operating facility, the Owner's inspection and testing of the Goods may be made under operating conditions after the Goods have been installed.

4.2.2 Certification: 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.

4.2.3 Expenses: Unless otherwise specified in the Contract Documents, the Engineer's travel, subsistence and labour expenses for inspection and testing shall be paid by the Owner.

If the Supply Contractor requests the Engineer to inspect and test Goods, materials or equipment at the point of manufacture, then the additional costs to the Owner for travel, subsistence and labour expenses shall be paid by the Supply Contractor and may be deducted by the Owner 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 Owner 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.

GC 4.3 DEFECTIVE OR IMPROPER GOODS

4.3.1 Correction of Defective Goods: If upon inspection, testing or otherwise the Goods or any portion thereof are found to be non-conforming, unsatisfactory, defective, or 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 Owner 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 Owner 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.

4.3.2 If upon inspection, testing or otherwise the Goods or any portion thereof are found to be non-conforming, unsatisfactory, defective, or 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 Owner 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 Owner to the Supply Contractor on account of the Contract Price of such returned Goods, shall be repaid to the Owner by the Supply Contractor. The Supply Contractor shall advise the Owner, 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 Owner's right to reject non-conforming Goods. The Owner reserves the right even after it has paid for 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 Owner'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.

4.3.3 Retention of Defective Work: If in the opinion of the Engineer any portion of the work done 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 Owner 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 Owner shall be entitled to make such deductions from the payments due or to become due to the Supply Contractor as are just and reasonable.

4.3.4 No Implied Approval: The fact that the Engineer or the Owner has not disapproved of or rejected any part of the Goods or any of the plant used in connection therewith shall not be deemed or be construed to be an acceptance of any such part of the Goods or any such materials.

GC 4.4 WARRANTY AND GUARANTEE

4.4.1 The Supply Contractor agrees that the Goods manufacturer's standard warranty will be to the benefit of the Owner and that the Goods are free from all defects arising from faulty construction, manufacturing, materials, equipment or workmanship for a period of the lesser of two (2) years from the date of the Completion Certificate, or 26 months from the date of final shipment.

4.4.2 The Supply Contractor warrants and guarantees that the Goods are free from all defects arising from faulty construction, manufacturing, installation, materials, equipment or workmanship in any part of the Goods for a period of two years commencing from the date of acceptance by the Engineer after each operational testing under each construction contract. During the warranty period, the Supply Contractor, upon the receipt of notice in writing from the Owner or the Engineer, shall promptly make all repairs arising out of the defects. The Owner 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 Owner 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. The costs of any repair made by the Owner in connection with this clause shall be charged to the Supply Contractor and the Supply Contractor shall reimburse the Owner for such costs. All covenants and agreements shall continue to be binding on the Supply Contractor until they have been fulfilled.

4.4.3 The Owner is relying on Supply Contractor's skill and judgment in selecting and providing the proper Goods and any applicable services for the Owner's particular use. The Supply Contractor warrants to the Owner 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 applicable in the place of the Work. 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.

4.4.4 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 OF OWNER

GC 5.1 INDEMNIFICATION

5.1.1 The Supply Contractor shall save harmless and indemnify the Engineer, the Owner, and their directors, 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 out of negligent act or omission connected with the Goods by the Supply Contractor or its subcontractors, or their servants or employees under this Contract, except to the proportionate extent that such actions, claims, demands, proceedings, suits, losses, damages, costs and expenses were caused by the Indemnified Parties or any of them.

5.1.2 The Supply Contractor represents that it has fully investigated all Specifications, including any furnished by the Owner, 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.

5.1.3 The Supply Contractor warrants to the Owner 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 Owner's 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 un-copyrighted composition, secret or other process, patented or un-patented invention, articles or appliances manufactured or used in connection with the Goods, and used or to be used by the Owner before or after completion of the work 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.

5.1.4 The Supply Contractor shall release and discharge the Engineer, the Owner, and their directors, officers, servants, employees and agents (the "Released 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) which the Supply Contractor or its subcontractors, or their servants or employees might have in any manner arising in any way out of or connected with the Goods by the Supply Contractor or its subcontractors, servants or employees under this Contract except to the proportionate extent that such actions, claims, demands, proceedings, suit, losses, damages, costs, and expenses were caused by the Released Parties.

GC 5.2 SHIPMENT OF GOODS/DAMAGE TO GOODS

5.2.1 The Goods will be delivered by the Supply Contractor to the FOB Point.

5.2.2 The Supply Contractor will be responsible and pay for all transportation, freight, insurance, storage, customs or excise charges or duties and all other costs and expenses whatsoever incurred in connection with the Goods prior to the Goods being delivered to the FOB Point.

5.2.3 Notwithstanding any shipping instructions or otherwise, the Supply Contractor shall assume and pay any and all loss or damage to the Goods from any cause whatsoever up to the FOB Point.

5.2.4 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 Owner 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 represents and warrants that the warranty provided herein shall not be affected or changed to any manner or respect whatsoever.

PART 6 PROGRESS AND COMPLETION

GC 6.1 CONTRACT TIME

6.1.1 Execution of the Work: Time shall be strictly of the essence. The Supply Contractor shall supply the Goods and all portions of the work thereof shall be completed in accordance with the Contract Documents. The Supply Contractor acknowledges that the schedule for the work and supply of the Goods as set out in the Contract Documents is reasonable.

6.1.2 Schedule: The Supply Contractor shall provide a schedule and reports in accordance with the Contract requirements for scheduling and coordinating the work and supply of Goods within the prescribed time. Contract time extensions, if any, under the Contract shall be incorporated into updated schedules. The failure of the Supply Contractor to comply with this requirement shall entitle the Owner to terminate the Supply Contractor's right to continue with the work and supply of Goods or to delay progress payments.

6.1.3 Progress: If the work or supply of the Goods falls behind schedule, the Supply Contractor shall advise the Engineer what actions will be taken to return the work or supply of the Goods or portions thereof to comply with the schedule including:

.1 Increase manpower in quantities and crafts;

.2 Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of equipment, or any combination of the foregoing; and

.3 Reschedule activities.

6.1.4 The Supply Contractor upon request of the Engineer shall prepare a proposed schedule revision to make up the delay in progress and ensure completion of the work and supply of the Goods in accordance with the Contract Documents. The proposed schedule revisions shall be submitted to the Engineer in accordance with the Contract. All costs and expenses of getting the work or supply of Goods back on schedule shall be for the Supply Contractor's account.

6.1.5 None of the services performed by the Engineer in monitoring, reviewing and reporting on the status and progress of the work or supply of the Goods shall relieve the Supply Contractor of responsibility for planning and managing the work or supply of the Goods in conformance with the Contract Documents.

6.1.6 If the Engineer makes any suggestion to the Supply Contractor relating to the work or supply of the Goods which is not set out or provided for in the Contract Documents and which the Supply Contractor adopts and uses, in whole or in part, such adoption or use shall be at the risk of the Supply Contractor. The Owner and the Engineer shall bear no risk or responsibility for the adoption and use of such suggestion and without limitation will not be responsible for any defects, non-compliance with the Contract Documents or delay in the work or supply of the Goods, which may result from the adoption and use of such suggestion.

6.1.7 Extension of Time: If the Supply Contractor wishes to claim an extension of the time allowed for the completion of all or any portion of the work or supply of the Goods by reason of being ordered to perform extra work or furnish extra material, or consequent upon any delay occasioned by strikes, lockouts (other than by the Supply Contractor alone), Act of God or any other cause beyond the control of the Supply Contractor, whether or not of similar kind or nature, the Supply Contractor must give notice in writing to the Engineer within seven days after any such order has been given or such delay has first arisen, stating the reason for such delay and requesting an extension of time. In such event, the Engineer shall advise the Owner of the notice it received from the Supply Contractor and shall review the request within 15 days and make a recommendation to the Owner about the disposition of the request. The Owner, after receipt of the Engineer's recommendation, shall reasonably determine what extension of time, if any, the Supply Contractor shall be allowed for the supply of Goods.

6.1.8 No claim by the Supply Contractor for an extension of the time allowed for the completion of all or part of the supply of the Goods shall be considered or allowed by the Owner unless it is for and results from one or more of the events or causes set out in GC 6.1.7.

6.1.9 The Owner's determination under GC 6.1.7 shall not in any way affect the adequacy of the Contract Price or derogate from the rights of the Owner under any provision of the Contract Documents. Any extension of time granted pursuant to GC 6.1.7 shall be deemed to be in full and final compensation and satisfaction for any actual or probable losses, claims, damages, costs, expenses, causes of action or injuries sustained or sustainable by the Supply Contractor in respect of any matter or things for which an extension of time is granted.

6.1.10 Consequential Damages: The Owner, and the Engineer shall not be liable to the Supply Contractor for, and the Supply Contractor hereby waives recovery from them of, loss of profits or anticipated profits, loss of production, impact costs, overhead, claims of the Supply Contractor's customers, suppliers or contractors, or other indirect or consequential damages arising at any time from any cause whatsoever, whether arising under tort, implied or statutory warranties, strict liability or breach of contract ("Consequential Damages") notwithstanding any right or remedy available to the Supply Contractor at law or in equity to Consequential Damages.

6.1.11 Liquidated Damages: If the Supply Contractor fails to supply the Goods to the FOB Point on or before the dates shown on the schedule of Supply and Delivery, the Supply Contractor shall pay consideration to the Owner in accordance with the following schedule for each day or part thereof after the dates upon which the Goods were required to be delivered to the FOB Point.

Period After Goods Required to be Delivered to FOB Site	**Amount Payable per Calendar Day**
1) First Four weeks 2) Second Four weeks and thereafter	$ 1,000 $ 2,000

The total consideration payable by the Supply Contractor pursuant to this clause is up to a maximum of $ 100,000.

6.1.12 Every amount charged to the Supply Contractor or owed to the Owner by the Supply Contractor shall be paid by the Supply Contractor to the Owner on demand or, in the Owner's discretion, may be set off by the Owner from monies due to the Supply Contractor under this Contract or recovered by the Owner from the Supply Contractor or its Surety.

GC 6.2 SUSPENSION OF WORK BY OWNER

6.2.1 The Owner may at any time suspend the Work, or any portion thereof, provided that the Owner gives the Supply Contractor five (5) days written notice of suspension. The Supply Contractor shall resume work upon written notice of the Owner within ten (10) days after the date set forth in such notice, or in a subsequent notice to resume work. The Owner will reimburse the Supply Contractor for direct and provable costs and expenses incurred by the Supply Contractor necessitated by such suspension of work or portion thereof, but the Supply Contractor shall not recover from the Owner payment for any loss of profits or damages. If the suspension notice lasts more than ninety (90) days, the Supply Contractor may, on ten (10) days written notice, terminate the contract.

GC 6.3 OWNER’S TERMINATION OF CONTRACT

6.3.1 The Owner 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 Owner giving notice thereof.

6.3.2 If at any time the Owner forms the opinion that the Supply Contractor is in default under this Contract because the Supply Contractor:

.1 has breached a fundamental term of the Contract or is in substantial breach of the terms of the Contract;

.2 has failed to commence work or 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 carry on the work or supply the Goods or any part thereof;

.5 has abandoned the work or failed to supply the Goods; or

.6 has repeatedly failed to make prompt payments to subcontractors, suppliers or others for labour, materials or equipment; then the Owner 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 Owner, the Owner may terminate the Contract. Such termination shall be effective immediately.

6.3.3 Upon termination, the Owner may take all Goods out of the Supply Contractor's hands and employ such means as the Owner may see fit to complete the work. 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 7, 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 Owner for all purposes incidental to the completion of supply of the Goods and may be used, exercised, and enjoyed by the Owner 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 Owner may assign all rights and privileges granted to the Owner in this clause to another supply contractor retained by the Owner to continue with the work or supply of the Goods.

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 work and supply of Goods is completed.

6.3.4 Except as hereinbefore provided, the Supply Contractor shall have no claim against the Owner for any reason whatsoever by reason of the termination of the Contract.

GC 6.4 SUPPLY CONTRACTOR'S TERMINATION OF CONTRACT

6.4.1 The Supply Contractor shall have the right to terminate the Contract for any of the following reasons:

.1 In the event of an Order of any Court or other public authority, other than the Owner, causing the Work to be stopped or suspended, and when the period of such stoppage or suspension has exceeded ninety (90) days, and when such stoppage or suspension occurs through no act or fault of the Supply Contractor, the Supply Contractor's agents or servants, and after giving ten (10) days written notice to the to do so.

.2 In the event the Owner fails to pay, except as provided in the Contract Documents, any sum certified by the Engineer within twenty (20) days from the due date of payment, and fails to remedy such default within ten (10) days of the Supply Contractor's written notice to do so.

.3 In the event the Owner suspends work as provided for herein for more than ninety (90) days.

In such event, the Supply Contractor will receive from the Owner payment for all work performed and losses sustained in respect of any materials. For termination under .1 above, the Owner will not be liable for any loss of profits, damages, or expenses incurred by the Supply Contractor as a result of such stoppage or suspension, but under .2 or .3 above, the Supply Contractor will be paid for loss of profits, damages and expenses. Such termination shall be effective upon the Supply Contractor giving notice thereof.

PART 7 PAYMENT

GC 7.1 PAYMENTS TO SUPPLY CONTRACTOR

7.1.1 Progressive payments to the Supply Contractor will be made on the basis of the schedule of proposal prices as presented on the Proposal Form.

7.1.2 The Supply Contractor shall submit to the Engineer at each scheduled payment event, a request for a payment by the Supply Contractor. If requested by the Engineer, the Supply Contractor shall provide such additional information as may be reasonably required to support the request for a payment. Such information may include satisfactory evidence of payment for equipment, materials and labour including payments to subcontractors and suppliers.

7.1.3 Within ten (10) days after receipt of the request for a schedule payment, the Engineer will review the request and recommend to the Owner the amount of the schedule payment to be made to the Supply Contractor. Subject to the provisions of the Contract, the Owner will, within 15 days after receipt of the Engineer's recommendation, process the payment.

7.1.4 The Owner may withhold from any scheduled payment:

.1 Any deduction the Owner may be entitled to under the Contract;

.2 Such reasonable amount as the Owner determines appropriate for any part of the Goods that are not supplied or with respect to work otherwise not in compliance with the Contract Documents.

.3 Holdbacks in accordance with applicable legislation.

7.1.5 Payments may be withheld in accordance the Contract until the relevant operating manuals and all operating and maintenance materials together with all warranties have been delivered to the Engineer.

7.1.6 In addition to any other remedy the Owner may have in the Contract or law, the Owner 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 Owner from loss as a result of:

.1 Defective or damaged Goods;

.2 A deductive change order;

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

7.1.7 The Owner, may withhold from payment to the Supply Contractor:

.1 Any set-off the Owner may be entitled to under the Contract;

.2 The amount of any bona fide builders lien claim asserted against the Owner or which the Owner acting reasonably anticipates will be made against the Owner; and

7.1.8 Prior to payment to the Supply Contractor, if requested by the Owner, the Supply Contractor shall deliver to the Owner a statutory declaration in form satisfactory to the Owner declaring that all subcontractors, labour and accounts for material and equipment have been paid.

GC 7.2 BUILDERS' LIEN ACT

7.2.1 The amounts withheld to comply with the Builders' Lien legislation will be retained by the Owner until payment is due in accordance with the provisions of the relevant legislation. In those cases where work is such that the Builders' Lien legislation does not apply or does not require the retention of holdback, the Owner will nevertheless retain holdbacks to the same extent as if such legislation applied to the Work.

GC 7.3 SUBSTANTIAL PERFORMANCE

7.3.1 Substantial Performance shall be as defined under the Builders' Lien Act of British Columbia.

.1

GC 7.4 HOLDBACK RELEASE DOCUMENTS

7.4.1 The following documents shall be obtained by the Supply Contractor and submitted to the Owner before payment of any holdback monies will be made:

.1 A certified copy of the title to the property upon which the work of this Contract is being performed proving that, as of a date two days after the expiry of the applicable 45-day holdback period, no notice or affidavit of lien or liens have been filed or other matters recorded to make effective any lien.

.2 A certificate from the Workers' Compensation Board certifying that, as of a date after the expiry of the applicable 45-day holdback period, all assessments due to the Board by the Supply Contractor have been paid.

.3 If there is no person who can provide the land title certificate referred to in (a) above, the Supply Contractor shall furnish to the Owner a Statutory Declaration, dated not earlier than seven (7) days after the expiry of the applicable 45-day holdback period, stating why no land title certificate is possible and stating that all materials, labour, work and services incurred directly or indirectly on account of the work in respect of which holdback monies are being released have been paid for by the Supply Contractor.

GC 7.5 CHANGE ORDERS / CHANGE DIRECTIVES

7.5.1 The Owner may at any time make any change in the Goods within the general scope of the work including a deceleration or an acceleration of the supply of the Goods or any portion thereof by issuing a change order to the Supply Contractor.

7.5.2 Where agreement cannot be reached between the Supply Contractor and the Engineer on the fair value of the cost of the change, the Engineer may instruct the Supply Contractor to proceed under the Force Account provisions of the Contract.

GC 7.6 EXTRA WORK

7.6.1 Extra work means the furnishing of goods, materials and equipment or the doing of work not directly or by implication called for in the Contract. If the Owner requires extra work it may do it itself or by the employment of others or it may direct the Supply Contractor to do the extra work by the issuance of a change order at a mutually agreed upon lump sum. If the Owner and the Supply Contractor cannot agree upon a lump sum and the Supply Contractor intends to assert a claim for an adjustment under this section, it must, within fifteen (15) days after receipt of a written change order or the furnishing of a written notice, submit to the Engineer a written statement setting forth the general nature and monetary extent of such claim, unless the Engineer extends this period. The statement of a claim hereunder may be included in this written statement.

7.6.2 Nevertheless, the giving of such a written statement to the Engineer shall not relieve the Supply Contractor of its obligations to carry out and obey such orders and instructions.

GC 7.7 FORCE ACCOUNT

7.7.1 Compensation for work done on a force account basis authorized by Engineer will be made in accordance with the following:

.1 Labour: All classifications of labour actually employed on the extra work will be paid for at the rates actually expended by or legally payable by the Supply Contractor including assessments payable under any statutory scheme relating to workers' compensation, pension, unemployment insurance, or holidays with pay. The Supply Contractor will be allowed a twenty percent (20%) fee based on the gross cost of labour as described above.

.2 Equipment: The rates for equipment, vehicles, and power tools shall include operator's wages and fringe and other benefits, all maintenance and operating costs. Compensation will be paid at the rates listed in the latest edition of the Province of British Columbia “Blue Book” Equipment Rental Rates. The Supply Contractor will be allowed a ten percent (10%) fee based on the gross cost of equipment as described above. Such fees shall be applied to the rental charge for equipment and will be the maximum paid regardless of the ownership.

.3 On subcontract work, the percentage fee allowable to the Supply Contractor shall be ten percent (10%) of the subcontractor's bill for such work performed.

.4 Materials supplied by the Supply Contractor shall be paid for at the supplier's invoice price plus an additional payment of ten percent (10%) of cost to cover handling and indirect overhead costs, plus ten percent (10%) of all costs, including handling and indirect overhead as its fee.

.5 The proper proportion, if applicable, as determined by the Engineer, of the net board and lodging costs of the labour employed on extra work or of applicable reasonable living-out allowances paid in lieu thereof.

.6 The cost of the work done each day will be submitted to the Engineer in a satisfactory form on each succeeding day after force account work is carried out and shall be applied or adjusted by the Engineer.

The submission to, or acceptance of, or approval by, the Engineer of daily force account work records shall not at any time be deemed an admission that the work is properly chargeable to force account.

GC 7.8 WORK AND MATERIALS OMITTED

7.8.1 The Supply Contractor shall, when ordered by change order, omit goods, materials or equipment or work to be done or furnished under the Contract Documents and the value of the omitted goods, materials, equipment or work will be deducted from the total Contract Price. The value of the omitted goods, materials, equipment or work will be valued on the basis of the actual direct cost saving to the Supply Contractor and based on the breakdown of prices submitted by the Supply Contractor pursuant to Section 004200.

GC 7.9 COMPLETION CERTIFICATE

7.9.1 When the Supply Contractor is of the opinion that Work has been completely performed, the Supply Contractor shall submit a written request to Engineer for a final inspection. The Engineer will make an inspection and will notify the Supply Contractor in

writing of any defects or deficiencies, which require to be corrected before all the Work has been performed. When the defects or deficiencies, if any, have been corrected and the Supply Contractor has submitted to the Engineer a written statement that all claims and demands of the Supply Contractor for extra work or otherwise in connection with the Contract have been presented in writing to the Engineer, the Engineer will recommend to the Owner that a Completion Certificate be issued to the Supply Contractor.

7.9.2 The Owner, subject to the Owner's acceptance of this recommendation, will issue the Completion Certificate.

END OF DOCUMENT

MODIFICATIONS TO GENERAL CONDITIONS

The General Conditions are hereby revised as follows:

ADDITIONAL GENERAL CONDITIONS

Add the following:
Add GC1.6.2 as follows:

The Owner will assign the Contract arising from the acceptance of a bid hereunder to a General Contractor, when such general contractor has been selected. The Supplier under this contract (Supply Contract) will be required to execute a tripartite Assignment and Novation Agreement with the Owner and the said General Contractor.

Add GC 1.8 as follows:

.1 The Contractor shall, prior to commencement of the Work, pay for and provide to the Owner:

(a) a performance bond, in the amount of 50% of Contract Price, covering the performance of this Contract, including any warranty requirements; and

.2 The Owner shall not be obligated to make any payment to the Contractor until such time as the bonds specified in GC 11.1 have been delivered to the Owner by the Supply Contractor.

.3 The cost of all Contract Security shall be included in the Proposal Price

.4 The bonds specified in GC 11.1 shall be:

(a) in the form which is in accordance with the latest edition of the CCDC approved bond forms;

(b) issued by a duly licensed surety company authorized to transact the business of suretyship in the province or territory of the Project Site;

(c) acceptable to the Owner; and maintained in good standing until the fulfillment of the Contract

.4 The Proposal shall be accompanied by a letter of consent from the Proponent's surety confirming that it will issue new bonds in favour of the General Contractor upon execution of the Novation Agreement and the surrender of the original bonds.

Add GC7.10 as follows:

Under the proficions of the Collective Agreement between the City and C.U.P.E. Local 118, the employees of contractors or subcontractors performing work for the Employer shall receive wags and conditions of employment at least equal to the terms of the Collective Agreement. Contract shall list all current wage rates in the declaration form included in this package.

The City may request a random check of wages paid to employees. Failure to adhere to the confirmed wage rates may be considered to be a breach of contract.

The City may withhold funds equal to the value of wages not paid and require confirmation that the situation.

GC8. CANADIAN ANTI-SPAM LEGISLATION

.1 In accordance with Canadian anti-spam legislation, each Party consents to contacting the other Party and its personnel through electronic messages relating to the Project. Following completion of the Project, either Party may withdraw consent by contacting the other Party.

END OF DOCUMENT

Part 1 General

1.1 PAYMENT SCHEDULE

.1 Payment for the work of this Contract shall be based on the Lump Sum Price and the breakdown in Section 00 42 00 Schedule A (less 10% for Builder's Lien Fund Holdback).

.2 Payment of the Builder's Lien Fund Holdback will be in accordance with the Builder's Lien Act of the Province of British Columbia.

1.2 WARRANTY

.1 Defects in the Work due to faulty design, products or workmanship appearing within two (2) years from the date of Substantial Performance of the Supply Contract shall be promptly replaced or corrected at no expense to the Owner.

.2 Defects in any repaired or replaced product or work appearing within two (2) years of the date of the repair or replacement shall be promptly corrected at no expense to the Owner and a one (1) year warranty shall remain in effect for the repaired or replaced part after the repair or replacement.

.3 If completion of repairs or replacement parts takes more than four (4) weeks, then the Equipment Supplier shall provide and install temporary facilities at the Supplier's expense until the repairs are completed.

.4 The decision of the Engineer is to be final as to the nature and cause of any such deficiency and the necessity to remedy same.

.5 Bonding is not required for Warranty.

.6 Provide scope of warranty and associated services.

.7 Detail specific extended warranty or additional items offered in the proposal.

.8 List the nearest service centre location that has fully trained technicians.

.9 List location of parts centre and list all relevant stock items carried.

.10 Describe technical support and available hours.

END OF SECTION

Part 1 General

1.1 REQUIREMENTS INCLUDED

.1 Shop drawings and product data.

.2 Operating and maintenance manuals.

.3 Testing procedures, reports and related documentation.

1.2 ADMINISTRATIVE

.1 Provide to Engineer for review the submittals specified. Submit in accordance with the Proposal Schedule.

.2 At Engineer's request, prepare and submit a schedule fixing the dates for submission and return of shop drawings, product data or samples.

.3 Do not proceed with Work affected by the submittal until review is complete and a Notice to Manufacture and Deliver the Goods has been issued.

.4 Review submittals prior to submission to the Engineer. This review represents that 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 as to the specific project will be returned without being examined and will be considered rejected.

.5 Supply Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.

.6 Supply Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer's review.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Detail all shop drawings using the metric system. If customary units are presented, provide them after the metric units, in brackets. Prepare to a drafting standard equivalent to the Owner's existing record drawings.

.2 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 or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the Section under which the adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 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.

.4 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. Include owner specified tags for valves, instruments, process variables etc.

.5 Submit six 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.

.6 Submit six prints of shop drawings for each requirement requested in specification Sections and as the Engineer may reasonably request.

.7 "REVIEWED" - Make and distribute additional copies as required for execution of the Work.

.8 "REVISE & RESUBMIT" - Make the necessary revisions and resubmit revised drawings for review. Show the drawing number of the first such revised drawing and show the latest revision number applicable to the drawing by adding a suffix to the drawing number as - "REV. 1", "REV. 2", etc.

.9 "NOT REVIEWED" - This notation indicates when the Engineer has not reviewed the drawing. It may also be used in combination with the notation to revise and resubmit the drawing where the Engineer lacks sufficient information to complete his review and requires the drawing to be resubmitted for review after revision.

.10 Drawings will be marked "REVIEWED" together with the notation to "REVISE & RESUBMIT" when the Engineer requires resubmission of a revised drawing showing corrections made as a result of the Engineer's notations on the shop drawings. This procedure will not relieve the Supply Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract.

.11 Use only those shop drawings on the work that bear the "REVIEWED" notation.

.12 Do not revise shop drawings marked "REVIEWED" unless resubmitted to the Engineer for further review.

.13 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.

.14 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 materials.

.15 Manufacturers' catalogues, manuals, or price lists will not be accepted as shop drawings. Such materials may be used as supplemental information to the shop drawings.

.16 Indicate the tag number of instruments and valves and clearly show the features and details applicable to the equipment being supplied. Tag all equipment and instruments cables, conductors etc. as specified by the Engineer.

.17 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 where the work is located, in accordance with the governing legislation. Seal such drawings before submitting them for review.

.18 If upon review by the Engineer, no errors or omissions are discovered or if only minor corrections are made, three copies will be returned. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through the same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.19 Owner may deduct, from payments due to Supply Contractor for costs of additional Engineering work associated with the review of resubmitted shop drawings.

.20 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 or 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 fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 LATEST EDITIONS

.1 All references to specifications, standards, or methods of technical associations refer to the latest adopted revision, including all amendments, in effect on the date of submission of bids, except where a date or issue is specifically noted.

1.2 ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Antifriction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ARI	Air-Conditioning and Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWMAC	Architectural Woodworkers Manufacturers Association of Canada
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
CAN	Canadian National Standard
CBM	Certified Ballast Manufacturers
CBTIC	Clay Brick and Tile Institute of Canada
CEC	Canadian Electrical Code
CEMA	Canadian Electrical Manufacturers Association
CGA	Canadian Gas Association
CGRA	Canadian Good Roads Association
CGSB	Canadian General Standards Board
CISC	Canadian Institute of Steel Construction
CITC	Canadian Institute of Timber Construction
CLA	Canadian Lumbermen Association
CMAA	Crane Manufacturers Association of America
CMHC	Canada Mortgage and Housing Corporation
CPCA	Canadian Painting Contractors Association
CPCI	Canadian Prestressed Concrete Institute
CRCA	Canadian Roofing Contractors Association
CRSI	Concrete Reinforcing Steel Institute

CSA	Canadian Standards Association
CSSBI	Canadian Sheet Steel Building Institute
CUA	Canadian Underwriters Association
CWB	Canadian Welding Bureau
CWC	Canadian Wood Council
CSPI	Corrugated Steel Pipe Institute
EEI	Edison Electric Institute
EEMAC	Electrical and Electronic Manufacturers of Canada
FFPC	Federal Fire Prevention Committee
FM	Factory Mutual Engineering Corporation
IAO	Insurers' Advisory Organization
IBRM	Institute of Boiler and Radiator Manufacturers
IEC	International Electrotechnical Commission
IEE	Institution of Electrical Engineers (U.K.)
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IGMAC	Insulated Glass Manufacturers Association of Canada
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
ISO	International Standardization Organization
LEMA	Lighting Equipment Manufacturers Association
LTIC	Laminated Timber Institute of Canada
MMA	Millwork Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NBC	National Building Code of Canada
NEC	National Electrical Code
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NLGA	National Lumber Grade Authority
OECI	Overhead Electrical Crane Institute
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PMBC	Plywood Manufacturers Association of British Columbia
RCABC	Roofing Contractors Association of British Columbia
RLM	RLM Standards Institute
RTAC	Road and Transportation Association of Canada
SAE	Society of Automotive Engineers
SBI	Steel Boilers Institute
SJI	Steel Joist Institute
SSPC	Steel Structures Painting Council
TTMAC	Terrazzo, Tile and Marble Association of Canada
ULC	Underwriters' Laboratories of Canada
USFG	United States Federal Government
WorkSafe BC	Workers' Compensation Board of BC Act and Regulations
WCLIB	West Coast Lumber Inspection Bureau

1.3 CONFORMANCE

.1 Conform to these standards, in whole or in part as specifically requested in Specifications.

.2 If there is question as to whether any product or system is in conformance with applicable standards, Engineer reserves the right to have such products or systems tested to prove or disprove conformance.

.3 The cost for such testing will be born by Owner in the event of conformance with Contract Documents or by the Supply Contractor in the event of non-conformance.

Part 2 Products

Not Used

Part 3 Execution

Not Used

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This Section describes the general requirements for the shipment, protection and storage of the Goods.

.2 The Supply Contractor shall take responsibility for all items arising under this Section up to and including delivery of the Goods.

1.2 CARE

.1 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 that have been satisfactorily repaired and are acceptable to the Engineer.

1.3 TRANSPORTATION

.1 Pay all costs of transportation of the Goods to the FOB Point.

.2 Provide protection against damage from moisture, freezing, dust, handling, or other cause during transport from manufacturer's premises to Work Site.

.3 Items or components of items with unique numbering systems such as mechanical and electrical equipment and instruments shall be clearly tagged with such numbers.

.4 Use stiffeners where necessary to maintain shapes and to give rigidity.

.5 Deliver parts of Goods in assembled units where possible.

.6 Wrap or otherwise seal bearing housings, vents and other types of openings to prevent contamination by grit and dirt.

.7 Correct any damage to conform to the requirements of this Contract before the Goods are incorporated into the work and pay the costs arising out of dismantling, inspection, repair and reassembly as necessary.

Part 2 Products

.1 Not Used.

Part 3 Execution

.1 Not Used.

END OF SECTION

Part 1 General

1.1 MANUAL

.1 Furnish complete manuals for installation, operation, maintenance, and lubrication requirements for each unit of mechanical, electrical, and instrumentation equipment and each instrument of the Goods.

.2 Provide separate manuals for operating data and for maintenance data.

.3 Customize the manuals to describe the equipment supplied. Do not include extraneous data for models, options, or sizes not supplied. When more than one model or size of equipment type is furnished, show the information pertaining to each model, option or size.

.4 Provide four (4) copies of each manual.

.5 Provide one (1) electronic version of manual in searchable .pdf format.

1.2 GENERAL

.1 Assemble each copy of the manual in the specified three-ring hard-back type binders. Assemble the binders in the following manner:

.1 Label each binder to designate the system or equipment with reference to the equipment number, and Specification section. Provide each binder with a table of contents and heavy section dividers with numbered plastic index tabs.

.2 Provide each binder with title page to include names and addresses of the manufacturer, the nearest representative of the manufacturer, nearest supplier of the manufacturer's equipment and parts.

.3 Where more than one binder is required, label each binder "Vol. 1 of," "Vol. 2 of," etc.

.4 Punch all data for binding and composition. Arrange printing so that punching holes does not obliterate data.

.5 Provide materials suitable for photographic reproduction. If copies are used they shall equal the clarity and quality of the original.

.6 Provide drawings, diagrams and manufacturer's literature which are legible and no larger than 11x17 fold out.

.7 All instructions in these manuals shall be in simple language.

1.3 BINDERS

.1 Hard cover, extension-type, bound in heavy-weight fabricord, 3-hole, loose leaf, for 215 x 280-mm paper.

.2 Identification: Lettering on front and spine. Include Specification numbers, title, and equipment numbers.

1.4 REQUIREMENTS

.1 For each identification, appropriately label each manufacturer's manual with the equipment name, equipment number, and Specification section as it appears in the Contract Documents. Organize the information in the binders by Specification section, numerically ordered by the equipment numbers assigned in the Contract Documents.

.2 Group the documents into tabbed sections as listed below. Provide each section with tabbed dividers marked with the tab number and title and sequential page numbers.

.3 Manufacturer's equipment specific manuals may be substituted for the documents specified to be contained within tabs 3 through 9. If the manufacturer's standard manuals do not contain all the required information, provide the missing information in supplementary documents and drawings inserted behind the appropriate tabs.

.4 Mark or highlight manufacturer's standard documents to indicate the specific information applicable to the equipment, assembly, subassembly or material supplied. Cross out, annotate or eliminate extraneous material.

.5 Label those tab sections that are not applicable "N/A".

1.5 OPERATING DATA MANUAL CONTENTS

.1 Cover Sheet

.1 Show on the cover sheet for each set of operating data a functional title of the system, equipment or material, list of equipment numbers and corresponding function descriptions, revision date and Specification reference.

.2 Tab 1 - Table of Contents

.1 List the tab numbers and corresponding tab label and a one- or two-line description of the tab contents.

.3 Tab 2 - Reference Data

.1 Include Specifications and Drawing references, completed equipment maintenance summary forms, warranties and guarantees, address and telephone number of the manufacturer and the nearest manufacturer's representative.

.4 Tab 3 - Technical Data

.1 Include manufacturer's technical Specification and data sheets, certified performance curves for the Goods and protective device setting under this item.

.5 Tab 4 - Start-Up Instructions

.1 Provide requirements to set up and prepare each system for use. Include all required and recommended step-by-step inspections, lubrications, adjustments, alignments, balancing and calibrations. Include warnings and cautions to prevent equipment damage and to ensure personnel safety.

.6 Tab 5 - Operating Instructions

.1 Include the manufacturer's recommended step-by-step procedures for starting, stopping normal and emergency operation. Include all specified modes of operation including recommended operation while the assembly or equipment is in long-term storage. Provide control diagrams with data to explain operation and control of systems and specific equipment. Include alarm analysis and trouble shooting.

1.6 MAINTENANCE DATA MANUAL CONTENTS

.1 Cover Sheet

.1 Show on cover sheet for each set of maintenance data the functional title of the system, equipment, list of equipment numbers and Specification reference.

.2 Tab 1 - Table of Contents

.1 List the tab numbers and corresponding tab label and a one or two line description of the tab contents.

.3 Tab 2 - Reference Data

.1 Include Contract Specification, Drawings, and equipment data sheet references, address and telephone numbers of the manufacturers and nearest manufacturer's representative.

.4 Tab 3 - Preventive Maintenance Instructions

.1 Provide the following information for preventative and scheduled maintenance:

.1 Lubrication data, other than instructions for lubrication.

.2 A table showing recommended lubricants for specific temperature ranges and applications.

.3 Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.

.4 A lubrication schedule showing service interval frequency.

.5 Manufacturer's schedule for routine preventive maintenance, inspections, tests, and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair.

.6 Provide manufacturer's projection of preventive maintenance man-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft.

.5 Tab 4 - Corrective Maintenance Instructions

.1 Provide manufacturer's recommendations on procedures and instructions for correcting problems and making repairs.

.2 Provide step-by-step procedures to isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

.3 Provide wiring diagrams and control diagrams with point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job-specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type identically to actual installation numbering.

.4 Provide instructions and list tools required to restore product or equipment to proper condition or operating standards.

.5 Provide step-by-step procedures and list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings, and adjustments required. Instructions shall include a combination of text and illustrations.

.6 Provide lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. List spare parts and supplies that have a long lead time to obtain.

.7 Provide manufacturer's projection of corrective maintenance man-hours including craft requirements by type of craft. Separately identify and tabulate corrective maintenance which requires participation of the equipment manufacturer.

.6 Tab 5 - Parts Identification

.1 Provide the following information, including information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the Goods:

.1 Identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification.

.2 Clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies.

.3 Spare parts list which includes the manufacturer's recommendations for quantities of spare parts which the Owner should keep on hand. Special storage precautions will be noted.

.7 Tab 6 - Training and Testing Equipment

.1 Provide the following:

.1 Information available from the manufacturers to use in training personnel to maintain the Goods properly.

.2 Information on test equipment required to perform specified tests and on special tools needed for the maintenance and repair of components.

.8 Tab 7 - Drawings

.1 Provide drawings which completely document the equipment, assembly, subassembly or material which the instruction is for. Provide the following drawings as applicable:

.2 Fabricated details.

.3 Wiring and connection diagrams.

.4 Electrical and piping schematics.

.5 Block or logic diagrams.

.6 Shop drawings.

.7 Installation drawings.

.8 Layout and dimension drawings.

.9 Electrical component fabrication drawings.

.9 Tab 8 - Other Required Information

.1 Include maintenance instructions for components and assemblies which are part of the equipment but which do not have separate instruction sections. List the information on a sheet directly behind this tab.

.10 Warranties and Guarantees

.1 Include a copy of all warranties and guarantees required by the Contract. Include the name and telephone number of the manufacturer's contact person. Indicate the time frame of each warranty or guarantee.

1.7 FIELD CHANGES

.1 Following the acceptable installation and operation of an equipment item, modify and supplement the item's instructions and procedures to reflect any field changes or information requiring field data.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Specific requirements for maintenance materials, tools and spare parts are specified in individual specification sections. Supply Contractor is to identify and supply specific required spare parts.

.2 Supply special tools, wrenches, and accessories that are required for removing worn parts, making adjustments, and carrying out maintenance works.

.3 Deliver maintenance materials, special tools and spare parts in designated area as directed by Engineer.

.4 Prepare lists of maintenance materials special tools and spare parts for inclusion in operations and maintenance manuals.

1.2 MAINTENANCE MATERIALS

.1 Deliver specified items packaged to prevent damage.

.2 Identify, on carton or package, colour, room number, system or area, as applicable, where item is to be used.

1.3 SPECIAL TOOLS

.1 Assemble special tools as specified and/or required.

.2 Include following:

.1 Identification tag reference.
.2 Identification of equipment or system for which tools are applicable.

.3 Instruction on intended use of tool.

.4 Identify special tools to indicate equipment or system for which tools are intended.

1.4 SPARE PARTS

.1 Assemble spare parts as specified and/or required.

.2 Include the following:

.1 Part number.
.2 Identification of equipment or system for which parts are applicable.
.3 Installation instructions as applicable.
.4 Name and address of nearest supplier.

.3 Identify spare parts to indicate equipment or system for which parts are applicable.

Part 2 Products

Not Used

Part 3 Execution

Not Used

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This Section contains requirements for training the Owner's personnel, by persons retained by the Supply Contractor specifically for the purpose, in the proper operation and maintenance of the Goods and systems supplied under this Contract.

1.2 QUALITY ASSURANCE

.1 Provide on-the-job training of the Owner's personnel. Training sessions are to be conducted by qualified, experienced (5 years minimum), manufacturer-trained representatives. Training includes instruction in equipment operation, preventative maintenance regular maintenance, trouble-shooting, and repair for operators, plant mechanics, electricians, and electronics technicians.

Part 2 Products

2.1 GENERAL

.1 Conduct training sessions for the Owner's operation and maintenance personnel on the operation, care, and maintenance of the Goods supplied under this Contract. Training will take place at the City of Port Alberni site and under the conditions specified in the following paragraphs. Operation and maintenance manuals will be reviewed and accepted at least 15 days prior to the date scheduled for the initial training session.

2.2 LOCATION

.1 Field training sessions will take place at the installed location of the Goods.

2.3 LESSON PLANS

.1 Prepare formal written lesson plan for each training session and coordinate with the Engineer. Lesson plan shall contain an outline of the material to be presented along with a description of visual aids to be utilized during the session. Include a time allocation for each subject. Furnish 5 copies of necessary training manuals, handouts, visual aids and reference materials at least 3 weeks prior to each training session. Provide electronic versions in pdf format of all training materials to the Owner and Engineer.

2.4 FORMAT AND CONTENT

.1 Include time in the classroom and at the installed location of the Goods for each training session. As a minimum, cover the following topics for each item of equipment:

.1 Familiarization
.2 Safety
.3 Operation
.4 Troubleshooting

.5 Preventive maintenance

.6 Corrective maintenance

.7 Parts

.8 Local representatives

2.5 VIDEO RECORDING

.1 The Owner may record each training session. After taping, the material may be edited and supplemented with professionally produced graphics to provide a permanent record for the Owner's use.

Part 3 Execution

3.1 GENERAL REQUIREMENTS

.1 Conduct training in conjunction with the operational testing and commissioning periods. Schedule classes such that classroom sessions are interspersed with field instruction in logical sequence. Arrange to have the training conducted on consecutive days, with no more than 4 hours of classes scheduled for any one day.

.2 Provide acceptable operation and maintenance manuals, as defined in Section 017823 – Operating and Maintenance Data, for the specific equipment to the Owner's at least 3 weeks prior to the start of any training.

3.2 OPERATOR CLASSROOM TRAINING

.1 As a minimum, classroom equipment training for operations personnel will include:

.1 The Goods' specific location in the plant and an operational overview. Use slides and drawings to aid discussion.

.2 Purpose and plant function of the Goods.

.3 The operating theory of the Goods.

.4 Start-up, shutdown, normal operation, and emergency operating procedures, including system integration and electrical interlocks, if any.

.5 Safety items and procedures.

.6 Routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the Goods and ancillary components.

.7 Operator detection, without test instruments, of specific equipment trouble symptoms.

.8 Required equipment exercise procedures and intervals.

.9 Routine disassembly and assembly of Goods if applicable (as judged by the Owner on a case-by-case basis) for purposes such as operator inspection of equipment.

3.3 OPERATOR HANDS-ON TRAINING

.1 As a minimum, hands-on training for operations personnel will include:

.1 Discussing, demonstrating, and performing standard operating procedures and round checks.

.2 Discussing and performing the preventative maintenance activities.

.3 Discussing and performing start-up and shutdown procedures.

.4 Performing the required equipment exercise procedures.

.5 Performing routine disassembly and assembly of equipment if applicable.

.6 Identifying and reviewing safety items and performing safety procedures, if feasible.

3.4 MAINTENANCE CLASSROOM TRAINING

.1 Classroom equipment training for the maintenance and repair personnel will include:

.1 Basic theory of operation.

.2 Description and function of equipment.

.3 Routine start-up and shutdown procedures.

.4 Normal and major repair procedures.

.5 Equipment inspection and troubleshooting procedures.

.6 Safety procedures.

.7 Preventive and normal maintenance.

3.5 MAINTENANCE HANDS-ON TRAINING

.1 Hands-on training for maintenance and repair personnel will include:

.1 Locating and identifying equipment components.

.2 Reviewing the equipment function and theory of operation.

.3 Reviewing normal repair procedures.

.4 Performing routine start-up and shutdown procedures.

.5 Reviewing and performing the safety procedures.

.6 Reviewing and using equipment manufacturer's manuals in the hands-on training.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This Section contains general requirements for testing and documentation. These requirements supplement, but do not supersede, specific testing requirements found elsewhere in the Specifications. The Contractor will conduct any shop or factory tests required by the Specifications. The Contractor will develop and carry out field testing of all items supplied under this contract. Any retesting of goods supplied under this contract due to failure to meet specified performance criteria will be paid for by the Contractor.

1.2 QUALITY ASSURANCE

.1 The Contractor will manage, coordinate, and conduct the testing program. The Contractor will develop and carry out the performance testing requirements for the supplied equipment.

.2 The Contractor will provide input to the quality assurance program for the supplied equipment including:

.1 Required testing of goods and instruments.

.2 A testing plan detailing the sequence and how the specified testing work will be implemented. Include procedures for performance and operational testing.

.3 Review and certification of the installation prior to start of testing, if installation is by a subcontractor.

.4 A documentation program to record the results of equipment and system tests.

1.3 SUBMITTALS FOR REVIEW

.1 The Contractor to provide 6 copies of the following in accordance with Section 01330 - Submittals.

.2 Factory Testing

.1 A detailed testing plan for factory testing setting forth step-by-step descriptions of the procedures proposed by the Contractor for the systematic factory calibration and testing of all equipment supplied under this Contract.

.3 Field Testing

.1 Certification that the Goods have been installed in accordance with the manufacturer's recommendations.

.2 A detailed testing plan for performance testing setting forth step-by-step descriptions of the procedures proposed by the Contractor for the testing of all equipment under this Contract.

.3 Performance test results of equipment and system prior to commencement of the operational test.

.4 Sample forms for documenting the results of field performance tests and operational tests.

Part 2 Products

2.1 GENERAL

.1 Prepare test and documentation plans as specified in the following paragraphs. Test work for the purpose of acceptance will not commence until all test documentation and calibration plans and the specified system or equipment test plans have been submitted and reviewed by Engineer.

2.2 DOCUMENTATION

.1 Develop and implement a records keeping system to document compliance with the requirements of this Section.

.2 Include, as a minimum, for equipment and system documentation, date of test, equipment number, nature of test (factory or field performance) test objectives, test results, test instruments employed for the test and signature spaces for the Engineer and the Contractor. Establish a file for each item of equipment. Include in the files the following information as a minimum:

.1 Factory performance tests

.2 Field performance tests

.3 Develop test documentation forms specific for each system and associated equipment items under this Contract. Produce acceptable documentation forms for all systems and items of equipment for review by the Engineer a minimum of 4 weeks prior to any performance testing. Once the Engineer has reviewed, produce sufficient forms to document all testing work.

.4 Develop test plans detailing the sequential testing of each item of equipment. Identify test plans by specific equipment or tag number each device or control station to be manipulated or observed during the test procedure and the specific results to be observed or obtained. Test plans are to also be specific as to support systems required to complete the test work, temporary systems required during the test work, manufacturers' representatives to be present and expected test duration.

Part 3 Execution

3.1 GENERAL

.1 Provide required test and documentation plans and field personnel to test each item supplied under this Contract to demonstrate compliance with the specified performance requirements.

.2 The testing program will demonstrate to the Engineer's complete satisfaction that the equipment meets specified performance requirements and the facility is ready for the commissioning process to commence.

.3 Retesting required due to the failure of goods furnished under this contract to meet the specified performance requirements will be paid for by the Contractor.

3.2 PERFORMANCE TESTS

.1 Performance tests consist of the following:

.1 Pre-Operational checkout of all systems and mechanical equipment.

.2 Functional tests of all mechanical and instrumentation equipment and systems.

.2 Pre-Operational Checkout

.1 Prior to energization (in the case of electrical systems and equipment) ring out and test all circuits for continuity and shielding.

.2 Pre-operational check-out shall include the following:

.1 Manufacturer's recommendations for pre-start preparation.

.3 Functional Tests

.1 Once specified pre-operational check-out procedures are complete and the Engineer has witnessed and has not found deficiencies, equipment and systems may be started and operated under simulated operating conditions. Operate equipment a sufficient period of time to determine operating characteristics; to observe and document performance characteristics; and to permit initial adjustment of operating controls.

.2 Test results shall be within the tolerances set forth in the detailed specifications. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice. Should any doubt, dispute, or difference arise between the Engineer and the Contractor regarding the test results or the methods or equipment used the Engineer may order the test to be repeated. If the repeated test substantially confirms the previous test, then all costs in connection with the repeated test will be paid by the Owner, otherwise the costs shall be at the expense of the Contractor. Should the test results fail to comply with the specifications then retest as necessary to achieve the Contract requirements at the Contractor's expense.

3.3 OPERATIONAL TESTS

.1 After completion of all performance testing and receipt by the Engineer of all test submittals that show all equipment complies with the requirements of the specifications, the following operational tests will be completed.

.2 Variable testing:

.1 Monitoring the characteristics of equipment according to manufacturer information and specifications. Report any unusual conditions to the Engineer.

.3 Continuous 5-day testing:

.1 The 5-day test period shall commence after all work associated with variable testing is completed.

.2 The testing period shall be 24 hours per day for 5 continuous days. The test period can be changed as directed by the Owner in writing; however, a minimum of 120 hours will be required.

.3 Should the operational testing period be halted or rescheduled for any reason related to the facilities constructed or the equipment furnished under this contract, or the Contractor's temporary testing systems, the testing program will be repeated until continuous operation for the specified period has been accomplished without interruption.

.4 All process units shall be brought to full operating conditions.

.5 The intent of the test is to prove satisfactory operation of the aeration system and compliance with all specified performance criteria under all anticipated operating conditions.

.4 The Owner may sample and perform laboratory tests or conduct other tests to confirm that performance meets all of the requirements of the Supply and General Contracts. Any additional testing required by the Contractor will be completed by a third party and paid for by the requesting party.

.5 Following successful completion of the operational testing, the system can be turned over to the Owner.

3.4 RETESTING

.1 If under performance or operational tests, any portion of the work should fail to fulfill the Contract requirements and is adjusted, altered, renewed, or replaced, tests on that portion when so adjusted, altered, removed, or replaced, together with all other portions of the work as are affected thereby, shall, unless otherwise directed by the Engineer, be repeated within reasonable time and in accordance with the specified conditions. The Contractor shall pay to the Owner all reasonable expenses incurred by the Owner, including the costs of the Engineer, as a result of repeating such tests.

3.5 POST-TEST INSPECTION

.1 Once performance and operational testing has been completed, recheck all equipment and adjust, as required. Check all equipment for loose connections, unusual movement, or other indications of improper operating characteristics. Correct any deficiencies to the satisfaction of the Engineer.

END OF SECTION

For the purposes of the life cycle cost evaluation (LCCE) of the Proposal, the Proponent shall estimate the following operational costs based on the plant operating at a flow rate of 40 ML/d, with an average total daily flow of 19 ML (i.e. average operating time of 11.4 hours per day, allowing for required reactor starts and stops), based on the feed water quality provided, and the cost items in the following tables.

All monetary values quoted are to be in Canadian dollars.

Item	Description	Amount
1	**Capital Cost of the UV Disinfection System** Capital Cost of the UV Disinfection Systems designed to meet all requirements of the Scope of Supply. (Total Proposal Price from Proposal Form).	$

2	**Annual Electric Power Consumption (2019 – 2039)** Power requirements of all equipment supplied under this contract will be included in the electric power consumption calculation.

		MWh/year
2.1	Annual Power Consumption Guaranteed not to exceed annual power consumption expressed in MWh. To be calculated based on a minimum UV dose required, UV transmittance of 35 percent, 0.70 safety factor, and daily average flows of 19 ML.	
		Total $/Year
2.2	Annual Cost for Electricity (ACE) Annual Power Consumption multiplied by the power cost. The cost for electrical power per year at an operational flow of 19 ML/d is: (use power cost of $80/MWh).	

		Units	Value
3			
3.1	Number of Lamps in Service (LS) Calculate the number of lamps at a flow rate of 40 ML/d, UVT of 35% , and a safety factor of 70 percent.	#	
3.2	Guaranteed Lamp Life (GLL) Expressed in hours for the conditions in 3.1	H	

		Units	Value
3.3	Number of Lamps Replaced per Year (LPY) LS (Item 3.1) divided by GLL (Item 3.2) multiplied by an average of 11.4 operating hours per day (19 ML divided by 40 ML/d).	#	
3.4	Lamp Material Cost (LMC) Guaranteed not-to-exceed replacement cost for one UV lamp, expressed in dollars.	$	
3.5	Annual lamp replacement costs LPY (Item 3.3) multiplied by LMC (Item 3.4)	$/a	
3.6	Total number of ballasts/transformers in the system (BS)	#	
3.7	Guaranteed replacement cost per ballast/transformer Expressed in dollars (BRC).	$	
3.8	Guaranteed Ballast/Transformer Life (GBL) Expressed in years.	Years	
3.9	Annual ballast/transformer replacement costs BS (Item 3.6) multiplied by BRC (Item 3.7) divided by GBL (Item 3.8)	$/a	
3.10	Total number of quartz sleeves in the system (QS)	#	
3.11	Guaranteed replacement cost per quartz sleeve Expressed in dollars (QRC)	$	
3.12	Guaranteed Quartz Sleeve Life (GQSL) Expressed in years.	Years	
3.13	Annual sleeve replacement costs QS (Item 3.10) multiplied by QRC (Item 3.11) divided by GQSL (Item 3.12).	$/a	
3.14	Total number of UV intensity sensors in the system (SS).	#	
3.15	Guaranteed replacement cost per UV intensity sensor Expressed in dollars (SRC).	$	
3.16	Guaranteed Sensor Life (GSL) Expressed in years.	Years	
3.17 (Total across sites)	Annual sensor replacement costs SS (Item 3.14) multiplied by SRC (Item 3.15) divided by GSL (Item 3.16).	$/a	

		Units	Value
3.18	Sensor recalibration cost, if required, including return freight to District of Mission (SCC).	$	
3.19	Estimated sensor recalibration interval (SC) Expressed in months.	Months	
3.20	Annual sensor recalibration costs SS (Item 3.14) multiplied by SCC (Item 3.18) divided by SC (Item 3.19) multiplied by 12.	$/a	
3.21	Estimated annual maintenance cost of other system components (e.g. UVT analysers, cleaning chemical systems, etc.). List these components.	$/a	
3.22	Total Annual Maintenance Cost (TAMC) Sum of items 3.5, 3.9, 3.13, 3.17, 3.20, and 3.21 listed above.	$/a	

		Amount
4		
4.1	Total Capital Costs (Item 1 above).	$
4.2	Present Value of Electricity Costs Multiply ACE (Item 2.2) by 13.07.	$
4.3	Present Value of Total Annual Maintenance Costs Multiply TAMC (Item 3.22) by 13.07.	$
4.4	Present Value System Cost Sum of 4.1, 4.2, and 4.3 above.	$

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Sections of Division 26.

1.2 CODES AND STANDARDS

.1 Except where specified otherwise, do complete installation in accordance with CSA C22.1 Part I and as amended for use in the Province of British Columbia, henceforth alternatively referred to as the Rules and Regulations.

.2 Do overhead and underground systems in accordance with CSA C22.3, No.1 and CSA C22.3 No. 7, except where specified otherwise.

.3 Abbreviations for electrical terms: to CSA Z85.

.4 In addition to the above, the requirements related to electrical installations that are not governed by the Rules and Regulations but are required by the BC Building Code, BC Hydro, Telus, and WorkSafe BC, shall be met.

1.3 CARE, OPERATION AND START-UP

.1 Refer to Division 1 for Pre-start-up, Start-up and Commissioning requirements.

.2 Instruct operating personnel in the operation, care and maintenance of equipment.

.3 Arrange and pay for services of manufacturer's qualified field service representative (FSR) to supervise start-up of installation, check, adjust, balance and calibrate components.

.4 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

.5 Submit a service and commissioning report, by the FSR, for each applicable piece of equipment or system.

1.4 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235.

.2 Electric equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 PERMITS, FEES AND INSPECTION

.1 Submit to Technical Safety BC and Supply Authority the necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Upon request of Contractor, Engineer will provide drawings and specifications to Contractor, as required by Technical Safety BC and Supply Authority at no cost.

.4 Notify Engineer of changes required by Technical Safety BC prior to making changes.

.5 Furnish Certificates of Acceptance from Technical Safety BC and authorities having jurisdiction on completion of work. The Contractor's Declaration of Completion, countersigned by the Electrical Inspector will be accepted as the Final Certificate.

.6 Pay all fees and charges for FSR for testing, start-up, and commissioning of equipment.

1.6 MATERIALS AND EQUIPMENT

.1 Equipment and material to be of manufacturer's current design and to be certified by CSA or an equivalent certification agency as identified in the Rules and Regulations. Where there is no alternative to supplying equipment which is thus certified, obtain special approval from Technical Safety BC.

.2 Factory assemble control panels and component assemblies.

.3 Listing of a company as an acceptable manufacturer or supplier of equipment and materials is conditional to compliance with the specified requirements.

.4 Uniformity of equipment: Materials and equipment of similar or identical nature shall be of same manufacture and type.

.5 Upgrades to existing equipment: materials and equipment required for modifications to existing electrical equipment to be supplied and installed by the manufacturer's service group.

1.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish air dry enamel.

.1 Paint outdoor electrical equipment "dark transformer green" finish to EEMAC Y1-2.

.2 Paint indoor switchgear and distribution enclosures and outdoor junction boxes light grey air dry enamel to EEMAC 2Y-1.

.2 If acceptable to Engineer, clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

.4 If acceptable to Engineer, apply Galvacon touch-up paint to damaged portions of galvanized threads and surfaces.

1.8 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment, instruments, control devices and mechanical equipment which have an electrical component with nameplates and labels as follows.

.2 Nameplates:

.1 Lamacoid 2-ply, 3 mm thick plastic engraving sheet, white face, black backing, attached with foam-tape 3M Scotch-Mount No. 4032 adhesive backing where used in controlled environment indoor areas and with self tapping screws (rivetting not acceptable) where used outdoors or in wet, damp or contaminated indoor areas. Epoxy glued where integrity of enclosure would be impeded by screwholes.

NAMEPLATE SIZES

Size 1	13 x 50 mm	1 line	4 mm high letters
Size 2	13 x 70 mm	1 line	4 mm high letters
Size 3	20 x 50 mm	2 lines	4 mm high letters
Size 4	20 x 70 mm	2 lines	4 mm high letters
Size 5	27 x 70 mm	3 lines	4 mm high letters
Size 6	27 x 90 mm	4 lines	3 mm high letters
Size 7	70 x 150 mm	as required	min. 10 mm high letters

.3 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise, for use inside cabinets and panels only.

.4 Nameplates shall include the device, loop number, and the description from the single line diagrams and schematics as typically shown below.

P-101
WATER PUMP #1

SF-250
CHEMICAL ROOM
SUPPLY FAN

.5 Nameplate sizes shall be verified as being adequate before they are fabricated.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

1.9 CONDUIT AND CABLE IDENTIFICATION

.1 Identify conduits and cables which are numbered on the drawings or schedules using the alpha-numeric tag number as shown. Attach a tag at each point of termination or connection.

.2 Identify conduits and cables installed in non-hazardous or non-corrosive indoor areas or within enclosures with white nylon marker plates, Panduit #MP xxx-C, fastened with locking-type black nylon ties. Use intermediate grade ties, Panduit #PLT xxI-CO. If tie also serves as cable strap, use heavier grade tie.

.3 Identify conduits and cables installed outdoors or in hazardous or corrosive areas with stainless steel, embossed metal marker plate, Panduit #MMP, fastened with stainless steel, Panduit #MLT PANSTEEL ties. Use #304 or #316 stainless steel as appropriate.

.4 Identify conduits and cables installed in areas where they are subjected to chemical attack with stainless steel marker plates as specified above and fastened with Panduit #PLT xx - x76 Pan-Ty TEFZEL ties.

.5 Provide the required embossing and printing equipment, complete with software where applicable. Keep equipment on-site until plant commissioning is complete.

.6 Catalogue numbers specified are for the purpose of illustrating features and quality of the conduit and cable identification system. Products from other manufacturers are acceptable subject to meeting or exceeding the specified products.

1.10 WIRE IDENTIFICATION

.1 Identify control and instrument wires with permanent, indelible numbered markings on both ends of wires, i.e. at all points of terminations and splices. Characters to be no less than 2 mm high. Numbering shall not be handwritten.

.2 Unless otherwise specified or shown, wire numbers and terminal block numbers shall be the same.

.3 Maintain phase sequence and colour coding of wires throughout.

.4 Colour code wires to CSA C22.1 and as follows:

.1 Power wires: phase A-B-C from left to right or front to back, red-black-blue

.2 Neutral: white

.3 AC, control: red

.4 AC, ground: green

.5 DC + (ungrounded): yellow

.6 DC- (grounded): blue

.7 Instrument wires: shielded twisted pairs, white for higher potential, black for lower potential, grey overall jacket.

.8 Taping for the purpose of colour coding will not be accepted for conductors less than #2 AWG.

1.11 CONDUCTOR TERMINATIONS

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

1.12 MANUFACTURERS AND APPROVAL LABELS

.1 Visible and legible after equipment is installed.

1.13 WARNING SIGNS

.1 As specified and to meet requirements of BC Electrical Safety Authority and Engineer.

.2 Decal signs, minimum size 175 x 250 mm.

1.14 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete, unless otherwise shown: Schedule 40 PVC, sized for free passage of conduit and cable, and protruding 50 mm.

.2 Install cables, conduits, and fittings to be plastered over, neatly and close to building structure so furring can be kept to minimum.

1.15 QUALITY CONTROL

.1 Test, calibrate and, unless otherwise specified, program and configure the new works to ensure that they are operating in accordance with the intent of the drawings and specifications. Any clarification required as to the intent of the drawings and specifications must be obtained prior to bid closing.

.2 Supply all necessary instruments, meters, equipment and qualified personnel to perform tests and calibrations.

.3 Furnish manufacturer's certificate or letter confirming that entire installation, as it pertains to each system, has been installed to manufacturer's instructions.

.4 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument; use a 1000 V instrument for system voltages above 350 V. Note: Disconnect cables connected to instruments, controllers and similar devices.

.2 Check resistance to ground before energizing.

.3 Carry out tests in presence of Engineer.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project. Instruments should be calibrated within the last 12 months.

.5 Submit test results for Engineer's review.

.5 Check electrical equipment and motor nameplates to ensure that the breakers, fuses, overload heaters and conductors are sized in accordance with the Rules and Regulations.

.6 Ensure that circuit protective devices such as overcurrent trips, relays, fuses, and the like, are set to required values.

.7 Provide Engineer with list of test results including, but not limited to, the following:

.1 Nameplate full load current of each motor.
.2 Measured operating current of each motor.
.3 Cat. No. and current range of installed O/L heater or settings, as applicable.
.4 Setting of circuit breakers.
.5 Settings of all protective relays.
.6 Thermostat settings.
.7 Calibration calculations.
.8 Analog and control setpoints.
.9 Parameter setting record sheets for devices and equipment which need programming, e.g. UV control panel, chlorination control, and the like.
.10 All other relevant and similar data.

.8 Submit a completed Motor Data Sheet as shown appended to this Section.

1.16 GUARDING

.1 Guard exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.

1.17 PROTECTION

.1 Protect equipment and material from the weather, moisture, dust and physical damage.

.2 Cover equipment openings and open ends of conduit piping and pullboxes as work progresses. Failure to do so will result in the Contractor being required to adequately clean or replace materials and equipment at no extra cost to the Owner.

.3 Refinish damaged or marred factory finish to as-new condition.

.4 Protect all existing services encountered. Obtain instructions from the Engineer when existing services require relocation or modification, further to that defined in these contract documents.

1.18 CLEANING

.1 Do final cleaning in accordance with Section 01 74 23 – Final Cleaning.

1.19 WORKMANSHIP

.1 Workmanship shall be in accordance with well established practice and standards accepted by Engineer.

.2 The Engineer has the right to reject any item of work that does not conform to the contract documents and accepted standards of performance, quietness of operations, finish and appearance.

1.20 DRAWINGS AND MEASUREMENTS

.1 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of the work. Do not scale the drawings.

.2 Take field measurements where equipment and material dimensions are dependent upon buildings.

.3 Ensure adequate clearance in front of all electrical panels and equipment.

.4 Ensure that all suppliers of equipment and material have sufficient information to determine that their equipment and material is suitable for the intended use shown in these documents.

1.21 EXAMINATION

.1 Locations shown on the Drawings must be verified and the responsibility for any error resulting from failure to exercise such precaution shall be the responsibility of this Contractor.

.2 Examine the documents for details of work included. Obtain written clarification from the Engineer, in the event of conflict within the Specification, between the Specification and Drawings, or in the Drawings. Obtain written clarification from the Engineer if work affecting the installation is not clear.

1.22 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data as specified.

.2 Shop drawings depicting schematic and single line diagrams, connection diagrams, panel layouts, and the like must be prepared by electronic drafting means.

.3 Include information for the following:

.1 Electrical distribution equipment, such as panelboards.

.2 Lighting equipment including ballasts and applicable photometrics with coefficient of utilization tables.

.3 Instrumentation equipment.

.4 Information for the above listed items to include, but not be limited to, wiring diagrams, bills of materials, dimensional data and operating descriptions. Catalogue sheets may be submitted as shop drawings provided they are for actual piece of equipment supplied; literature which covers an entire family of equipment is only acceptable if the equipment proposed is clearly highlighted.

1.23 INSTALLATION INSTRUCTIONS

.1 Obtain the manufacturer's instructions necessary for the correct installation, calibration and adjustment for all equipment well in advance of commencement of shop and site work.

1.24 RECORD DRAWINGS

.1 Contractor to provide project record documents.

.2 Record drawings and information is to include but is not limited to the following:

.1 Field Instrument Manufacturer calibration certification sheets.

.2 Shop drawings, revised to as constructed status; refer also to another clause in this Section entitled Shop Drawings.

.3 Design drawings, revised to as constructed status.

.4 Instrument and calibration record forms.

.5 Data sheets with listing of programming and configuration variables of such equipment as Transmitters, Metering Systems, and the like.

1.25 OPERATIONS AND MAINTENANCE MANUAL

.1 Provide operation and maintenance data for incorporation into Operation and Maintenance Manual.

.2 The data must include all information listed under another item of this Section entitled Shop Drawings and Product Data, supplemented by illustrated parts lists, catalogue numbers and detailed instructions to permit effective operation, maintenance and repair of the equipment.

.3 Include data for each type and style of device.

.4 For each manual, provide 1 print of each shop drawing, revised to as-built status, including all final settings and sizes of circuit breakers, fuses, relays, and the like.

.5 Information must be for actual piece of equipment supplied; literature which covers an entire family of equipment is only acceptable if the equipment in use is clearly highlighted.

1.26 TERMINOLOGY

.1 Unless further qualified, the following definitions apply:

.1 Wiring - refers to any or all of conduits, cables, wires, conductors and associated fittings and hardware.

.2 Conductor - refers to the current carrying portion of an insulated or non-insulated wire.

.3 Wire - refers to a single, insulated conductor.

.4 Cable - refers to an assembly of a single or multiple wires with shield, jacket, sheath or armour.

.5 Field wiring - refers to wiring outside a control panel or kiosk.

.2 Wherever the term 'duct' appears, it applies equally to conduit.

Part 2 Products

Not Used

Part 3 Execution

Not Used

END OF SECTION

Part 1 General

1.1 REQUIREMENTS

.1 This section is a general specification for the supply and installation of the electrical systems and components, as identified here-in.

.2 The scope of the work for this project is identified in Division 01.

.3 Not all systems and components identified in this specification section are required for this project.

.4 Components and systems identified is this section that are required to complete the scope of the work, or are incidental to complete the scope of work, or is required by other specification sections, shall be supplied and installed in accordance with the relevant parts of this section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with the requirements of Division 1 and Section 26 05 02 – Electrical: General Requirements.

1.3 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for inclusion into manual specified in Section 26 05 02 – Electrical: General Requirements and Division 01.

Part 2 Products

2.1 WIREWAYS

.1 Sheet steel with hinged cover to give uninterrupted access, non-metallic (polyester or fibreglass) in outdoor and corrosive environments.

.2 Cross section dimensions: minimum 50 x 50 mm.

.3 Finish: baked grey enamel for metallic enclosures.

.4 Elbows, tees, couplings and hanger fittings manufactured as accessories to wireway supplied.

2.2 ETHERNET AND FIBRE OPTIC CABLING

.1 All Ethernet cabling must be CAT6 or better. Ethernet network to comply with EIA/TIA-568.

2.3 TECK CABLES AND CONNECTORS

.1 Compliance: CSA C22.2, No. 03 and No. 131.

.2 CSA Type TECK.

.3 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as specified.

.4 Insulation:

.1 Chemically cross-linked thermosetting polyethylene rated type RW90.

.2 600 V insulation for circuits up to nominal 240 VAC.

.3 1000 V insulation for circuits above 240 VAC.

.5 Inner jacket: thermosetting polyvinyl chloride material.

.6 Armour: interlocking aluminum.

.7 Overall covering: polyvinyl chloride material, rated -40°C and meeting low gas emission and FT4 flame test requirements set forth in CSA C22.2, No. 03.

.8 Fastenings and Supports:

.1 Refer to another clause in this specification, entitled Conduit Fastenings.

.2 6 mm dia threaded rods to support suspended channels.

.3 Except as otherwise noted, cable ties are only to be used with the approval of the Contract Administrator, and shall meet the requirements specified in Section 26 05 02S – Electrical: General Requirements.

.9 Connectors:

.1 Watertight, approved for TECK cable; dry-type not accepted.

.2 Approved for hazardous location where applicable.

.3 Acceptable products: Thomas and Betts "STAR TECK" series.

2.4 FLEXIBLE CABLES

.1 Compliance: CSA C22.2, No. 49.

.2 CSA Type SOW, size and number of conductors as shown.

.3 Other flexible cable as factory-supplied with equipment.

2.5 SHIELDED CABLES

.1 Compliance CSA C22.2 No. 239.

.2 CSA Type CIC (unarmoured) for installation into conduit.

.3 CSA Type ACIC (armoured) for surface or direct buried installation, or installation into non-magnetic conduit.

.4 Common features:

.1 Single or multiple twisted pair #16 AWG copper conductors, number as specified.

.2 300 V insulation, except 600 V insulation where required by the Rules and Regulations for installation on common raceway (tray) with other 600 V circuits.

.3 Shield with drain wire for each pair and overall shield with drain wire for multiple pair cables.

.4 PVC outer jacket, 90°C and -40°C, FT-4 rated.

.5 Acceptable products, in alphabetical order:

.1 for CSA Type CIC (unarmoured)
- Belden Series 224XX
- Nexans Series 900 000
- Shawflex Series 6B021M16XX

.2 For CSA Type ACIC (armoured)
- Belden Series 245XX (aluminum armour)
- Nexans Series 910 000 (aluminum armour)
- Shawflex Series 6B222M16XX (aluminum armour)

.3 The above product numbers are for 300 V-rated cables; adjust as required for 600 V-rated cables.

.6 Factory-supplied shielded cables where forming part of an instrument assembly.

2.6 INSTRUMENTATION WIRING

.1 Instrumentation and control wiring external of cabinets shall be as minimum:

.1 For control, no smaller than #14 AWG stranded copper or as indicated in drawings.

.2 For instrumentation, #16 AWG stranded copper or as indicated in drawings. All instrumentation wiring pairs shall be individually shielded.

.2 Control wires which terminate to a screw stud which are not equipped with terminal saddles shall be made using fork lugs that are insulated and locking.

.3 Wiring shall be free from abrasion and tool marks and shall have a minimum bending radius of 1¼ inch.

.4 Unsupported wiring on panels will not be permitted. Control wire and cable shall be formed in accordance with good wiring practices. Where cable bundles must be carried across hinges to devices mounted on doors, each cable or wire bundle shall be looped and carried between a clamp on the door and one on the fixed portion of the cabinet in such a manner that torsion and flexure in the loop shall be minimized. The cables shall be protected against abrasion with "spiral" or "snakeskin" protection material.

.5 Wiring between terminals of various devices shall be "point-to-point" (no splicing or tee connections of wire will be permitted), with wires neatly tucked along the back of the

panels. Adequate support shall be provided to prevent sagging or damage from vibration in transit and operation.

.6 All wire shields / drain wires shall be grounded on the PLC side of the cable. Instrument side to be ground isolated.

.7 Refer to the Control Block drawing.

.8 Conductor color coding as follows:

.1 120 VAC line: Black.
.2 120 VAC neutral: White.
.3 120V control: Red.
.4 Ground: Green.
.5 24 VDC +: Yellow
.6 24 VDC Control: Yellow
.7 24 VDC -: Blue
.8 Input: Yellow.
.9 Output: Orange.
.10 Shielded twisted pairs: Black is positive; White or Clear is negative.

2.7 JUNCTION, PULL AND TERMINAL BOXES

.1 To CSA C22.2, No. 40.

.2 Welded steel or aluminum construction with screw-on flat covers for surface mounting in dry indoor areas.

.3 Non-metallic, PVC, fibreglass, polyester or similar materials, with screw-on covers for outdoor, wet and corrosive areas, such as chemical room and as shown on the drawings.

.4 Aluminum EEMAC Type 4 construction for larger size boxes used for outdoor surface mounting. Provide a breather fitting where box serves as a protective enclosure for other enclosed equipment.

.5 Copper free aluminum in areas classified as hazardous.

.6 Complete with terminal block kit assembly, where applicable.

.7 Provide appropriate terminations and identification in control terminal boxes (CTB) and instrument terminal boxes (ITB).

2.8 OUTLET AND CONDUIT BOXES GENERAL

.1 Compliance: CSA C22.2, No. 18.

.2 Size boxes in accordance with CSA C22.1.

.3 102 mm square or larger outlet boxes as required for special devices.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where more than one system is present.

.6 Boxes suitable for area classification shown or specified and where available or noted, made of same material or to have same finish as connecting conduit.

.7 Gang boxes where wiring devices are grouped.

.8 Cast FS or FD copper-free aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle. Pressed sheet steel boxes and sectional boxes not acceptable for surface-mounted devices.

.9 Surface-type FS or FD style fibreglass or PVC boxes with hubs and mounting feet for corrosive and wet locations, such as chemical room.

2.9 FITTINGS

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of foreign materials.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes or enclosures.

2.10 SUPPORT CHANNELS

.1 C-shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

.2 Steel for dry indoor location, fibreglass for outdoor and wet and corrosive locations.

.3 Acceptable products: for fibreglass, Champion, available from Milham Industries, Delta, B.C.

2.11 SPLITTERS

.1 Compliance: CAN/CSA C22.2 - No. 76.

.2 Sheet metal enclosure, welded corner and formed hinged gasketed cover suitable for locking in closed position.

.3 Main and branch lugs or connection bars to match required size and number of connecting conductors as indicated.

.4 At least three spare terminals on each set of lugs in splitters.

2.12 MOULDED CASE CIRCUIT BREAKERS

.1 Common-trip breakers: quick-make, quick-break type with single handle for multi-pole applications.

.2 Temperature compensation for 40°C ambient. Thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for overload and short circuit protection.

.3 Handle with door interlock, complete with interlock defeater mechanism.

.4 On-off locking device for operating handle.

.5 EEMAC Type 12 enclosure.

2.13 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, premium specification-grade, with following features:

.1 Urea moulded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Break-off links for use as split receptacles.
.4 Eight back wired entrances, four side wiring screws.
.5 Double wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground, premium specification-grade, with following features:

.1 Urea moulded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Four back wired entrances, 2 side wiring screws.

.3 Twistlock receptacles, specification grade, CSA type L5-15 R, 125 V, 15 A.

.4 Other receptacles with ampacity and voltage as indicated.

.5 Except as otherwise specified, ivory or brown coloured bodies for light or dark surrounding wall surfaces respectively.

.6 For wet and corrosive locations, such as chemical room, yellow melamine body Hubbell 52CM61/62.

2.14 WIRING DEVICE COVER PLATES

.1 Cover plates for wiring devices from one manufacturer throughout project.

.2 Brushed stainless steel coverplates for recessed locations.

.3 Sheet metal cover plates with rounded edges for wiring devices mounted in surface-mounted metal boxes.

.4 Lever-type Ipex/Sceptre, Type VSC 15/10, switchplates for weatherproof, wet or corrosive locations.

.5 PVC coverplates for PVC boxes.

.6 Cast aluminum with double lids "cover open" type, Hubbell Series 520*WO, receptacle plates for weatherproof, wet or corrosive locations.

.7 Provide multi gang cover plates on multi gang boxes.

2.15 CONNECTORS

.1 Pressure type wire connectors: with current carrying parts sized to fit copper/ aluminum conductors.

.2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for armoured cable, flexible conduit, as required.

2.16 GROUNDING

.1 Unless specifically differentiated, the terms "grounding" applies equally to the system grounding and equipment bonding requirements.

.2 Clamps for connection of conductor, size as required to electrically conductive underground water pipe or ground electrode.

.3 Rod electrodes, copper clad steel 19 mm dia by 3 m long.

.4 Grounding conductors, bare and insulated stranded copper, size as indicated.

.5 Equipment bonding conductors, bare and insulated stranded soft annealed copper size as indicated or as required by the Rules and Regulations.

.6 Insulated grounding conductors: green, insulation to match circuit conductors.

.7 Non-corroding accessories necessary for grounding system, type, size, material as required, including but not necessarily limited to:

.1 Grounding and bonding bushings.
.2 Protective type clamps.
.3 Compression type conductor to conductor connectors.
.4 Exothermic welded type conductor connectors.
.5 Bonding jumpers, straps.
.6 Pressure type conductor to equipment connectors.
.7 Ground electrode box, Thomas & Betts #51629 or Slocan #22109.

.8 All grounding connections should be cleaned of oxidation prior to connection, and protected against corrosion by corrosion inhibiting compound, such as De-ox or approved similar.

Part 3 Execution

3.1 WIRING

.1 Wiring to be surface-installed, except where it services equipment located away from walls in which case wiring shall be installed in or below slabs, as indicated on the drawings.

.2 Where wiring is subject to mechanical injury, provide additional mechanical protection.

.3 Unless otherwise specified, do not install wiring on exterior building surfaces; instead, run conduit on inside wall and enter boxes and equipment from the back.

.4 Unless otherwise specified, minimum conductor size is #12 AWG, except for control and instrumentation wiring which may be done with #14 AWG and #18 AWG respectively.

.5 Line voltage wiring for the HVAC system shall be done to the same standards as specified in this Section. Low voltage wiring method must provide protection against physical damage.

.6 Run surface wiring parallel or perpendicular to building lines; where applicable, run wiring in flanged portion of structural steel. Wherever possible, group wiring on profile channels. Do not pass wiring through structural members except as indicated.

.7 Install wiring to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.8 Use rigid PVC conduit or Teck cable, except where specified otherwise. If metallic conduit is required use rigid aluminum.

.9 Use liquid tight flexible metal conduit or Type SOW cable, as permitted by the Rules and Regulations, for connection to motors and other devices requiring flexible connection. Maximum length 450 mm.

.10 Where permitted by the Rules and Regulations, Teck and Teck-style cable may be used in lieu of liquid-tight conduit for motors, control and instrumentation wiring respectively.

.11 In corrosive areas, and as permitted by the Rules and Regulations, liquid-tight conduit shall be non-metallic.

.12 Use DB2 conduit, rigid PVC conduit, or a combination thereof for wiring buried below grade or in wet and damp areas.

.13 CSA Type AC cable ("BX" cable) is not acceptable.

.14 Install plastic warning tape over underground wiring, placed 300 mm below finished grade. Minimum burial depth of conduit is 900 mm or as shown.

.15 Place U/G wiring in a sand envelope of not less than 100 mm.

.16 Slightly snake direct-buried U/G cable when laying into trench, to allow for some take-up during settlement of ground.

.17 Except as otherwise shown, maintain a separation of not less than 300 mm between analog instrumentation and power wiring where they run parallel to each other.

.18 Bend metal conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.19 Mechanically bend metal conduit over 19 mm diameter.

.20 Sleeves through concrete: Schedule 40 plastic pipe, sized for free passage of conduit or cable, and protruding 50 mm. After installation of conduit or cable, seal voids with approved compounds such as Duxseal or expandable foam material. Seal larger-sized openings, provided for passage of cables from one area to another, in a similar fashion. Seal all openings around wiring entering or leaving the wet well and building.

.21 Where it is essential that the integrity of a room or space is preserved, seal voids around sleeves, cables and conduits with fire-rated material approved for that purpose.

.22 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.23 U/G conduit joints for PVC conduits to be done with solvent cement; push-fit couplings not acceptable unless conduit is concrete encased.

.24 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.

.25 Dry conduits out before installing wire.

.26 Install pullstring in empty conduit.

.27 Use non-metallic boxes, fittings and straps in wet, damp and corrosive environments.

.28 Unless otherwise specified, terminate conduit sleeves and spare conduits in an coupling or end bell.

3.2 FIRE RATED SEALS

.1 After installation of cables and conduits, seal voids around cables and conduits with an approved re-enterable fire stop compound, full thickness of the construction material. Trim any excess material to obtain a neat appearance; do not damage outer jacket of armoured cable. Strictly follow the fire stop manufacturer’s instructions.

3.3 WIREWAYS

.1 Wireways and auxiliary gutters may be used to facilitate multiple conduit or cable entries into an enclosure.

.2 Keep number of elbows, offsets, connections to minimum.

.3 Install supports, elbows, tees, connectors, fittings.

.4 Install barriers where required.

.5 Install gutter to full length of equipment.

3.4 SHIELDED CABLES

.1 Unless cable has its own magnetic armour, install shielded cables for instrumentation wiring into magnetic, i.e. steel, conduit.

.2 Ground cable shield.

.3 Maintain a separation of not less than 300 mm between analog instrumentation and power wiring where they run parallel to each other.

3.5 JUNCTION AND PULL BOXES

.1 Install pull boxes in accessible locations.

.2 Only main junction boxes are indicated. Install pull boxes as required.

3.6 CONDUIT AND OUTLET BOXES

.1 Use FS-style boxes for surface installations; sheet steel utility boxes not acceptable.

.2 Use non-metallic boxes in wet, damp or corrosive areas.

.3 Support boxes independently of connecting conduits and cables.

.4 Provide correct size of openings in boxes for conduit and cable connections. Reducing washers not allowed.

3.7 WIRING DEVICES

.1 Install wiring devices as indicated.

.2 Do not use coverplates meant for flush outlet boxes on surface-mounted boxes.

3.8 CONNECTORS

.1 Remove insulation carefully from ends of conductors.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2, No. 65.

.3 Install fixture type connectors and tighten. Replace insulating cap.

3.9 FASTENING AND SUPPORTS

.1 Secure equipment to metal members by clamping or by drilling and tapping. Welding will not be acceptable.

.2 Secure equipment to poured concrete with non-corroding expandable inserts.

.3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members. In outdoor or corrosive areas use non-metallic, stainless steel or brass materials and brass or stainless steel screws and bolts.

.4 Fasten exposed conduit or cables to structures or support system using PVC straps or other non-metallic straps. Straps exposed to daylight must be of ultra-violet stabilized materials.

.5 Suspended support systems:

.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 3 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.6 For surface mounting of 3 or more conduits or cables use channels at spacing in accordance with the Rules and Regulations.

.7 Provide brackets, frames, hangers, clamps and related types of support structures as required to support conduit and cable runs.

.8 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.9 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.10 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.

.11 Install fastenings and supports as required for each type of equipment, cables and conduits, and in accordance with manufacturer's installation recommendations.

3.10 GROUNDING SYSTEM

.1 Install complete system grounding and equipment bonding systems including number of electrodes, conductors, connectors and accessories to conform to requirements of Contract Administrator, and local authority having jurisdiction over installation.

.2 Install a grounding conductor in each conduit run unless otherwise indicated.

.3 Install connectors in accordance with manufacturer's instructions.

.4 Protect exposed grounding conductors from mechanical injury.

.5 Make buried connections to electrodes using copper welding by exothermic process or high pressure compression connectors. Bolt-type connectors are not acceptable.

.6 Install an electrode box, placed flush with finished grade, high pressure compression connectors. Bolt-type connectors are not acceptable for access to top of ground rods.

.7 Use mechanical connectors for grounding connections to equipment provided with lugs.

.8 Use Penetrox "E" joint compound on all connections.

.9 Soldered joints not permitted.

3.11 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 02 – Electrical: General Requirements.

.2 Identify each phase conductor of feeders and check phase rotation for 3-phase systems.

.3 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

.4 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Contract Administrator, to ensure compliance with the Canadian Electrical Code, but not to be less than 5 ohms. The test to include the complete grounding system.

.5 Provide Contract Administrator with list of test results.

.6 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 REQUIREMENTS

.1 This section specifies the supply and installation and, unless specified otherwise, the configuration, calibration and verification of instrumentation and control devices for this project.

1.2 REFERENCES AND STANDARDS

.1 For control equipment, conform to CSA Standard C22.2, No. 14 - Industrial Control Equipment.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Refer Section 26 05 02 - Electrical: General Requirements.

1.4 EQUIPMENT IDENTIFICATION

.1 Identify instruments with nameplates and labels as specified in Section 26 05 02 - Electrical: General Requirements.

1.5 QUALITY CONTROL

.1 Refer to Section 26 05 02 - Electrical: General Requirements.

.2 Instruments shall be pre-calibrated by manufacturer or supplier whenever possible. When pre-calibration is not possible or re-calibration is required, conduct instrument calibration.

.3 Verification of each instrument's calibration or pre-calibration shall be completed prior to its installation.

.4 Confirm instrument selection with manufacturer. In particular, confirm materials selection for process conditions (fluid type, temperature, pressure) and instrument sizing (device span, valve sizing, actuator sizing).

1.6 OPERATION AND MAINTENANCE MANUAL

.1 Refer to the requirements of Division 1 and Section 26 05 02 - Electrical: General Requirements.

1.7 RECORD DRAWINGS

.1 Refer to the requirements of Division 1 and Section 26 05 02 - Electrical: General Requirements.

.2 Provide calibration certification of all pre-calibrated instruments. Annotate such certificates with the instrument tag number.

.3 Provide calibration documentation for all instruments which require calibration.

.4 Provide verification testing documentation for all instruments.

.5 Organize all instrumentation field device pre-calibration, calibration and verification documentation on a per-device basis and provide in a single binder.

Part 2 Products

2.1 EQUIPMENT COMPONENTS

.1 Transmitters shall have adequate power output to drive all devices associated with the signal loop. Provide signal boosters as required to achieve adequate signal strength.

.2 All transmitters are to include a lamacoid label indicating the tag ID and description. The transmitter is to be mounted such that this label is visible from the normal operating floor position.

.3 Equipment tag numbers and quantities listed are for the benefit of the contractor. The contractor is responsible for ascertaining the correct quantities required.

.4 Transmitter and/or primary element enclosures (or housings) to be, as a minimum, rated NEMA Type 4; where located outdoors or in areas specified as corrosive, enclosures to meet NEMA Type 4X requirements.

.5 Transmitter flanges, adapters and associated bolts, nuts, etc. to be fabricated from 316 stainless steel.

.6 Provide all mounting brackets, cables, connectors and hardware necessary to install primary elements. Provide any and all brackets and sundry hardware to mount the transmitter on standard 50 mm pipe stands. Fabricate all brackets from aluminum or stainless steel and all sundry hardware from stainless steel. Primary elements and transmitters to be complete with all necessary liquid filling, identification, configuration, etc. as necessary to make the unit ready for use.

2.2 UV TRANSMITTANCE ANALYZERS (AIT-500, AIT-525)

.1 Vendor to supply two 4-20mA UVT analyzers with package. Output will connect directly to plant PLC for balancing calculations.

Part 3 Execution

3.1 INSTALLATION

.1 Install instrumentation as shown on drawings, readily accessible for maintenance and adjustments.

.2 Install all security contacts such that a closed door or hatch provides a closed contact. Contact to open when door/hatch is opened.

END OF SECTION

Part 1 General

1.1 REQUIREMENTS

.1 This section describes the requirements for the fabrication, inspection, testing, delivery and installation of control panels and control equipment included in RFP

1.2 CONTROL SYSTEM

.1 Complete the control panel designs and wiring, fabricate the control panels, configure all elements of the control system, and test and commission the control system.

.2 Make adjustments and modifications to the systems and equipment supplied as required during shop drawing, manufacture, installation, testing, and start-up stages.

1.3 REFERENCES AND STANDARDS

.1 Design and manufacture of equipment to conform to latest editions of applicable CSA and NEMA standards.

1.4 PROGRAMMING AND CONFIGURATION

.1 All instruments, switches, routers, PLCs, HMIs, valves, and other included package equipment to be programmed by vendor.

1.5 PRODUCT DATA

.1 Include details of control and instrumentation equipment.

1.6 SHOP DRAWINGS

.1 Submit shop drawings for approval prior to fabrication of control panel in accordance with Section 26 05 02 – Electrical: General Requirements.

.2 Indicate:

- .1 Outline dimensions of panels.
- .2 Scaled door and interior layouts of panels.
- .3 Power and control schematic wiring diagrams, complete with trip ranges and settings of circuit breakers, fuses, relays, as applicable.
- .4 Cable entry and exit locations.
- .5 Bill of materials with identification of each device by make and complete model number.

1.7 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for control panel and its contents for incorporation into manual as specified in Section 26 05 02 – Electrical: General Requirements.

1.8 RECORD DRAWINGS

.1 Provide record drawings in accordance with Section 26 05 02 – Electrical: General Requirements.

1.9 MAINTENANCE MATERIALS

.1 Provide maintenance materials.

.2 For each panel, provide:

.1 Three (3) power fuses of each type in use.

.2 Five (5) control fuses of each type in use.

.3 Two (2) pilot lamps of each type in use, including a lamp-removing tool if necessary.

.4 One (1) control relay of each type in use.

.5 Touch-up paint, one (1) 750-mL aerosol can.

.6 Any other additional components which the Contractor recommends to be kept as spares.

.3 Supply these maintenance materials in their original packages, clearly showing the manufacturers and catalogue or part numbers.

Part 2 Products

2.1 SUPPLY CHARACTERISTICS

.1 CP-100: 120 VAC, 60 Hz.

2.2 GENERAL DESCRIPTION

.1 NEMA Type 12 enclosure, formed and welded from minimum 1.9 mm (14 gauge) sheet steel, suitable for wall or floor mounting as shown on drawings.

.2 Panel door with formed edges and 3-point automotive handle, snap-latch or twist-latch closures and pocket for schematic drawings. Hinged as shown on the drawings.

.3 Removable equipment mounting pan made from minimum 2.6 mm (12 gauge) steel.

.4 Exterior finish light grey, interior white.

.5 Size control panel generously, but not less than the dimensions shown on the drawings, to allow for future additional equipment. As a minimum allow for the future addition of:

.1 4 control or timer relays.

.2 20 terminal blocks.

.6 Utilize plastic wiring ducts such as Panduit for organization of all interior and field wiring. Ducts are to be filled to no more than 50% of capacity.

.7 A space of no less than 300 mm must be kept clear across the top or bottom of the panel for field wiring.

.8 Provide terminal block assemblies and wiring ducts for DC instrument signal wiring separate from 120 VAC control terminal blocks and wiring.

.9 Provide buss bars for grounding connection as shown on drawings.

.10 Acceptable manufacturers, in alphabetical order: Hammond, Hoffman, or equivalent.

.11 The control panel will be powered by a 120 VAC circuit as follows:

.1 The power feed circuit will be connected to terminal blocks and then directly feed a control panel right side panel mounted external duplex receptacle. UPS will be mounted on the right side of the control panel and be seismically restrained.

.1 The external UPS will plug into this receptacle for power.

.2 The UPS will then feed UPS power to the control panel through a flexible cable with a plugged into one of the UPS output receptacles.

.3 The other end of the UPS power cable will connect directly to control panel terminal blocks which will then power the control panel equipment and I/O.

.4 The initial non-UPS feed into the panel, which powers the UPS, will be monitored by a relay whose contact will be monitored by the PLC. Normally when power is available, the relay contact will be closed. When power feeding the control panel fails, the relay will de-energize and open the contact that is monitored by the PLC to indicate a power failure and that the controls are now operating on UPS power.

.2 In case the UPS fails, configure the cable feeding the UPS power to the control panel so that it can be unplugged from the UPS and plugged into the control panel external receptacle thus bypassing the UPS and feeding the control panel controls with non-UPS power.

2.3 GROUNDING

.1 Copper buss size 25 x 6 mm minimum 150 mm long, located at bottom and bonded to metal cabinet. Drilled and tapped for lugs as required by the Rules and Regulations for each incoming and outgoing feeds; identified as "Panel Ground".

2.4 24 VDC POWER SUPPLIES

.1 Short circuit protected.

.2 5A, 24 VDC output.

.3 Acceptable manufacturer: Weidmuller or approved equivalent.

2.5 UNINTERRUPTIBLE POWER SUPPLY (UPS)

.1 Supplied loose for mounting adjacent to control panel.

.2 Batteries integral or in a close-coupled separate enclosure, as dictated by standby capacity.

.3 Ratings:

.1 Minimum 3000 VA output capacity.
.2 120 VAC, 60 Hz input/output.
.3 3% THD or less.
.4 150% overload capacity for 60 seconds.
.5 30 minutes of operation at 100% rated load.

.4 True online UPS with protection against power failures, brownouts, sags, surges, high voltage, spikes, switching transients, line noise, frequency variations and harmonic distortion.

.5 Input power supply via a flexible cord connection CSA 5-15P.

.6 Output power provided from receptacle(s), CSA 5-15R.

.7 Acceptable manufacturers

.1 Eaton 5PX Series.
.2 Eaton Powerware Series.
.3 Always-On.
.4 APC.
.5 Engineer approved alternate.

2.6 ETHERNET SWITCHES

.1 Provide and install a managed ethernet switch with a minimum of 8 RJ-45 ports.

2.7 PROGRAMMABLE LOGIC CONTROLLER

.1 Port Alberni standard control units are Schneider Electric SCADAPack 334 or 357. Any other PLC will require pre-approval from engineer.

.2 PLC, VFD, and RTU communications within the plant will be via Modbus TCP.

2.8 CONTROL RELAYS

.1 Unless otherwise noted, use plug-in relays. If contact requirements exceed 3 NO/NC contacts use fixed-type relays with field convertible contacts.

.2 Plug-in relays encapsulated type with indicating lamp across coil for relay status.

.3 All relays 3 PDT relays with 11-pin base, unless otherwise specified.

.4 Relay contacts rated minimum 230 VAC, 10 A resistive, 6 A inductive, or as required by switching duty.

.5 Coil voltage as indicated.

.6 Acceptable products in alphabetical order, include: Allen-Bradley Bull. 700-HA **-4, Omron Model MK, Potter & Brumfield Type KRP-N, Releco, Model C.

2.9 PLUG-IN SOCKETS

.1 Applicable to plug-in relays.

.2 Front-wired with binding head screw terminals.

.3 Heavy-duty industrial type.

.4 Provision for relay retaining clip or hold-down spring.

2.10 OPERATOR DEVICES

.1 Applicable to push buttons, selector switches, and pilot lights.

.2 Heavy duty, nominal 30 mm size, oiltight.

.3 Contact rating NEMA A600 (a.c.), P600 (d.c.)

.4 Selector switches:

.1 Maintained, spring return, 2, 3 or multiple position as indicated.
.2 Operator style: standard, unless otherwise indicated.
.3 Contact arrangement as indicated and to suit control requirements.

.5 Pushbuttons:

.1 Operator colour coding: red for stop, green for start, black for reset, others as selected by panel builder.

.6 Pilot lights:

.1 Push-to-test type where indicated with LED bulbs.
.2 AC type to be transformer type.
.3 Lens colours: green for running, red for stop, failure or alarm, amber or white for general status, or as indicated.

.7 Acceptable Product Families: Allen Bradley Bull.800T, Cutler-Hammer 30.5 mm heavy duty, oiltight.

2.11 WIRES

.1 Stranded copper.

.2 Insulation Type TEW, 105°C for conductors 10 AWG, and smaller, Type RW X-link, 90°C for conductors larger than 10 AWG.

.3 Instrumentation and Control wiring within cabinets shall be, as minimum #18 AWG or as indicated in drawings.

.4 Colour coding to Section 26 05 02 - Electrical: General Requirements.

2.12 SHIELDED WIRES

.1 Copper, 7-strands, XLPE insulation, rated 300 V.

.2 Minimum 18 AWG.

.3 Twisted pair with foil shield and drain wire.

.4 Overall PVC jacket.

.5 Acceptable manufacturers: Shawflex, Type 64021-1801, or as specified by equipment manufacturer.

2.13 TERMINAL BLOCKS

.1 Unfused terminals to be CSA approved for 600 V, 10 A, accepting #12 - #18 wire, and colored beige or grey. Terminals to be one of, or approved alternate:

.1 Phoenix Contact UK5N
.2 Wieland WK4U
.3 Weidmuller WDU4
.4 Allen-Bradley 1492-W4

.2 Fused terminals to be CSA approved for 300 V, 10A, with blown-fuse indicator operating on 120 VAC, accepting #10 - #14 wires, colored beige or grey, and either 5x20 mm fuses or ¼" x 1¼" fuses, or both. Terminals to be one of, or approved alternate:

.1 Phoenix Contact UK5HESI (Grey)
.2 Weidmuller WSI 6/LD (Beige)
.3 Wieland WK4/THSi6GL250U (Beige)
.4 Allen-Bradley 1492H5 (Grey)

.3 Provide and install 10% spare terminals of each type used.

.4 Grounding terminals to be CSA approved for 300 V, 15 A, accepting #14 wires, grounding to the rail, and colored green and yellow. Terminals to be one of, or approved alternate:

.1 Phoenix Contact USLKG5
.2 Wieland WK4SL/U
.3 Weidmuller WPE 2.5
.4 Allen-Bradley WG4

.5 Insulated shorting bars to be used for jumpering lengths longer than 2 terminals. Wire jumpers are not acceptable unless specific approval is obtained from Engineer.

2.14 FUSES

.1 All control fuses shall be installed such that easy removal is possible without disconnecting the incoming power to the drive or the use of special tools (i.e. insulated fuse holders).

2.15 WIRE IDENTIFICATION

.1 Provide wire identification to match control panel termination designations.

2.16 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification.

.2 In addition to manufacturer's standard nameplate, install a size no. 7 engraved nameplate bearing the panel's tag number.

.3 Each component inside the panel to be identified with a nameplate or an embossed plastic label as further specified.

.4 Each door-mounted device to be identified with an engraved lamacoid nameplate.

.5 Nameplates and labels clearly visible and positioned such that the removal of the device identified does not remove the nameplate or label.

.6 Nameplates and escutcheon plates to give an accurate description of the equipment or the functions of the device. Relays to be identified by their numbers corresponding to the drawings.

Part 3 Execution

3.1 EQUIPMENT MOUNTING

.1 Readily accessible for servicing, maintenance and adjustments.

.2 Space plug-in sockets as required for 11-pin devices to allow ready interchange between 8-pin and 11-pin plug-in relays and timers.

.3 Door-mount devices such as selector switches, pushbuttons, pilot lights, elapsed time meters, disconnect and circuit breaker operating handles.

.4 Devices and equipment which have integral indicating lights, LED’s and alpha-numeric displays must be viewable without the need to open the panel door. Solid state timer relays are exempt from this requirement. Similarly, access to operational pushbuttons and control switches which are part of the devices must be accessible without the need to open the door.

.5 Door cut-outs for access to equipment must be finished with polyethylene grommet edging.

.6 Live terminals, subject to accidental contact when doors are open must be effectively guarded.

3.2 WIRE INSTALLATION AND TERMINATIONS

.1 Run wires in plastic wiring duct wherever possible. Bundle and tie wires neatly where not run in wiring ducts and hold with fastening tabs.

.2 Self-adhesive tabs not acceptable where bundle is under strain or weight is excessive.

.3 Use insulated compression spade lugs to terminate conductors on binding head screws. Crimping die as per manufacturer's instructions.

.4 Group ac-, dc- and instrumentation wires separately from each other.

.5 Terminate drain wire of a shielded cable on a terminal block. Ground shield at control panel end, unless otherwise indicated.

.6 Provide a terminal block for each field wire. Multiple connections will not be accepted.

3.3 PANEL INSTALLATION

.1 Set and secure panels in place, rigid, plumb and square to building floor and wall.

.2 Provide fastenings and supports to meet the seismic requirements.

.3 Make field power and control connections as indicated.

.4 Protect against dust and damage during entire construction period.

.5 After connections have been made, vacuum-clean interior. Hand-clean exterior and touch-up damaged paint.

3.4 UPS INSTALLATION

.1 Shelf-mount UPS on the wall in close proximity to the Control Panel or raised off the floor under the control panel.

.2 Provide fastenings and supports to meet the seismic requirements.

.3 Locate the control panel so that the operator interface is 1600 mm above top of floor.

.4 Secure power cord connections in field to prevent accidental disconnection.

3.5 TESTS

.1 Perform tests of controls and control panel prior to delivery to site.

.2 Ensure moving and working parts are lubricated where required.

.3 Shop test prior to shipping:

.1 First tests to be done by manufacturer to ensure proper system operation, freedom from grounds and open and short circuits.

.2 Following above tests, notify Engineer minimum seven working days in advance of official shop tests.

.3 The Engineer reserves the right to witness official shop test.

.4 Perform:

.1 Functional test of control circuits. Simulate field contacts where necessary.

.2 Insulation resistance test on power and control wiring, freedom from grounds and open and short circuits.

.4 Submit to Engineer one copy of test results.

3.6 CONTROL PHILOSOPHY

.1 Vendor to provide a detailed control philosophy and programming logic as part of final O&M Manual.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the supply, delivery, certification of installation, testing and commissioning of an in-vessel UV disinfection system. The equipment that is to be provided for the UV disinfection system includes, but is not necessarily limited to:

- .1 UV reactors, including lamps in quartz sleeves and all related equipment
- .2 UV intensity monitoring system
- .3 UV transmittance equipment
- .4 Power distribution centers and interconnecting power and data cables to modules
- .5 Automatic mechanical or mechanical/chemical cleaning system
- .6 Accessories such as safety equipment
- .7 Complete local control system including:
  - .1 Control panel complete with front-mounted controls and indicators.
  - .2 Field-mounted switches, sensors, transmitters and associated equipment required to achieve the control philosophy for the UV disinfection system.
  - .3 Include remote signals not specifically listed but which are required to enhance or optimize the process performance of the UV disinfection system. These signals shall be listed and provided and will be used in the main plant control system for advanced process control and monitoring.

1.2 REFERENCE STANDARDS

.1 Perform all work in strict accordance with the current edition of the following organization standards and any local laws and ordinances:

- .1 Canadian Standards Association (CSA)
- .2 Electrical Equipment Manufacturers Association of Canada (EEMAC)
- .3 American Institute of Steel Construction (AISC)
- .4 American Iron and Steel Institute (AISI)
- .5 American Petroleum Institute (API)
- .6 American Society for Testing and Materials (ASTM)
- .7 Worksafe BC

.2 Wherever the requirements of the specifications exceed those of these codes, the requirements of the specifications shall govern. Code compliance is mandatory.

.3 To ensure the latest proven technology is included in the system provided, equipment supplied under this section is manufactured after the date the contract is awarded.

1.3 DEFINITIONS

.1 UV Dose: The total radiant energy incident from all directions onto an infinitesimally small sphere of cross sectional area (dA) divided by dA, for a given contact time in seconds. The unit of UV dose is millijoules per square centimeter (mJ/cm^2). UV dose is calculated as follows:

$$D = I.t$$

Where: D = UV Dose, $mW\text{-}s/cm^2$ (mJ/cm^2)
I = average intensity or irradiance, mW/cm^2
t = average exposure time, s

.2 UV Transmittance (UVT): The percent transmittance of ultraviolet light at a wave length of 254 nanometres (nm) through the water across a path length of one centimetre (cm). UV transmittance is calculated from UV absorbance (A) at 254 nm by the following equation:

$$\text{Percent Transmittance} = 100 \times 10^{(-A)}$$

.3 Intensity or Irradiance: The intensity of UV energy defined as the total radiant power incident from all directions onto an infinitesimally small sphere of cross-sectional area dA, divided by dA. The units of intensity are milliwatts per square centimetre (mW/cm^2).

.4 Reduction Equivalent Dose: The effective dose considered to have been delivered with a full scale UV system when it provides a level of inactivation of a specific organism equivalent to the level of inactivation for the same organism achieved in a laboratory at a carefully measured dose using a collimated beam apparatus with a low pressure lamp producing UV energy at a wavelength of 254 nm.

.5 Design Safety Factor: A factor that accounts for the relative UV lamp output within the UV channel in comparison to the conditions of clean, new lamps (after burn-in period). A safety factor of 70% shall be used for system design to account for lamp aging (loss in UV output), lamp sleeve fouling, and cleaning efficiency, excluding the transmittance characteristics of the quartz sleeve. Note that systems without automatic cleaning of the lamps shall be required to complete the validation testing after contact with the plant flow for a period equal to the recommended operating time between cleaning cycles in order to achieve typical fouled lamp condition.

1.4 QUALIFICATION

.1 The Supplier shall have delivered at least 10 low pressure, high output UV disinfection systems, for disinfecting wastewater at plants with greater than 50 ML/d design capacity using the same reactor configuration and UV lamps that are proposed for this project, each with at least 12 months successful operating history. Indicate experience as required on Tender Form.

.2 Document Supplier's experience with low pressure, high output UV disinfection systems. Provide a list of operating installations, with capacities, names and current phone numbers of contacts to establish the qualification of the supplier as required on the Proponent's Qualifications, Section 00 45 13.

1.5 COORDINATION

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

1.6 QUALITY ASSURANCE

.1 Structural steel and welds: use structural steel for equipment fabrication which conforms to the requirements of the standard specifications for steel for Bridges and Buildings ASTM A36. Conform to the latest standards of the American Welding Society.

.2 Structural Design: Design all steel structural components so that the stresses developed under installation and operating conditions will not exceed the allowable stresses defined by the latest AISC Standards and the aforementioned standards.

1.7 SUBMITTALS

.1 Equipment Submittals

.1 All drawing submittals shall include electronic file copies in AutoCAD format.

.2 Provide the following in one complete submittal in accordance with Section 01 33 00 - Submittals:

.1 A copy of this Section with checks to indicate conformance or acceptance of each clause. Non-conformance shall be indicated by a cross "X".

.2 Shop drawings showing general arrangements and layouts, overall dimensions, connection and mounting details, cross-sections and weights, make and model numbers, and a complete materials list. Include specifications, catalogue cuts, and descriptive literature. Include electrical schematics and control schematics. Provide information for all components of the system including, but not necessarily limited to:

.1 Maximum input power for each lamp including ballast (either one or one half ballast per lamp).

.2 UV lamps.

.3 UV reactor vessels.

.4 Variable output electronic ballasts.

.5 UV intensity detection systems.

.6 UV Transmittance instruments

.7 Power distribution centres.

.8 Automatic mechanical or mechanical/chemical cleaning system.

.9 Separate chemical cleaning system.

.10 All other equipment, components and/or instrumentation required to deliver a complete UV package system.

.3 Provide a drawing showing the required dimensions to accommodate the UV disinfection system, and indicate allowable pressure range of liquid in the reactor.

.4 Installation instructions indicating assembly and mounting requirements, alignment and assembly tolerances, and points of connection for ancillary services.

.5 Start-up instructions including lubricant or cleaning solution requirements, electrical requirements, lamp and sleeve changing procedures, etc.

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

.7 Calculations and background data indicating conformance of the system with the specified UV dosage requirements. Provide third party bioassay test results that confirm the system will be capable of delivering the design, bioassay based dosage. Use the following design values:

.1 Minimum UV Transmissivity = 35%

.2 UV lamp end of life factor (f_p) = 80%

.3 Quartz sleeve fouling factor (f_t) = 89%

.8 Qualifying information on the electronic ballast supplier, including number and type of electronic ballasts manufactured to date, ballast technical specification, extent of experience in electronic ballast manufacturing, list of primary purchasers of the electronic ballasts, quality control procedures used, location of manufacturing facility and component suppliers, and description of testing program to which electronic ballasts have been subjected.

.9 At least one graph or table summarizing guaranteed UV lamp output through lamp design life, when it is operated at its optimal input power level. Indicate output in terms of kW of output at an equivalent wavelength of 254 mm and life in terms of hours of operation.

.10 A graph characterizing the head loss expected through the system. On the x-axis of the graph, indicate the flow and on the y-axis indicate the head loss. Cover the flow range from a low flow condition of 40 ML/d to a flow which exceeds the peak hydraulic flow of 80 ML/d through the system.

.11 Replacement parts list. Include as a minimum lamps, sleeves, and ballasts, with prices current at the time of tender.

.12 Operating characteristics of all electrical and control equipment; operating voltage and amperage tolerances; ancillary electrical services required.

.2 System Performance Guarantees

.1 Provide the following warranties as part of the submittals, complete with a notarized statement accepting the responsibilities outlined below.

.1 During the guarantee period, replace all ballasts, which failed within the two year guarantee period, at no cost to the Owner. After that point, furnish at no cost to the Owner, those devices required to replace failures which occur in excess of 3 percent per annum in the following four years.

.2 Warrant that lamp sleeves will last a minimum of three years. Make the design life of the sleeves 10 years. Replace all lamp sleeves that fail within the three years following substantial performance.

.3 Warrant that the peak system power consumption will not exceed the maximum listed in the submittals. The peak power consumption will include the power draw of all supplied lamps and all ancillary devices necessary for the continuous operation of the UV disinfection system.

.4 Warrant that at the end of the lamp design life, the supplied UV system will achieve bacterial kill equivalent to that measured when the dosage of UV light, at a wavelength of 254 nm, is 30 mJ/cm^2 at peak flow for UV systems with chemical/mechanical cleaning systems.

.5 For UV systems with mechanical cleaning systems, provide equipment and contingencies to remove and clean the lamps chemically to maintain an end of design lamp life UV dose of not less than 30 m J/cm^2.

.3 Complete all other submissions as requested by other regulatory authorities.

.4 Operation and Maintenance Data: Provide for incorporation in the Operation and Maintenance Manuals as specified in Section 01 78 23. Include complete description of operation together with general arrangement and detailed drawings; wiring diagrams for power and control schematics, parts catalogues, with complete list of repair and replacement parts with section drawings, illustrating the connections and identifying numbers. Provide information on electronic media, using AutoCAD or pdf files for drawings and graphical material and MS Word for documents, in addition to hard copies.

1.8 COORDINATION

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

1.9 SHIPMENT, PROTECTION AND STORAGE

.1 Ship equipment pre-assembled to the degree which is practicable.

.2 Provide storage instructions indicating specific requirements to ensure there is no weathering, corrosion, contamination, mechanical damage, distortion, or any other deterioration of the components.

.3 Identify all other special storage requirements and ensure requirements are clearly communicated to and understood by the General Contractor.

.4 Conform to the requirements of Section 01 65 00 – Shipment, Protection and Storage.

Part 2 Products

2.1 DESCRIPTION

.1 The UV disinfection system reduces the concentration of viable microorganisms in the treatment plant effluent by irradiation with UV light at 254 nm.

.2 The UV system will treat lagoon effluent from two cells operating in parallel in the wastewater lagoon. Wastewater is treated in the lagoon through an extended aeration process. Wastewater is pumped through the UV reactors and to the outfall by two pump stations (one located in each lagoon cell).

.3 The UV system will consist of in-vessel reactors located in the UV room of the treatment building. Piping and reactor vessel layout is shown in the drawings in Appendix A.

.4 Knife gate valves located at the inlet to the UV reactors will control flow to each reactor. The valves will be equipped with electric actuators and controlled by the plant PLC.

.5 Flow measurement will be taken by a flow meter downstream of the UV reactors. The signal corresponding to the measured flow will be transmitted to the UV control panels by the plant PLC.

2.2 ACCEPTABLE MANUFACTURERS

.1 Design Standard: ITT Wedeco (LBX)

.2 Approved Equal.

2.3 DESIGN CAPACITIES, OPERATING CONDITIONS AND PERFORMANCE REQUIREMENTS

.1 The characteristics of the influent wastewater to the UV system are outlined in the following table:

Parameter	Design Value
Flow, ML/d	
Minimum	40
Peak	80
UVT Transmittance, percent	
Minimum	35
Maximum	85
TSS, mg/L	
Maximum (Approval Limit)	25
BOD_5, mg/L	
Maximum (Approval Limit)	25
Water Temperature, °C	
Minimum	1
Maximum	25

1. The supplier shall ensure the UV package system design complies with the above listed parameters.
2. The UV building is heated and ventilated to maintain a minimum ambient air temperature of 10°C in the winter under normal circumstances and maximum air temperature less than 35°C in the summer. The temperature in the building could be less than 10°C and the UV system should be designed as not to be adversely affected by lower temperatures.

.2 System Design Parameters:

.1 Deliver a UV dose sufficient to meet the requirements for fecal coliform reduction at peak flow for wastewater with UV transmissivity of 35 percent at the end of lamp life for mechanical/chemical cleaning systems.

.2 Adjust UV intensity for age and for reduced output through quartz sleeve to maintain disinfection effectiveness.

.3 The discharge limit is less than 200 fecal coliform per 100 mL at the edge of the initial dilution zone (IDZ) based on a 30 day geometric mean. The estimated minimum dilution ratio within the IDZ is 20:1.

.4 Year round disinfection is required.

2.4 MATERIALS

.1 Fabricate all welded metal components in contact with wastewater of Type 316L stainless steel.

.2 Provide all necessary cables between UV reactors and individual UV reactor control panels. Installation and termination of cables to be by the supply contractor. If terminations are required by others, the supply vendor must provide appropriate documentation and instructions to the engineer.

.3 All wiring exposed to UV light shall be Teflon coated or protected by other suitable long-term resistant materials.

.4 Fabricate all material exposed to UV light of Type 316 stainless steel as a minimum, Type 214 clear fused quartz glass, Teflon, or other suitable long-term UV resistant materials.

2.5 UV LAMPS

.1 The design is based on low pressure, high output UV lamps.

.2 Provide amalgam lamps or mercury vapour lamps. Provide either ‘preheat’ or ‘instant start’ type lamps.

.3 Provide clamped design filaments, significantly rugged to withstand shock and vibration.

.4 Place electrical connections at one end only.

.5 Provide a dielectric barrier or pin isolator to prevent arcing in moist conditions. Dielectrically test the barrier for 2500 volts.

.6 Provide lamps rated to produce zero levels of ozone.

.7 Operate the lamps by electronic ballasts with variable output settings. Alternatively, provide an automatic flow pacing control system that adjusts the number of lamps in service.

.8 Make available dual source of supply for replacement lamps.

.9 Lamp operating life to 80% of 100 hour output to be guaranteed at no less than 12,000 hours. Independent validation of lamp aging factor is required.

.10 90 percent of UV output to be within the wavelengths of 233.7 to 273.7 mm.

2.6 LAMPS SLEEVES

.1 Type 214 clear fused quartz circular tubing.

.2 Fabricate sleeves such that they do not degrade due to exposure to UV light.

2.7 UV BALLASTS

.1 Provide electronic ballasts, specifically designed for low pressure, high output UV lamps.

.2 Ensure that the design time between mean ballast failures is at least 10 years.

.3 Design the ballast and lamp combination to allow automatic regulation of power input. Alternatively provide an automatic flow pacing system that adjusts the number of lamps in service.

.4 Enclose all wires connecting the lamps to the ballasts.

2.8 UV INTENSITY SENSORS

.1 For each UV reactor, provide a minimum of one UV intensity sensor to measure the UV intensity at 253.7 nm wavelength. Ensure that the measuring range of the sensor is suitable for high output lamps under the expected wastewater transmissivity and lamp fouling conditions.

.2 Do not use a filter or a reflector prism in the sensor.

.3 Design the sensor such that prolonged exposure to UV light or wastewater will not degrade the sensor.

.4 Locate the sensor the recommended distance from the sleeve of the UV bulbs.

.5 Allow selective display of the UV intensity measured by each active UV sensor on the local operator interface on each UV control panel.

.6 Ensure that the UV intensity sensor can be calibrated.

2.9 UVT ANALYZERS

.1 Supply two (2) UVT Analyzers for installation upstream of the UV reactors. Each UVT Analyzer will monitor UVT in the effluent from one of the two lagoon cells.

.2 The signal from the UVT analyzers will be hardwired to the main plant PLC. The UVT value will be available for use by the UV system PLC via the ethernet/Modbus network.

2.10 MODULE/REACTOR CLEANING SYSTEM

.1 Provide an automatic and integrated lamp cleaning system as part of the UV system. In the cleaning system, use either mechanical wiping or mechanical/chemical wiping to descale the lamp sleeves.

.2 Design the cleaning system to be fully operational without requiring either lamps or reactors to be removed from service.

.3 Make the cleaning frequency field adjustable. Design to allow the cleaning cycle to be activated from the control panel.

.4 Provide all cleaning reagents and solutions necessary for initial equipment testing and equipment startup.

.5 Fabricate the wiper of materials resistant to high intensity UV radiation, high temperature and strong acids. Design the wiper to remove deposits effectively and, if applicable, to retain the cleaning chemicals without leaking.

.6 Design wiper system to function without interference from TSS levels in the effluent.

.7 Design the cleaning system to prevent binding of the wiper seals on the lamps.

.8 In addition to wiper system, provide means of periodic chemical cleaning of the quartz sleeves. Chemical cleaning may be either in reactor or by removal of quartz sleeves from reactor vessel and immersion in separate tank.

.9 Provide all components required for chemical cleaning system including (but not limited to) chemical storage tank, spill containment, chemical pumps and hoses.

2.11 ELECTRICAL

.1 All products provided shall be CSA Approved, Canadian Underwriters' Laboratory approved where applicable, and new, unless otherwise specified.

.2 If products specified are not CSA approved, obtain special approval from the local regulatory authority. Pay all applicable charges levied and make all modifications required for approval.

.3 Make all power and signal wiring between sub-systems suitable for wet and corrosive locations in accordance with applicable codes.

.4 Power Supply:

.1 Power is available to the UV system at 480 Volt, 3 Phase 60 Hz.

.5 The UV equipment Supply Contractor will provide complete information on the harmonic footprint of the total proposed system. This will include voltage and current harmonics up to the 30^{th} harmonic.

.6 Supply control cabling between ballast and reactors.

.7 Each electrical power supply will be provided with a separate disconnect by others.

.1 Refer to Sections 26 05 02 – Electrical: General Requirements and 26 05 43 – Electrical Installation for electrical requirements.

2.12 CONTROL PANEL ENCLOSURE

.1 CSA NEMA 12 rated enclosure.

.2 12 gauge steel, seams to be continuously welded and ground smooth with body stiffeners (as required), back panel supports, heavy duty hinges, heavy duty lifting eyes (as required), oil resistant door gasket, grounding stud on doors and body and painted ASA 61 - Grey.

.3 Floor mounted or wall mounted.

.4 Single or double lockable doors with three point latch and stainless steel handle.

.5 Solid cover and sides.

.6 Steel back panel(s) extending entire width of panel.

.7 Data pocket inside of door with folding shelf for laptop

.8 LED light activated by door switch, one for each door.

.9 Powder coat epoxy paint.

.10 Cooling fans and filters as required, for continuous operation.

.11 Cable entry from power supply to be through the top or side of panels and cable entry to the UV reactors to be through the bottom of the panels.

2.13 CONTROL AND INSTRUMENTATION

.1 System Control:

.1 Manufacturer of PLCs and HMIs must be compatible with the Main Plant PLC, refer to Section 262903 for details on controls and communication.

.2 Each UV control panel shall be complete with an HMI. All status and alarm information available on the Reactor Control Panel HMIs shall be made available to the plant main PLC.

.1 Provide a menu-driven operator interface with automatic fault message windows appearing upon alarm conditions.

.2 Provide alarms to indicate to plant operators that maintenance attention is required or to indicate an extreme alarm condition in which the disinfection performance may be jeopardized. Include as a minimum:

.1 Individual Lamp Failure

.2 Low UV Intensity alarm Make the setpoint field adjustable.

.3 Multiple Lamp Failure

.4 Low UV Dose

.3 Identify the affected lamps by an address system, specifying the reactor, module and lamp.

.4 Record the 20 most recent alarms in an alarm history register for display when prompted.

.5 Provide ability to place reactor status either in Manual, Off or Auto mode.

.6 Cycle reactors for equal run time and time off to minimize reactor cycling.

.7 Record elapsed time of each reactor and display on the display screen when prompted.

.8 Provide CSA or UL approved panel, rated NEMA 1.

.9 Locate the panel in the UV building.

.2 Plant Communications:

.1 Primary communication with plant control system to be Ethernet.

.2 Data to be transmitted includes the following:

Signal Description	From	To
UV System Status	UV PLC	PCS
UV Alarm Signals	UV PLC	PCS
Power Consumption Data	UV PLC	PCS
Flow Rate	PCS	UV PLC
Operating Set Points	Both	Both

2.14 DOSE PACING

.1 Supply a dose-pacing system to modulate the lamp UV output in relationship to a flow signal from the plant PLC, in conjunction with either UV transmittance. Allow for manual input of a UV intensity value into the control system.

.2 Dose-pace the system such that as the flow and water quality change, the UV dose delivered is optimized while conserving power.

.3 The dose-pacing system shall allow the operator to vary the design dose setting.

.4 Provide logic and time delays to regulate the UV reactor ON/OFF cycle.

.5 The dose pacing system shall take into account when the number of reactors in operation. When both channels are in service, the flow shall be split equally between both channels.

2.15 ACCESSORIES

.1 Equipment Identification Plates: A 16-gauge stainless steel identification plate shall be securely mounted on the equipment in a readily visible location. The plate shall bear the 1/4-inch die-stamped equipment name.

2.16 SPARE PARTS

.1 Furnish the following spare parts and special tools. Suitably mark and pack all parts and tools.

.1 10 percent of system UV lamps.
.2 5 percent of system ballasts.
.3 5 percent of quartz sleeves.
.4 5 percent of lamp holder seals.
.5 10 percent of wiper O-rings.
.6 One year's worth of spare parts for the cleaning system.
.7 2 control relays of each type used.
.8 1 time delay relay of each type used.
.9 2 push button contact blocks of each type used.
.10 One (1) spare PLC Input card for each type of input card used. One (1) spare PLC Output card for each type of output card used.
.11 2 Face shields that block UV light wavelengths between 200 and 400 nm
.12 One box of fuses of each type used.

Part 3 Execution

3.1 SUPPLIER'S REPRESENTATIVE

.1 The Supplier's Representative shall be required to attend the site to train installation personnel, train operating and maintenance staff, to witness installation and testing, to ensure the equipment is installed and operated as intended.

.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.

Description	No. of Days
Equipment Delivery	0.5
Installation Assistance (combined with Item 1)	0.5
Witnessing of Equipment Installation	1
Assistance in Equipment Performance Testing	2
Process Performance Testing	1
Operator and Maintenance Training	2
Guaranteed Performance Testing	3

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

3.2 INSTALLATION TRAINING

.1 Conform to the requirements of Section 01 87 13 – Equipment, System Performance and Operational Testing and 01 79 00 - Training.

3.3 INSTALLATION

.1 The General Contractor shall ensure that equipment is installed plumb, square and true within tolerance specified by the Supply Contractor and as indicated in the Contract Documents.

.2 The General Contractor shall check and confirm maximum weir set point to ensure lamp submergence under low flow conditions and make adjustments as required.

.3 The General Contractor shall ensure the equipment is installed as required to provide satisfactory service.

.4 Conform to the requirements of Section 01 87 13 - Equipment, System Performance and Operational Testing.

3.4 EQUIPMENT PERFORMANCE TESTING

.1 Conform to the requirements of Section 01 87 13 - Equipment, System Performance and Operational Testing.

.2 Prior to startup, the installed UV disinfection system is to be inspected for proper alignment, correct operation, proper connection, and satisfactory function of all components. The Supply Contractor's representative shall approve the installation and provide certification that the system components have been installed correctly and are ready for operation.

.3 Proposed equipment testing procedure shall be developed by the Supply Contractor, submitted to and reviewed by the Engineer, before scheduling and performing the functional test.

.4 Test shall include proving of the serial interface between the UV power distribution centers and the plant control system. The General Contractor shall require the presence of both the UV Supply Contractor and the plant control system manufacturer/supplier during the interface test.

.5 Test will be witnessed by the Engineer and shall demonstrate that the system and related control system operate in accordance with the specifications, including all operating, monitoring, and shutdown functions.

.6 If, in the opinion of the Engineer, the system meets the requirements specified herein, the system will advance to guaranteed performance test. If, in the opinion of the Engineer,

the functional test results do not meet the requirements specified herein, the system will be classed as nonconforming.

.7 In the case of a non conforming system, advancement to guaranteed performance testing will not commence until the Contractor has made, at no additional cost to the Owner, such adjustments, changes, and/or additions as are necessary to correct the system, and demonstrated this by a satisfactory functional test as specified above.

3.5 GUARANTEED PERFORMANCE TEST (GPT)

.1 Conform to the requirements of Section 01 87 13 - Equipment, System Performance and Operational Testing.

.2 The Guaranteed Performance Testing will be scheduled to take place at approximately 80 percent of the design life of the UV lamps, approximately 400 days after commissioning and start up.

.3 The Supply Contractor shall submit the proposed Guaranteed Performance Test procedure to the Engineer, before scheduling and performing the Guaranteed Performance Test.

.4 During the Guaranteed Performance Test, the General Contractor shall start up and operate the UV disinfection system continuously for 3 days to demonstrate the Guaranteed Performance Requirements. The Guaranteed Performance Requirements testing shall be done to determine the actual system operating conditions and verify that the system meets the Guaranteed Performance Requirements of this specification.

.5 Collimated Beam Analysis

.1 Conduct collimated beam analysis using a low pressure lamp, shielded through its length other than at the collimated beam discharge point. The light emitted from the discharge point will travel along a reflective collimating tube, of the same or large diameter as the sample Petri dish mounted at the bottom of the collimating tube. Make the collimating tube length sufficient to ensure that the light intensity across the tube cross section is consistent. Control entry of light into the tube by the use of a precision aperture. At the Petri dish liquid surface elevation, measure UV intensity in $\mu W/cm^2$, using an approved, laboratory quality radiometer/photometer. Place a sample in a Petri dish, on a mixing plate, at the same elevation. Expose it to UV light for a controlled period and then measure the residual fecal coliform density in the sample. Repeat this procedure for at least six UV dosages, intended to range from 5 to 40 mJ/cm^2. In addition, measure the fecal coliform density of a sample with no exposure to UV light. Measure the UV transmissivity of the sample. Calculate the average UV intensity through the exposed samples in accordance with the Beer-Lambert equation. Using the results from these analyses, construct a dose-response graph for the effluent. The dose (mJ/cm2) should be shown on the x-axis and the ratio between the measured number of fecal coliforms in the exposed samples to the measured number of fecal coliforms in the exposed samples to the measured number of fecal coliforms in the untreated sample should be shown on the y-axis (logarithmic scale, dimensionless).

.6 Effluent Quality Test:

.1 The purpose of the test is to confirm that the effluent quality is satisfactory under the specified worst-case design conditions, i.e. minimum UV dose, the lowest UV transmittances, and the highest suspended solids and influent fecal coliform levels. If, during the test period, the influent conditions are significantly better than the design conditions, the Contractor shall propose measures such as spiking the influent with solids, chemicals or microorganisms to simulate the design influent conditions as closely as possible.

.2 Prior to the start of the tests, the Contractor shall propose the number, location and power output (for high intensity lamps only) of online UV lamps based on the measured UV transmittance and average lamp age. The average UV dose to be delivered during the tests shall be between 27 and 33 mJ/cm^2. The lamps shall be cleaned before the tests on the first day and the UV dosage shall be calculated based on clean lamp conditions.

.3 Unless otherwise specified, the Owner will bear the cost for the water and the power used during the GPT.

.4 Plant staff will ensure that the flow is relatively consistent and approximately equal to the peak design flow.

.5 The timing for the tests shall be determined based on the diurnal flow variations and the laboratory working hours. The sampling for the effluent quality test shall coincide with sampling for the collimated beam analysis.

.6 During the test, three sets of grab samples for the influent and effluent of the UV disinfection facility shall be collected and analyzed for fecal and total coliform levels. At the time when the samples are collected, time, UV intensity, lamp age, power output levels (for high intensity lamps only) and wastewater flow rates shall be recorded. The influent samples shall also be analyzed for filtered and unfiltered UV-transmittance, total suspended solids and particle size distribution. The procedures shall be repeated three times on a day.

.7 The test is considered to be successful if the geometric mean of the effluent fecal coliform levels, based on consecutive daily samples during the test period, is less than 200 counts/100 mL at the average condition of the six influent samples with the minimum UV dose is delivered.

.8 Within 10 working days of conduction the GPT, provide a report summarizing the findings of the GPT testing and analyses. Include a complete listing of test results and describe the mathematical methods used in the analyses.

.9 The Engineer will assess the results of the GPT to determine whether the installed UV system is capable of delivering the specified UV dosage. Should the GPT results prove unacceptable, the GPT will be redone at no cost to the Owner.

.10 Should the subsequent GPT prove unacceptable, the system will be deemed deficient.

.11 At the successful completion of the GPT, confirming documentation will be signed by the General Contractor, Supply Contractor and Engineer.

.7 Laboratory Tests:

.1 All laboratory tests necessary to confirm the Guaranteed Performance Requirements testing for the UV Disinfection System shall be performed in

conformance with the applicable portions of the most recent edition of Standard Methods.

.2 The General Contractor shall arrange and pay for all laboratory testing required during the intensive testing phase of the effluent quality tests.

3.6 OPERATOR TRAINING

.1 Provide training to enable the operation staff to operate the system independently after installation.

.2 The Owner will set the training date. The supplier will be giving at least four weeks notice.

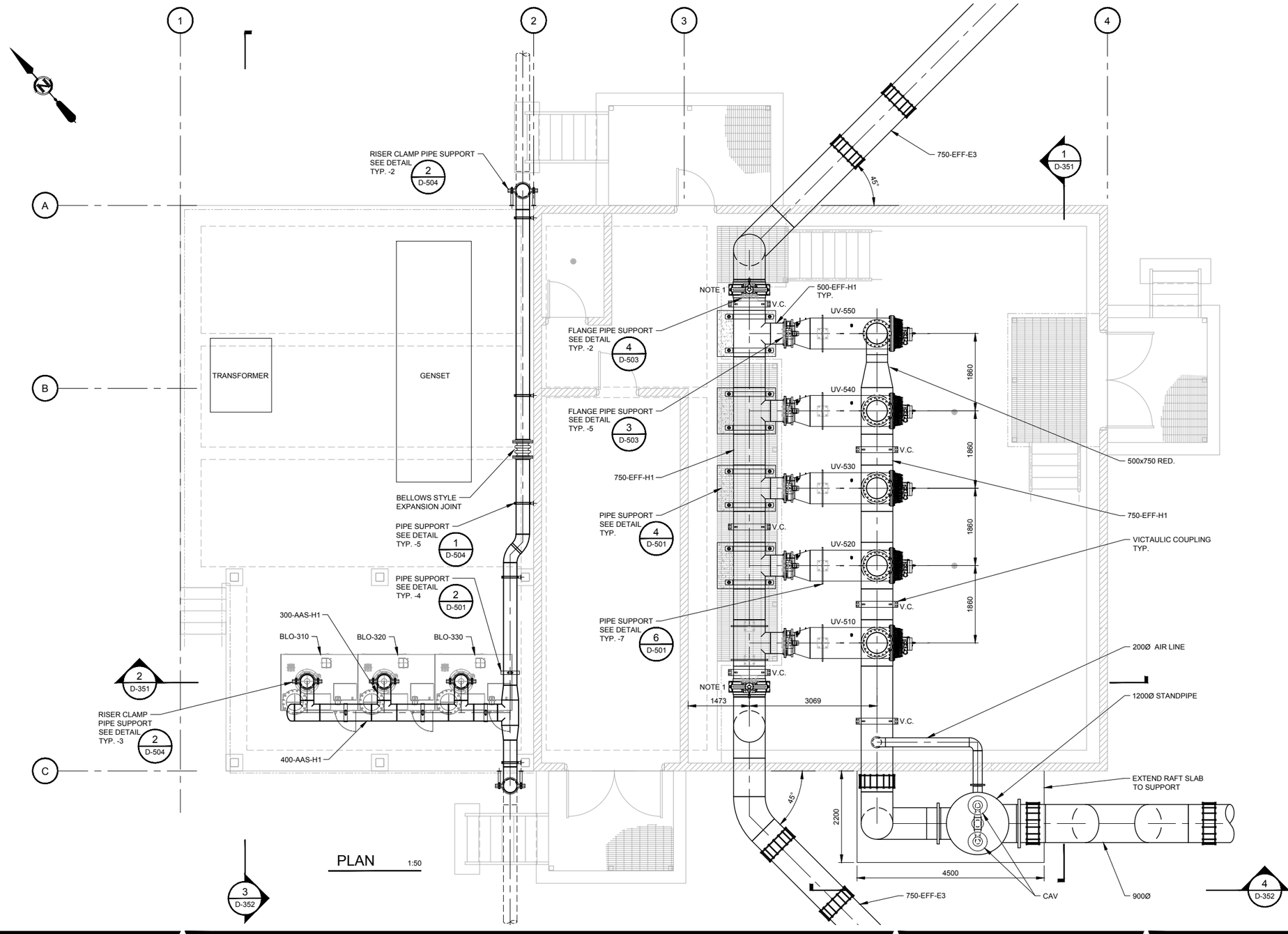
.3 Conform to Section 01 79 00 - Training.

END OF SECTION

Appendix A - Drawings

IF NOT 50 mm ADJUST SCALES
50 mm

SCALE(S) SHOWN ARE INTENDED FOR ANSI D (22X34) SIZE DRAWINGS, TABLOID (11X17) SIZE DRAWINGS ARE 1/2 OF SCALE(S) SHOWN UNLESS NOTED OTHERWISE



NOTES:

1. VALVE HANDWHEEL ACCESSIBLE FROM PLATFORM.

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DATE: 2018-03-07, Hugo Masuda

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www.ae.ca

PRELIMINARY/ FOR DISCUSSION
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DRAFT

REV	DATE	DESIGN	DRAWN	DESCRIPTION
B	2018MAR02	H. MASUDA	S. KE	ISSUED FOR PROGRESS REVIEW
A	2018JAN26	H. MASUDA	S. KE	ISSUED FOR PROGRESS REVIEW

CITY OF PORT ALBERNI

WASTEWATER LAGOON EXPANSION UPGRADES

20172972-00

SCALE: AS SHOWN

THE CITY OF Port Alberni

PROCESS MECHANICAL TREATMENT BUILDING PLAN

DRAWING	REVISION	SHEET
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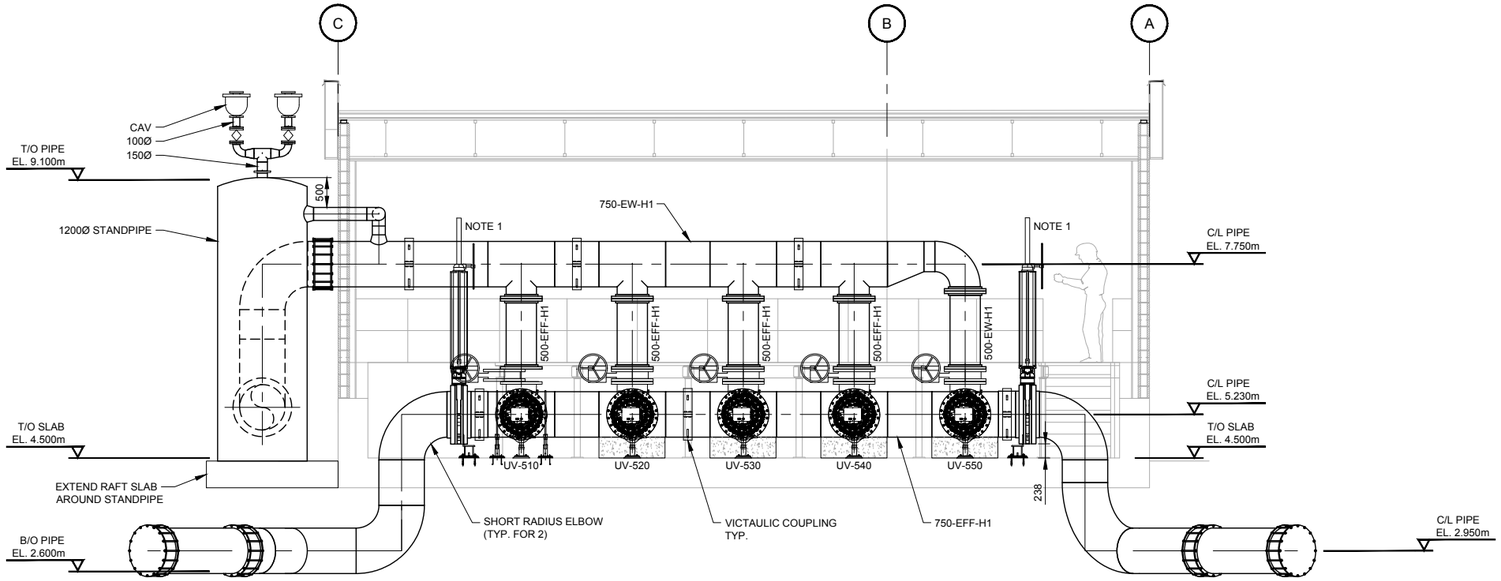
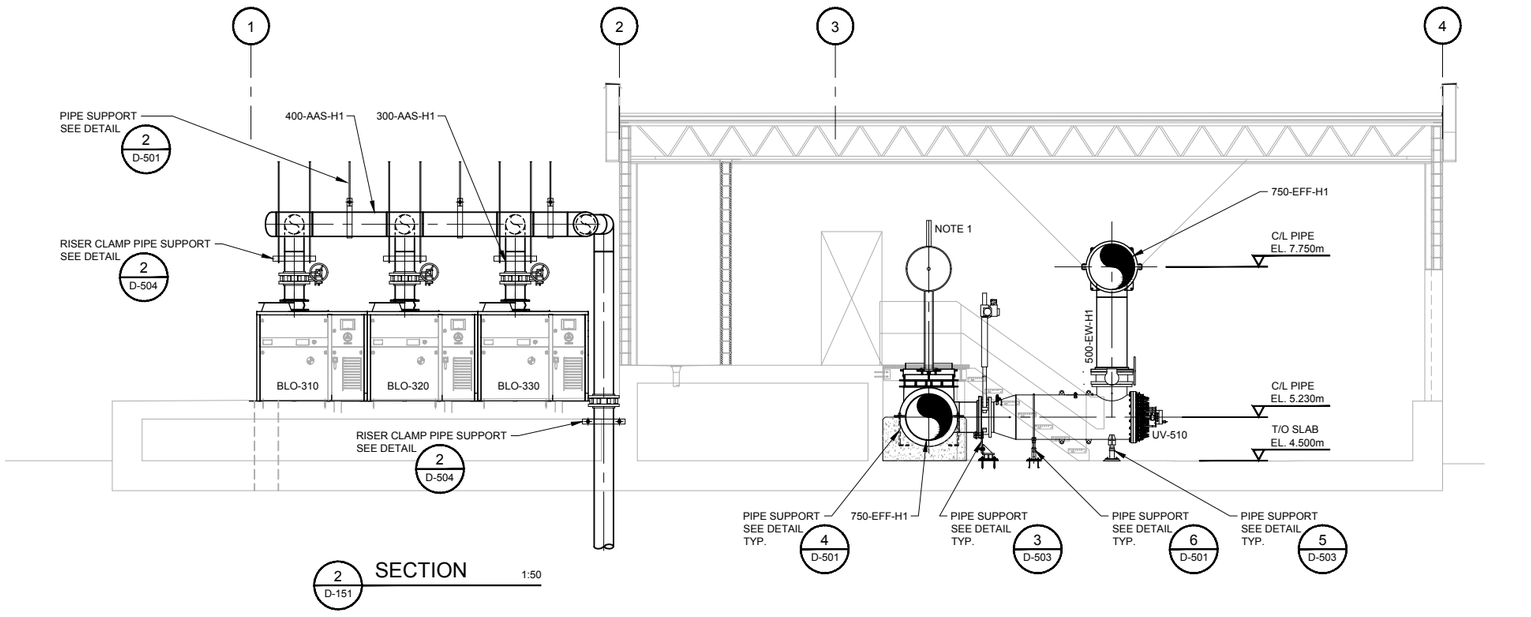
IF NOT 50 mm ADJUST SCALES
50 mm

SCALE(S) SHOWN ARE INTENDED FOR ANSI D (22X34) SIZE DRAWINGS, TABLOID (11X17) SIZE DRAWINGS ARE 1/2 OF SCALE(S) SHOWN UNLESS NOTED OTHERWISE



1 D-151 SECTION 1:50



2 D-151 SECTION 1:50

NOTES:

1. VALVE HANDWHEEL ACCESSIBLE FROM PLATFORM.

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DATE: 2018-03-07, Hugo Masuda

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EXPANSION UPGRADES

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THE CITY OF Port Alberni

PROCESS MECHANICAL
TREATMENT BUILDING
SECTION SHEET 1

DRAWING	REVISION	SHEET
2972-00-D-351	B	/