REGIONAL DISTRICT OF NANAIMO

CONTRACT DOCUMENTS

FOR

REGIONAL DISTRICT OF NANAIMO
Tender No. 23-040
NANOOSE BAY PUMP STATION NO. 6 UPGRADE AND SANITARY FORCEMAIN REPLACEMENT

AUGUST 2023

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

Parksville, BC

REGIONAL DISTRICT OF NANAIMO

Tender No. 23-040

NANOOSE BAY PUMP STATION NO. 6

UPGRADE AND SANITARY FORCEMAIN REPLACEMENT

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DRAWINGS (Bound Separately) - CONTINUED

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INVITATION TO TENDER

REGIONAL DISTRICT OF NANAIMO
Tender No. 23-040
NANOOSE BAY PUMP STATION NO. 6
UPGRADE AND SANITARY FORCEMAIN REPLACEMENT

The purpose of this Tender is to solicit submissions from qualified firms to construct a new sanitary forcemain and to complete pump station upgrades at the Regional District of Nanaimo's Pump Station No. 6, located on Schooner Cove Drive in Nanoose Bay. Signed Tenders will be received by the Regional District of Nanaimo up to **3:00:00 pm** local time, on **Thursday, August 31, 2023**. Tenders will not be opened in public.

Submission Method: By Email Only With "23-040 Nanoose Bay Pump Station No. 6 – Upgrade and Sanitary Forcemain Replacement" as the subject line at this electronic address: cmathie@rdn.bc.ca. **All Tenders must be accompanied by a verifiable digital Bid Bond, and a verifiable digital Consent of Surety as defined by the Surety Association of Canada.**

Tender documents will be available from the Regional District of Nanaimo after 3:00 pm on **Tuesday, August 01, 2023**. Tender documents will be available for download in electronic (PDF) format from www.rdn.bc.ca/current-bid-opportunities, and the BC Bid website at www.bcbid.gov.bc.ca at no charge.

Last Question & Answer Received	**Friday**	**August 25, 2023**	**5:00pm**
Last Addenda/Q&A Response	**Tuesday**	**August 29, 2023**	**5:00pm**
Tender Closing	**Thursday**	**August 31, 2023**	**3:00pm**

An onsite information session will not be held as part of the Tendering period. Tenderers are responsible to make themselves familiar with, and for viewing the site on their own time.

Enquiries regarding the project shall be directed to Chris Mathie, P.Eng., E&I Project Engineer, Engineering Services of the Regional District of Nanaimo by telephone (250) 758-1157, or email at cmathie@rdn.bc.ca.

Award of the contract is subject to sufficient budget funds being available for the project and subject to obtaining Ministry and Board approval. The proposed project superintendent, subcontractors, schedule of completion, size of workforce, proposed equipment, previous experience, and submission of suitable references from other similar sized projects will all be considered in review and acceptance of the tender.

The lowest or any tender will not necessarily be accepted. The Regional District of Nanaimo reserves the right to waive minor informalities in or reject any or all tenders, or accept the tender deemed most favourable in the interests of the District, as detailed in this invitation and the tender documents. Tenders not conforming to the specified requirements may be returned to the Tenderer without consideration.

ARTICLE 1. TENDER

Signed Tenders with the Tender No. and Project identified in the subject line as prescribed, will be received by email only, and up to the time stated in the Invitation to Tender. All Tenders must be accompanied by a verifiable digital Bid Bond, and a verifiable digital Consent of Surety as defined by the Surety Association of Canada.

The Tenderer is entirely responsible to ensure that the Tender is received, and prior to the date and time established for the Tender Closing. Any late Tenders will be returned unopened. Tenders submitted in any other manner will not be considered.

ARTICLE 2. (NOT IN CONTRACT)

ARTICLE 3. EXAMINATION

The Tenderer must carefully examine the Contract Documents and the site of the proposed works, judging for and satisfying itself as to the probable conditions to be encountered. Should a Tenderer find discrepancies in, or omissions from, the Drawings or other documents, or should it be in doubt as to their meaning, it should at once notify Chris Mathie, P.Eng., E&I Project Engineer, Engineering Services of the Regional District of Nanaimo. The Tenderer may not claim, after the submission of a Tender, that there was any misunderstanding with respect to the conditions imposed by the documents.

The Tenderer's attention is drawn to the Supplementary General Conditions of the Contract Documents, which contain any changes or additions to the General Conditions. The Tenderer's attention is also drawn to any addenda which may be issued prior to the time of tender closing. Tenderers are solely responsible for checking and including any addendums prior to submitting their tender. Any addenda will be posted on the RDN website at www.rdn.bc.ca/current-bid-opportunities, and the BC Bid website at www.bcbid.gov.bc.ca.

No verbal agreement or conversation made or had at any time by a Tenderer with any officer, agent, or employee of the Owner or the Engineer shall affect or modify any of the terms or obligations herein stated, nor be deemed to be any representation or warranty.

ARTICLE 4. TEST EXCAVATIONS

The Tenderer is advised to satisfy itself as to the subsurface soil and groundwater conditions that will be encountered onsite.

Prior to the excavation of test holes on road allowances or privately owned property, the Tenderer is expected to obtain permission from the Engineer and the appropriate governmental agency or owner of the property and to comply with their requirements for restoration of disturbed surfaces and utilities. Failure to comply with ordinances restricting this practice may result in prosecution of the offending party.

ARTICLE 5. FORM OF SUBMISSION

The Tender Form must be submitted on the forms provided and be accompanied by the specified Bid Security. The submitted Tender Form must be completed by word processing or handwritten in ink.

The Tenderer accepts and acknowledges by its provision of a Tender Form that it has read and understood all of the requirements of the Tender and the Contract Documents.

ARTICLE 6. (NOT IN CONTRACT)

ARTICLE 7. TENDERER'S QUESTIONNAIRE

The Tenderer should furnish evidence that it has the necessary experience and is prepared to use the necessary personnel and equipment to carry out the work satisfactorily and within the time stated in the Tender Form. The Tenderer's Questionnaire should be completed in order that it's capabilities in this regard can be assessed by the Owner. Failure to complete the Questionnaire may result in the Tender being considered incomplete.

ARTICLE 8. PROPOSED ALTERNATE MATERIALS

The Tenderer may propose to use materials other than that specified or shown on the Drawings by providing the required information in the list of Proposed Alternate Materials in the Tender Form. Evaluation of proposed alternate materials will be made by the Owner following the closing of tenders. However, the amount of the Tender must be based on the use of specified materials.

ARTICLE 9. LIST OF MANUFACTURERS AND SUPPLIERS

The Tenderer should indicate in the List of Manufacturers and Suppliers in the Tender Form, the manufacturer or product brand name of the items listed together with the name of the supplier or distributor from which each item will be purchased.

Where more than one supplier or manufacturer is listed or specified, the name of the selected supplier or manufacturer should be inserted. Manufacturers and suppliers should not be changed from those shown in the Tender Form without the written authorization of the Engineer. Failure to complete the list may result in the Tender being considered incomplete.

ARTICLE 10. LIST OF SUBCONTRACTORS

The Tenderer should indicate in the List of Subcontractors in the Tender Form, the names of all subcontractors that it proposes to employ on the work. Subcontractors shall not be changed, or additional subcontractors employed without the written authorization of the Engineer. Failure to submit a complete list may result in the Tender being considered incomplete.

ARTICLE 11. SCHEDULE OF FORCE ACCOUNT RATES

The Tenderer should indicate in the Schedule of Force Account Rates of the Tender Form all personnel and equipment hourly rates likely to be used on the project. These rates will form the basis for payment for cash allowance work and force account work carried out in accordance with Article 40 of the General Conditions. Failure to adequately complete the schedule may result in the Tender being considered incomplete.

ARTICLE 12. REFERENCES

The Tenderer should provide in the list of References in the Tender Form in which the Tenderer has successfully completed other projects of a similar size and nature. The list should include the name and number of the contact person, details of the relevant project, and the overall project cost.

Failure to adequately complete the Reference section may result in the Tender being considered incomplete.

ARTICLE 13. SCHEDULE OF COMPLETION

Tenderers should complete their proposed schedule of completion, based on the number of calendar days to complete all work under the Contract, on Page 1 of the Tender Form. The specified construction period shall begin from the date of the Notice to Proceed and allow sufficient time to achieve Notice of Acceptance or Notice of Partial Acceptance as outlined in the General Conditions, subject to the provisions of Article 41 of the General Conditions for extension of Contract Time. The scheduled timing of completion may be a factor of consideration in the Owner's review and evaluation of a Tender Form.

ARTICLE 14. TENDER PRICE

The unit prices shall be filled in by the Tenderer where indicated in the Schedule of Quantities and Prices of the Tender Form. The prices tendered shall include the supply of all materials except those specified to be supplied by others, all supervision, labour and equipment and a provision for overhead and profit, and shall represent the entire cost to the Owner for the completed works as specified and shown on the Drawings. GST is not to be included in the unit prices tendered as it is shown as a separate cost in the summary.

The unit prices shall be extended in accordance with the quantities shown and the extensions shall be inserted in the space provided. The total Tender Price must be an accurate extension of the unit and lump sum prices submitted and the quantities shown, and the cash allowances. In the event of a discrepancy between the unit prices and extended totals, the unit prices will govern, and the Engineer will correct the extended totals accordingly.

The payment for the work done under the terms of the Contract will be made on the basis of the quantities measured by the Engineer and at the unit prices shown in the Tender Form.

ARTICLE 15. QUANTITIES

The quantities inserted against the various items in the Schedule of Quantities and Prices of the Tender Form have been stated for the purpose of comparing tenders on a uniform basis, but it must be distinctly understood that any quantities shown in the said Schedule are approximate only and that neither the Owner nor the Engineer expressly or by implication represent that the actual quantities will even approximately correspond therewith. No variation in the quantities actually handled shall give rise to any claim against the Owner or the Engineer.

ARTICLE 16. TENDER SIGNING

The Tender Form must be executed by the authorized signatory(s) of the Tenderer.

If the Tenderer is an individual or a partnership, the Tender Form shall be executed by the individual or a partner in the presence of a witness and the signing party must show the capacity in which he or she signs, e.g., "Partner" or "Proprietor"

If the Tenderer is a corporation, then the full name of the corporation must be included, together with the names and signature(s) of the authorized signatory(s).

If the Tenderer is a joint venture, each party to the joint venture must sign personally. If a partner or joint venture is a corporation, then such a corporation must sign as described above.

ARTICLE 17. BID BOND

The Tender must be accompanied by a verifiable digital Bid Bond in an amount not less than ten percent (10%) of the Tender Price.

Tenderers shall submit with the Bid Bond, a verifiable digital Consent of Surety as defined by the Surety Association of Canada, stating that the Surety Company providing the Bid Bond is willing to supply the required Performance and Labour and Material Payment Bonds.

The Bid Bond and Consent of Surety must be issued by a surety company licensed to conduct business in the province or territory wherein the work is located and shall be valid for a period of sixty (60) days following the Tender closing date.

All documentation must be verifiable and digital as defined by the Surety Association of Canada

The Bid Bonds submitted by unsuccessful Tenderers will be returned to them as soon as a contract has been fully executed with the successful Tenderer, or the period for which tenders are irrevocable has elapsed, whichever shall first happen.

ARTICLE 18. TENDER WITHDRAWAL

A Tenderer may, without prejudice to itself, withdraw its Tender on written request provided to the contact named on the Invitation to Tender, and received any time prior to the time set for the closing of tenders.

ARTICLE 19. MODIFICATION OF TENDER

A Tenderer may modify its Tender, prior to the tender closing time. Any modification to the tendered amount must be in writing, and must be submitted to the contact named on the Invitation to Tender prior to the closing time.

Communications and letters must be on the Tenderer's letterhead, and headed "23-040 Nanoose Bay Pump Station No. 6 – Upgrade and Sanitary Forcemain Replacement". The submission must state the amount by which the total Tender Price is decreased or increased, as well as the decrease or increase to each item. The letter must be signed by an authorized company official or individual, and their position and/or title must be stated.

The email address at the closing location is cmathie@rdn.bc.ca. Tenderers may call (250) 758-1157 to determine whether the email has been received. Neither the Owner nor the Engineer accepts responsibility for communications that are not received or only partially received prior to the closing time.

Note that the Tenderer must ensure that the total amount of the Bid Bond is not less than ten percent of the revised Tender Price. If in the opinion of the Owner a Tender modification is incomplete, unclear, or ambiguous as to meaning or intent, it may be disregarded, and the original Tender Price will prevail.

ARTICLE 20. TENDER REJECTION

The Owner reserves the right to reject any or all Tenders; the lowest will not necessarily be accepted.

Without limiting the generality of the foregoing, any Tender may, but need not, be disqualified or rejected which is incomplete, obscure, or irregular, which has erasures or corrections in the Tender Form, in which prices are omitted or are unbalanced, which contains an escalator clause or other qualifying conditions, or which proposes use of an unacceptable surety company. A Tender will be rejected if there is any evidence that the Tenderer has any legal connection with any other company, firm or person submitting a Tender for this work, any knowledge of the Tender Prices to be submitted for this work by others, or any undisclosed connection or arrangement with any other company, firm, or person having a financial interest in the proposed Contract.

The Regional District of Nanaimo may, but need not, in its absolute discretion, reject a Tender submitted by a Tenderer if the Tenderer, or any officer or director of the Tenderer, is or has been engaged either directly or indirectly through another corporation in a legal action against the Regional District of Nanaimo, its elected or appointed officers or employees in relation to:

1. any other contract for works or services; or

2. any matter arising from the Regional District of Nanaimo's exercise of its powers, duties, or functions under the Local Government Act or other enactment.

In determining whether to reject a Tender under this clause, the Regional District of Nanaimo will consider whether the litigation is likely to affect the Tenderer's ability to work with the Regional District of Nanaimo, its consultants and representatives, and whether the Regional District of Nanaimo's experience with the Tenderer indicates that the Regional District of Nanaimo is likely to incur increased staff, consultant, or legal costs in the administration of this Contract if it is awarded to the Tenderer.

The Owner reserves the right to waive informalities in, or reject any or all tenders, or accept the tender deemed most favourable in the interests of the Owner, in the exercise of the Owner's sole and absolute discretion.

ARTICLE 21. TENDER EVALUATION

Tenders may be evaluated based on any combination of the following criteria, with no set priority or weighting:

a) the Tender Price;

b) qualifications and related experience of the Tenderer, including senior personnel and subcontractors to be assigned to this project (this experience includes but is not limited to the projects listed in the Tenderer's Questionnaire in the tender form);

c) performance of the Tenderer and subcontractors on similar projects, including (without limitation) the Tenderer's history with respect to quality of work, scheduling, changes in the work and force account work, and previous experience of the Tenderer and selected subcontractors in the Regional District of Nanaimo on other similar projects;

d) overall cost to the Owner of having the Work completed in accordance with the Tender Documents;

e) the conformity of the Tender to the requirements set forth in the Instructions To Tenderers;

f) the Tenderer' s stated period of completion, and compliance with any time requirements or stipulations provided for in the Contract;

g) any other criterion which the Owner, in its sole and absolute discretion, considers to be in the Owner's best interests.

The Owner reserves the right to make enquiries regarding the qualifications and experience of any one or more of the Tenderers, and shall not be obliged to make the same enquiries regarding all Tenderers.

ARTICLE 22. TENDER ACCEPTANCE

The Owner reserves the right in its sole and absolute discretion to accept the Tender which it deems most advantageous to itself, and the right to reject any or all Tenders. The lowest or any Tender will not necessarily be accepted. In no event will the Owner be responsible for the costs of preparation or submission of a Tender.

Tender Forms which contain qualifications or otherwise fail to conform to the Instructions to Tenderers may, but need not, be disqualified or rejected. The Owner may, however, in its sole and absolute discretion, reject or retain for its consideration Tender Forms which are non-conforming because they do not contain content or form required by the Instructions to Tenderers or fail to comply with the process for submission set out in these Instructions to Tenderers.

The acceptance of any Tender will be subject to budgeted funds being legally available to the Owner for the performance of the Contract.

ARTICLE 23. AWARD

The Owner will, following receipt of an acceptable Tender, issue in writing a Notice of Intent to Award to the successful Tenderer. This notice will be given as soon as possible following the closing of tenders and, unless otherwise agreed to by the Tenderer, not later than sixty (60) days following the closing of Tenders.

Award of the Contract is subject to sufficient budgeted funds being available, and subject to the approval of the Regional District of Nanaimo Board and other outside agencies.

ARTICLE 24. CONTRACT EXECUTION

The successful Tenderer is required to execute the Contract Agreement in the form included in the Tender Document package and deposit with the Owner a Performance Bond and Labour and Material Payment Bond in the format provided in the documents and for the amounts specified in Article 32 of the General Conditions, within ten (10) days of the date of the Notice of Intent to Award of the Contract, such time limit being extended only on the written approval of the Owner. The Certificate of Insurance, WorkSafeBC Notice of Project and updated Construction Schedule are also required with that submission. Once a fully executed contract is in place, the Owner will issue in writing a Notice to Proceed to the Contractor.

If the successful Tenderer fails for any reason to execute the Contract Agreement and to provide the surety bonds stipulated in the General Conditions within the time agreed to in the Tender Form, or such extension of time as may be granted by the Owner, the Owner shall claim against the Tenderer's Bid Bond for payment of the amount of the difference in money between the Tender Price and the amount for which the Owner may legally contract with another party to perform the work, if the latter amount be in excess of the former.

ARTICLE 25. CONFIDENTIALITY

Personal information requested in these documents is obtained for the purpose of reviewing and processing the tender, and for contract administration and enforcement. Personal information submitted in these documents is not considered to be supplied in confidence.

ARTICLE 26. ACCESS TO INFORMATION LEGISLATION

Tenderers should be aware that part or all of the Tenders might be subject to disclosure under the B.C. Freedom of Information and Privacy Act. Tenderers who wish to protect their Tender Forms from disclosure should specifically identify any information within their Tender Form that constitutes a trade secret of business, or commercial information that is explicitly supplied in confidence, and the release of which could significantly harm their competitive position. Neither the Owner nor the Engineer can assure Tenderers that information contained in their Tender Form will remain confidential, since the Freedom of Information and Privacy Act may require disclosure. Tenderers should refer to that legislation, specifically Section 21, for more information. All Tenders become the property of the Regional District of Nanaimo.

ARTICLE 27. NO CLAIM FOR COMPENSATION

Except as expressly and specifically permitted in these Instructions to Tenderers, no Tenderer shall have any claim for compensation of any kind whatsoever against the Owner or the Engineer as a result of participating in this tendering process or of its Tender not being accepted by the Owner, and by submitting a Tender each Tenderer shall be deemed to have agreed that it has no claim.

Any representations in the tender documents are furnished merely for the general information of the Tenderers and are not in any way warranted or guaranteed by or on behalf of the Owner, the Engineer, or the Engineer's sub-consultants, and neither the Owner, the Engineer, nor any of their employees shall be liable for any representations, negligent or otherwise that are contained in these tender documents.

ARTICLE 28. DOCUMENTS AVAILABLE ON RDN AND BC BID SITES

Tender documents will be available for download in electronic (PDF) format from www.rdn.bc.ca/current-bid-opportunities, and the BC Bid website at www.bcbid.gov.bc.ca. Question & Answer Sheets and any Addendums that are issued will also be posted on these websites.

ARTICLE 29. CONFLICT OF INTEREST

The Tenderer declares that it has no financial interest, directly or indirectly in the business of any third party that would be or be seen to be a conflict of interest in carrying out the services. It warrants that neither it nor any of its officers or directors, or any employee with authority to bind the Tenderer, has any financial or personal relationship or affiliation with any elected official or employee of the Owner or the Engineer or their immediate families which might in any way be seen to create a conflict.

ARTICLE 30. SOLICITATION

The Tenderer may not make any representations or solicitations to any director, officer or employee of the Owner or the Engineer with respect to the Tender either before or after submission of the Tender except as provided herein. If any director, officer, employee, agent sub-contractor, supplier or other representative of the Tenderer communicates with any director, officer or employee of the Owner or any consultant engaged by the Regional District of Nanaimo in connection with this Invitation to Tender, other than the person named as the contact, the Owner shall have the unfettered right, regardless of the nature of the communication, to reject the Tender submitted by the Tenderer.

ARTICLE 31. WORKSAFEBC SUPPLEMENTARY ORDERS

The Tenderer is advised that the successful Contractor must forward a copy of its current Occupational Health & Safety Program document, WorkSafeBC Notice of project, and WorkSafeBC Clearance Letter prior to the pre-construction meeting.

The Tenderer is advised that the work area may have operations and/or site conditions that could present a potential hazard to workers and other persons at the work site.

The Tenderer is advised that the successful Contractor will need to address the potential hazards, in developing their own site-specific safe work procedures that will be utilized to protect the health and safety of all workers and persons on this project.

The Tenderer is also advised that WorkSafeBC now considers trenches to be a confined space. The successful Contractor will need to incorporate measures into their safe work procedures to address this requirement. Tenderers are referred to WorkSafeBC OHS Regulation Section G9.1-1.

ARTICLE 32. TIMING OF THE WORK

All work shall be completed within the time specified on the Tender Form. The Contractor is expected to provide full and continuous operations without delay once construction has commenced.

ARTICLE 33. CONSTRUCTION SCHEDULE

The Tenderer is advised that prior to commencing construction, the successful Contractor shall provide to the Engineer for review a weekly Construction Schedule listing the work tasks and their expected duration.

ARTICLE 34. ENVIRONMENTAL MANAGEMENT PLAN

The Tenderer is advised that prior to commencing construction, the successful Contractor shall provide an Environmental Management Plan to the Engineer for review. This plan shall describe the proposed methodology to minimize potential impact on the surrounding environment, and shall contain, at a minimum, items addressing the following issues, and those noted in sections 01010 and 01330 of the Contract Documents:

The Tenderers are advised that the downstream drainage courses lead to sensitive aquatic habitat, and that the Contractor will be required to take the necessary measures to protect the aquatic habitat in this area.

- Details relating to dust control and removal from roads.

- The expected hours of operation and noise control measures.
- An outline of a spill containment procedure, complete with spill kit details, and planned reporting procedures.
- The proposed locations of stockpiled material and methods designated to protect any stockpiled material.
- The details relating to the use of concrete to ensure that it is used in an environmentally benign manner.
- The methods used to control silt and sediment runoff, including steps taken to prevent the release of any deleterious material from entering any natural watercourse or body.
- The methods used to control trench water.
- An acknowledgement that all waste will be disposed of in accordance with applicable regulations.
- An outline of materials expected to be removed from the work area, and the location of the intended dumpsite(s).

ARTICLE 35. TRAFFIC CONTROL

Further to the traffic control and access to property requirements outlined in other sections of this document, the Tenderer is advised that following the submission of an acceptable Traffic Management Plan, portions of the work areas may be closed, and traffic detoured around the work area during construction provided that the following items are implemented as a minimum.

The Traffic Management Plan shall outline all methods that will be used to safely manage traffic within, and next to the work area and should include content the following items and those noted in Sections 01010 and 01330 of the Contract Documents.

- Areas of interruption to be minimized.
- Access to any of the individual lots must be maintained for local traffic.
- All applicable emergency services are notified.
- All appropriate signage and warning devices are implemented and relocated in an approved manner.
- Adequate notice is supplied to the affected residents.
- Coordinate any alternative means necessary to accommodate the needs of RDN Transit, the RCMP, local Fire Department, and the BC Ambulance.
- Work in multiple areas of the site shall not create conflicting traffic patterns.
- A listing of 24-hour emergency contact information to be provided

The Traffic Management Plan must be approved in writing by the Owner prior to closure of any Public roadway, or private access. Access for emergency vehicles is to be maintained at all times. Two-way uninterrupted traffic is to be maintained during non-working hours. Signs shall be placed as necessary to control traffic and provide all reasonable measures to warn the public of possible hazards.

ARTICLE 36. TESTING

The Owner may employ a Materials Testing Consultant during the work to test work and materials to determine if they are in general compliance with the Contract Documents. The Contractor shall co-ordinate their work with the Consultant to ensure that the testing is done efficiently and that no delays are caused. Intermittent or spot testing of portions of the work does not relieve the Contractor of their responsibility to meet the contractual obligations. Re-testing required due to defective material or workmanship will be done at the Contractor's expense.

ARTICLE 37. MATERIALS

No claim by the Contractor of unsuitability or unavailability of any material, nor their unwillingness to use, nor their inability to produce, first class work with same, will be considered unless submitted to the Engineer in writing 7 days before the Tender closing date.

ARTICLE 38. USE OF RDN FACILITIES

The Tenderer's attention is drawn to Article 23 of the General Conditions. The successful Contractor will be required to provide all water, power, and sanitary facilities necessary for the execution of this Contract, including that which is required for compaction or to pressure test, flush, and obtain water samples.

ARTICLE 39. EXISTING UTILITIES

Existing utilities shall remain in service during construction. Disruption of service will only be permitted during tie-ins or connection of overland or other types of temporary servicing as approved by the Engineer.

The Contractor shall be liable for damages resulting from the blockage, breakage, or other failure of temporary services or bypass pumping. The Tenderer shall include all costs for installation, maintenance, and removal of temporary servicing and bypass pumping in the applicable tender price.

The Tenderers are advised that the Contractor will be responsible for locating the existing sanitary sewer service connections to each property in the project area and to identify the location and depth of each service at the property line. Damage resulting from the failure to accurately locate, maintain, or reconnect the existing sanitary sewer connections will be sole responsibility of the Contractor.

ARTICLE 40. PUBLIC SAFETY

The Contractor shall be responsible for ensuring that public safety is protected at all times. Measures to warn the public and keep the public from entering the work area during the construction period will be required until the Notice of Acceptance is issued by the Owner.

ARTICLE 41. SUBMITTALS

The Tenderer is advised that prior to commencing construction, the successful Contractor shall provide to the Engineer for review, a Construction Schedule, Traffic Management Plan, and Environmental Management Plan. Refer to Section 01330 Submittals for details.

TO: **Chris Mathie, P.Eng.**
Regional District of Nanaimo
cmathie@rdn.bc.ca

FROM:

_____
Name of Contractor

_____
Business Address

_____
City, Postal Code

Ladies and Gentlemen:

The undersigned Tenderer, having carefully examined the Contract Documents and the locality of the proposed work, and having full knowledge of the work required and of the materials, to be furnished and used, hereby agrees to provide all necessary materials, supervision, labour, and equipment and perform and complete all work and fulfill everything as set forth and in strict accordance with the Contract Documents and Addenda numbered *_____for the prices stated in the Tender Form Schedule of Quantities and Prices. All prices are in Canadian Dollars excluding GST which shall be shown separately.

The undersigned also agrees:

1. That the Owner is in no way obligated to accept this or any other Tender.

2. That should the Tender Form be improperly completed or be incomplete, the Owner shall have the right to disqualify and/or reject this Tender.

3. That this Tender is made without knowledge of the tender prices to be submitted for this work by any other company, firm, or person.

4. That this Tender is made without any connection or arrangement with any company, firm, or person submitting a tender for this work.

5. That this Tender is made without any undisclosed connection or arrangement with any other company, firm, or person having an interest in this tender or in the proposed Contract.

6. That this Tender is irrevocable for sixty (60) days after the closing date for receipt of tenders and that the Owner may at any time within such period accept this tender.

7. To deposit with the Owner a Performance Bond and Labour and Material Payment Bond on the forms provided in the documents and for the amounts specified in Article 32 of the General Conditions, within ten (10) days of the date of the Notice of Intent to Award of the Contract, such time limit being extended only on the written approval of the Owner.

8. To execute the Contract Agreement and Contract Documents as directed in writing by the Engineer, and return these executed documents to the Engineer within three (3) business days of receiving the documents and written instructions. Such time limit being, extended only on the written approval of the Engineer.

9. To commence and proceed actively with the work within a period of seven (7) calendar days of issuing of the Notice to Proceed, and to complete all work under the Contract within a period of _____* calendar days from the date of the Notice to Proceed subject to the Provisions of Article 41 of the General Conditions for extension of Contract time.

* To be completed by Tenderer

10. That should he fail to complete the work in the time specified above, he shall compensate the Owner in accordance with Article 37 of the General Conditions.

11. 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 Article 39 of the General Conditions.

12. That the estimate of quantities shown in the Tender Form serves only to provide a basis for comparing tenders and that no representations have been made by either the Owner or the 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.

13. That payment for the work done will be made on the basis of the quantities measured by the Engineer and at the prices shown in the Tender Form which shall be compensation in full for the work done under the terms of the Contract.

14. That the 'provisional' items listed in the Tender Form are estimates only and the actual quantities may vary significantly, however no adjustment to the unit rates will be considered.

REGIONAL DISTRICT OF NANAIMO
NANOOSE BAY PUMP STATION NO. 6 UPGRADE
& SANITARY FORCEMAIN REPLACEMENT

SCHEDULE OF QUANTITIES AND PRICES

The following are our tendered prices for the cost of the work for each item as outlined in the payment clauses in the specification. Work required, but not specifically mentioned, is included in the item with which it is most closely associated.

Item	Description	Section	Qty	Unit	Unit Price	Extension
1.0	**DIVISION 01 – General Requirements**					
1.1	**General Requirements**					
0.1	General Requirements	01 11 00	1	LS		
0.2	Submittals	01 33 00	1	LS		
0.3	Temporary Bypass Pumping	01 57 00	1	LS		
1.2	**Site Treatment**					
0.1	Surface Restoration with Granular Base	01 57 10	1	LS		
0.2	Surface Restoration with Topsoil and Hydroseed	01 57 10	1	LS		
2.0	**DIVISION 26 – Electrical**					
2.1	**Electrical, Instrumentation & Controls, including Installation of Owner Supplied Items, and as Shown on the Drawings**	26 05 00	1	LS		
3.0	**DIVISION 31 – Earthwork**					
3.1	**Location of Existing Utilities**					
0.1	Expose Existing 200mm dia. PVC Watermain, Sta. 1+025	31 01 30	1	ea.		
0.2	Expose Existing 300mm dia. PVC Outfall, Sta. 1+190, 1+205	31 01 30	2	ea.		
0.3	Expose Existing 25mm dia. Water Service, Sta 1+192	31 01 30	1	ea.		

Item	Description	Section	Qty	Unit	Unit Price	Extension
0.4	Expose Existing Underground Hydro Service, Sta. 1+193	31 01 30	1	ea.		
0.5	Expose Existing 200mm dia. PVC Sanitary Main, Sta. 1+317, 3+334	31 01 30	2	ea.		
3.2	**Removal of Existing Items**					
0.1	Remove and Dispose of Existing Retaining Wall, Stairs and all associated landscaping features	31 01 30	1	ea.		
0.2	Remove Existing Water Service Heat Trace, Water Box, Service and Meter	31 01 30	1	ea.		
0.3	Remove Existing Kiosk, Wet Well Aluminum Cover, Vent, and Ladder	31 01 30	1	ea.		
3.3	**Support Existing Utility Pole**	31 01 30	1	ea.		
3.4	**Tree & Vegetation Removal**	31 11 00	1	LS		
3.5	**Authorized Rock Excavation (Provisional*)**	31 23 33.01	25	m^3		
3.6	**Authorized Over Excavation with 25mm Minus Import Backfill (Provisional*)**	31 23 33.01	25	m^3		
3.7	**Authorized Over Excavation with 75mm Minus Import Backfill (Provisional*)**	31 23 33.01	90	m^3		
4.0	**DIVISION 33 – Utilities**					
4.1	**Manholes and Misc. Structures**					
0.1	1050 dia. Sanitary Manhole A, complete	33 05 16	1	ea.		
0.2	1350 dia. Sanitary Manhole B, complete	33 05 16	1	ea.		
0.3	1050 dia. Sanitary Manhole C (Transition), complete	33 05 16	1	ea.		

Item	Description	Section	Qty	Unit	Unit Price	Extension
0.4	600 dia. Pigging Port Barrel, complete	33 05 16	1	ea.		
0.5	Concrete Expansion/Contraction Anchor	33 05 16	1	LS		
4.2	**Sanitary Sewer Piping**					
0.1	200mm dia. DR 17 HDPE	33 31 11	185	lm.		
0.3	200mm dia. DR 18 PVC	33 31 11	10	lm.		
0.2	200mm dia. DR 35 PVC	33 31 11	20	lm.		
0.4	250mm dia. DR 35 PVC	33 31 11	5	lm.		
0.5	25mm dia. PE Water Service Pipe	33 31 11	10	lm.		
0.6	316L Schedule 40 Stainless Steel Pipe and Fittings, as per the Drawings	33 31 11	1	LS		
4.3	**Sanitary Sewer Tie-ins**					
0.1	Tie-in to Existing Sanitary Manhole	33 31 11	1	ea.		
0.2	Tie-in to 200mm dia. PVC Sewer	33 31 11	2	ea.		
0.3	Tie-in to Existing Wet Well	33 31 11	1	ea.		
4.4	**Sanitary Fittings, not included at tie-ins**					
0.1	200mm dia. Long Radius 45^{o} PVC Bend	33 31 11	1	ea.		
0.2	200mm dia. Gate Valve (H x H) c/w Restraints	33 31 11	1	ea.		
0.3	200mm dia. HDPE Flange Adapter, c/w SS backing flange	33 31 11	1	ea.		
4.5	**Nanoose Bay Pump Station No. 6**					
0.1	Pump Station Mechanical Underground and Inside the Wet Well: including wet well modifications, installation of Flygt pump discharge connections, rails, supports, accessories, hardware, level devices, pig loading port, and all associated appurtenances as shown on the Drawings.	33 32 13.13	1	LS		

Item	Description	Section	Qty	Unit	Unit Price	Extension
0.2	Pump Station Mechanical Above Ground and Inside the Kiosk: including installation of Owner supplied kiosk, valves, flow meters, back flow preventor, supports, water service modifications, and all associated appurtenances as shown on the Drawings.	33 32 13.13	1	LS		
0.3	Kiosk Concrete Pad Structure: including excavation and disposal, backfill, site grading, hatch, penetrations, formwork, fall arrest anchor, davit crane base, floor drain, concrete placement, finishing, curing, and stripping, and all associated Work and appurtenances as shown on the Drawings.	33 32 13.13	1	LS		

SUBTOTAL TENDER PRICE _____

PLUS 5% GST _____

TOTAL TENDER PRICE _____

*Provisional items listed in the Tender Form are estimates only and actual quantities may vary considerably. No adjustment to the unit price will be considered.

TENDERER'S QUESTIONNAIRE

We provide the following information in order that the Owner may judge our ability to fulfil the Contract requirements.

1. The size, model, and make of the equipment which we will place on the project and use during the course of the works is as follows:

EQUIPMENT	SIZE	MODEL	MAKE
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

2. The average number of workers we will employ and maintain on the project is _____.

3. The name of the superintendent that we propose to place on the project and his previous experience on the construction of similar projects is as follows:

_____
_____
_____
_____
_____
_____

LIST OF MANUFACTURERS AND SUPPLIERS

The following is a list of suppliers from whom we intend to purchase the various items of material indicated, together with the product brand name or the name of the manufacturer of each.

We will alter neither products nor suppliers from those listed below without the written authorization of the Engineer.

Item	Product Brand Name or Manufacturer	Supplier
HDPE Pipe & Fittings	_____	_____
Knife Gate Valves	_____	_____
Check Valves	_____	_____
Stainless Steel Pipe	_____	_____
Air Release Valve	_____	_____
Hatch	_____	_____
Asphalt	_____	_____

Critical Delivery Materials:

Item	Price	Anticipated Delivery Date	Supplier
Flygt Accessories	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

SCHEDULE OF FORCE ACCOUNT RATES

The following personnel and equipment rates will form the basis of payment for force account work carried out in accordance with Article 40 of the General Conditions. Hourly rates shall include all mark-ups, including any applicable general contractor's mark-up on subcontractor's hourly rates.

PERSONNEL:

List By Occupation (c/w truck, tools etc.)	**Hourly Rate**	**Overtime**
Superintendent	_____	_____
Foreman	_____	_____
Labourer	_____	_____
Carpenter	_____	_____
Operator	_____	_____
Flagger	_____	_____
Electrician	_____	_____
Others (specify)	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

EQUIPMENT: (complete with Operator)

Description	**Hourly Rate**	**Model & Size**
Excavator (large size)	_____	_____
Excavator (medium size)	_____	_____
Excavator (small size)	_____	_____
Rubber-tired Backhoe	_____	_____
Vac Truck	_____	_____
Dump Truck	_____	_____
Truck and pup	_____	_____
Hydraulic Breaker	_____	_____
Others (specify)	_____	_____
_____	_____	_____
_____	_____	_____

LIST OF SUBCONTRACTORS

It is our intention that the following work will, subject to the Engineers approval, be subcontracted to the firms indicated below. All other work will be performed by our own forces, except as authorized by the Engineer.

Trade/Payment Method	Name & Address of Subcontractor
Electrical	_____
Mechanical	_____
Concrete	_____
Rebar	_____
Traffic Control	_____
Hydraulic Seeding	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

CONTRACTOR REFERENCES

Owner/Client: _____

Contact Person and Telephone No.:_____

Total Contract Amount: _____

Project Description and date: _____

_____

Owner/Client: _____

Contact Person and Telephone No.:_____

Total Contract Amount: _____

Project Description and date: _____

_____

Owner/Client: _____

Contact Person and Telephone No.:_____

Total Contract Amount: _____

Project Description and date: _____

_____

Owner/Client: _____

Contact Person and Telephone No.:_____

Total Contract Amount: _____

Project Description and date: _____

_____

Contractor's Signature Authorizing the Regional District of Nanaimo to Contact References Listed Above:

_____

Signature & Date

SIGNATURES

This Tender is signed at _____

this_____day of_____, 20____

_____
Name of Firm

_____
Address

_____

FOR INDIVIDUAL OR PARTNERSHIP

SIGNED AND DELIVERED by:

_____ _____
(Please Print) (Signature)

in the presence of:

_____
Name

_____
Address

_____
Occupation

FOR A LIMITED COMPANY:

The Corporation of:

_____
(Please Print)

was hereunto affixed in the presence of:

_____
Authorized Signing Officer and Title

_____
Authorized Signing Officer and Title

THIS AGREEMENT made this __ day of _____ in the year 2023, by and between the Regional District of Nanaimo, herein called the "Owner", and_____, herein called the "Contractor".

WITNESSETH: that the Contractor and the Owner undertake and agree as follows:

ARTICLE 1.

The Contractor shall:

1. Provide all materials, labour, supervision, and equipment, and perform all work and fulfil everything as set forth and in strict accordance with the Contract Documents for the project entitled "Regional District of Nanaimo – Nanoose Bay Pump Station No. 6 Upgrade & Sanitary Forcemain Replacement", which have been prepared by Koers & Associates Engineering Ltd., acting as and hereby entitled the Engineer; and

2. Commence actively with the work of the Contract within a period of seven (7) calendar days of receipt of the Notice to Proceed and complete all work under this contract within a period of ____ calendar days from the date of the Notice to Proceed, subject to the provisions herein for the extension of Contract time, and shall guarantee all materials furnished and work performed, for a period of twelve months from the date of acceptance contained in the Notice of Acceptance.

ARTICLE 2.

The Owner will pay to the Contractor as full compensation for the performance and fulfilment of this Contract, the sum or sums of money specified herein in the manner and at the times specified in the Contract Documents.

ARTICLE 3.

The Invitation to Tender, Instructions to Tenderers, executed Tender Form, Supplementary General Conditions, General Conditions, Specifications, Appendices, Drawings, and all Addenda incorporated herein, are annexed hereto and form a part of this Agreement as fully to all intents and purposes as though recited in full herein, and the whole shall constitute the Contract between the parties and it shall ensure to the benefit of and be binding upon them and their successors, executors, administrators, and assigns.

ARTICLE 4.

No implied contract of any kind whatsoever, by or on behalf of the Owner, shall arise or be implied from anything contained in this Contract or from any position or situation of the parties at any time, it being understood and agreed that the express contracts, covenants, and agreements contained herein and made by the parties hereto are and shall be the only contracts, covenants, and agreements on which any rights against the Owner may be founded.

ARTICLE 5.

Subject to Article 3, this Agreement shall supersede all communications, negotiations, and agreements, either written or verbal, made between the parties hereto in respect of matters pertaining to this agreement prior to the execution and delivery hereof.

ARTICLE 6.

All communications in writing between the parties or between them and the Engineer shall be deemed to have been received by the addressee if delivered to the individual, or to a member of the firm, or to any officer of the corporation for whom they are intended, or if sent by mail addressed as follows:

The Contractor at: _____

The Owner at: 6300 Hammond Bay Road, Nanaimo, B.C., V9T 6N2

The Engineer at: P.O. Box 790, 194 Memorial Avenue, Parksville, B.C., V9P 2G8

ARTICLE 7.

This Agreement is to be construed in accordance with and governed by the laws applicable in the Province of British Columbia.

IN WITNESS WHEREOF the parties hereto have executed this Agreement the day and year above first written.

FOR INDIVIDUAL OR PARTNERSHIP

SIGNED AND DELIVERED by

_____

(Please Print) (Signature)

in the presence of:

_____

Name

_____

_____

Address

_____

Occupation

FOR LIMITED COMPANY

_____

(Please Print Full Name of Company)

_____

Authorized Signing Officer and Position

_____

Authorized Signing Officer and Position

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

FOR OWNER

THE REGIONAL DISTRICT OF NANAIMO

_____

AUTHORIZED SIGNING OFFICER

_____

POSITION

_____

AUTHORIZED SIGNING OFFICER

_____

POSITION

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 2007 , for in accordance with the Specifications and Drawings submitted therefor which contract, Specifications and Drawings, are by reference made part hereof and are hereinafter referred to as the Contract.

Now, Therefore, the Condition 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 effect.

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 may 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 the 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 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 the 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 final payment under the Contract falls due.

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

No right of action shall accrue on this Bond, to or for the use of, any person or cooperation 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 2007

Signed and Sealed

((SEAL)

In the presence of (

((SEAL)

Endorsed by
Insurance Bureau of Canada
The Royal Architectural Institute of Canada
The Association of Consulting Engineers of Canada
The Engineering Institute of Canada
The Specification Writers Association of Canada

Approved by
Insurance Bureau of Canada

_____
Attorney-in-fact

Approved by Canadian Construction Association, 1972

LABOUR AND MATERIAL PAYMENT BOND

(Trustee Form)

No. $

NOTE: This Bond is issued simultaneously with another Bond in favour of the Obligee conditioned by the full and faithful performance of the Contract.

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 Trustee, hereinafter called the Obligee, for the use and benefit of the Claimants, their and each of their heirs, executors, administrators, successors and assigns in the amount of

($)of 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 entered into a written contract with the Obligee, dated the day of 2007 , for

which contract, Specifications & Drawings are by reference made a part hereof, and is hereinafter referred to as the Contract.

No, Therefore, the Condition of This Obligation is such that if the Principal shall make payment to all Claimants for all labour and material used or reasonably required for use in the performance of the Contract then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

(1) A Claimant for the purpose of this Bond is defined as one having a direct contract with the Principal for labour, material, or both, used or reasonably required for use in the performance of the Contract, labour and material being construed to include that part of water, gas power, light, heat, oil, gasoline, telephone service or rental equipment directly applicable to the Contract provided that a person, firm or cooperation who rents equipment to the Principal to be used in the performance of the Contract under a contract which provides that all or any part of the rent is to be applied towards the purchase price thereof, shall only be a Claimant to the extent of the prevailing industrial rental value of such equipment for the period during which the equipment was used in the performance of the Contract. The prevailing industrial rental value of equipment shall be determined, insofar as it is practical to do so, in accordance with and in the manner provided for in the latest revised edition of the publication of the Canadian Construction Association titled "Rental Rates on Contractors' Equipment" published prior to the period during which the equipment was used in the performance of the Contract.

(2) The Principal, and the Surety hereby jointly and severally agree with the Obligee, as Trustee, that every Claimant who has not been paid as provided for under the terms of his contract with the Principal, before the expiration of a period of ninety (90) days after the date on which the last of such Claimant's work or labour was done or performed or materials were furnished by such Claimant, may as a beneficiary of the trust herein provided for, sue on this Bond, prosecute the suit to final judgment for such sum or sums as may be justly due to such Claimant under the terms of his contract with the Principal and have execution thereon. Provided, that the Obligee is not obliged to do or take any act, action or proceeding against the Surety on behalf of the Claimants, or any of them, to enforce the provisions of this Bond. If any act, action or proceeding is taken either in the name of the Obligee or by joining the Obligee as a party to such proceeding, then such act, action or proceeding shall be taken on the understanding and basis that the Claimants, or any of them, who take such act, action or proceeding shall indemnify and save harmless the Obligee against all costs, charges and expenses or liabilities incurred thereon and any loss or damage resulting to the Obligee by reason thereof. Provided still further that, subject to the foregoing terms and conditions, the Claimants, or any of them, may use the name of the Obligee to sue on and enforce the provisions of this Bond.

(3) No suit or action shall be commenced hereunder by any Claimant:

(a) unless such Claimant shall have given written notice within the time limits hereinafter set forth to each of the Principal, the Surety and the Obligee, stating with substantial accuracy the amount claimed. Such notice shall be served by mailing the same by registered mail to the Principal, the Surety and the Obligee, at any place where an office is regularly maintained for the transaction of business by such person or served in any manner in which legal process may be served in the Province or other part of Canada in which the subject matter of the Contract is located. Such notice shall be given

(1) in respect of any claim for the amount or any portion thereof required to be held back from the Claimant by the Principal, under either the terms of the Claimant's contract with the Principal, or under the Mechanics' Liens Legislation applicable to the Claimant's contract with the Principal, whichever is the greater, within one hundred and twenty (120) days after such Claimant should have been paid in full under the Claimant's contract with the Principal;

(2) in respect of any claim other than for the holdback, or portion thereof, referred to above, within one hundred and twenty (120) days after the date upon which such Claimant did, or performed, the last of the work or labour or furnished the last of the materials for which such claim is made, under the Claimant's contract with the Principal;

(b) after the expiration of one (1) year following the date on which Principal ceased work on the Contract, including work performed under the guarantee provided in the Contract;

(c) other than in a court of competent jurisdiction in the Province or District of Canada in which the subject matter of the Contract, or any part thereof, is situated and not elsewhere, and the parties hereto agree to submit to the jurisdiction of such court.

(4) The Surety agrees not to take advantage of Article 1959 of the Civil Code of the Province of Quebec in the event that, by an act or an omission of a Claimant, the Surety can no longer be subrogated in the rights, hypothecs and privileges of said Claimant.

(5) The amount of this Bond shall be reduced by, and to the extent of any payment or payments made in good faith, and in accordance with the provisions hereof, inclusive of the payment by the Surety of Mechanics' Liens which may be filed of record against the subject matter of the Contract, whether or not claim for the amount of such lien be presented under and against this Bond.

(6) The Surety shall be liable for a greater sum than the specified penalty of this Bond.

In Witness Whereof, the Principal and the Surety have Signed and Sealed this Bond this day of 2007

Signed and Sealed ((SEAL)

In the presence of (

((SEAL)

Endorsed by
The Royal Architectural Institute of Canada
The Association of Consulting Engineers of Canada
The Canadian Construction Association
The Engineering Institute of Canada
The Specification Writers Association of Canada

Approved by
Insurance Bureau of Canada

_____
Attorney-in-fact

CERTIFICATE OF INSURANCE

ISSUED TO:

PROJECT: - Description:

- Location:

This is to certify that insurances as described herein have been arranged through this office for the insured named below on whose behalf this Certificate is executed and we hereby certify that such insurances are in full force and effect as of this date, but only with respect to the type(s) of insurance for which a policy number, policy period and limits of liability or amount is shown.

SCHEDULE OF INSURANCE			
TYPE OF INSURANCE	**COMPANY AND POLICY NUMBER**	**EFFECTIVE & EXPIRY DATES OF POLICY**	**LIMIT OF LIABILITY/AMOUNT**
COMPREHENSIVE GENERAL LIABILITY		Effective: Expiry: WRAP UP ❑	BODILY INJURY $_____ EACH PERSON $_____ EACH ACCIDENT $_____ AGGREGATE PRODUCTS PROPERTY DAMAGE $_____ EACH ACCIDENT $_____ AGGREGATE PRODUCTS BODILY INJURY & PROPERTY DAMAGE $_____ INCLUSIVE $_____ AGGREGATE PRODUCTS
EMPLOYERS LIABILITY		Effective: Expiry:	$_____ EACH PERSON $_____ EACH ACCIDENT
AUTOMOBILE LIABILITY (OWNED/LEASED VEHICLES)		Effective: Expiry:	BODILY INJURY $_____ EACH PERSON $_____ EACH ACCIDENT PROPERTY DAMAGE $_____ EACH ACCIDENT BODILY INJURY & PROPERTY DAMAGE $_____ INCLUSIVE
AUTOMOBILE LIABILITY NON-OWNED VEHICLES		Effective: Expiry: WRAP UP ❑	BODILY INJURY $_____ EACH PERSON $_____ EACH ACCIDENT PROPERTY DAMAGE $_____ EACH ACCIDENT BODILY INJURY & PROPERTY DAMAGE $_____ INCLUSIVE
UMBRELLA LIABILITY		Effective: Expiry:	$_____ LIMITS EXCESS OF $_____
BUILDERS RISK / INSTALLATION FLOATER		Effective: Expiry: WRAP UP ❑	$_____ SITE $_____ OTHER LOCATION $_____ TRANSIT
CONTRACTORS EQUIPMENT		Effective: Expiry:	$_____
WORKER'S COMPENSATION		Effective: Expiry:	AS REQUIRED BY THE ORDINANCE(S) OF THE
OTHER			

PARTICULARS OF INSURNACE

GENERAL LIABILITY	**BUILDERS RISK/INSTALLATION FLOATER**
❑Premises, Property and Operations ❑Products and Completed Operations ❑Blanket Contractual (all written agreements) ❑Tenants Fire Legal Liability ❑Owners and Contractors Protective ❑Occurrence Bodily Injury and Property Damage ❑Broad Form Property Damage ❑Contingent Employers Liability ❑Personal Injury ❑Employees as Additional Insured ❑Severability of Interest or Cross Liability ❑Exclusions pertaining to Blasting, Collapse, Underpinning, deleted as follows: ❑Owner as Additional Named Insured ❑Provides Coverage for Claims arising from use of Machinery and Equipment attached to licensed construction machinery on Project Site ❑ Waiver of Subrogation against Named Insured ❑30 Days Notice of Cancellation or Material Change ❑ ❑ ❑	❑All Risk Form ❑Fire, Extended Coverages, Riot, Vandalism or Malicious Acts ❑Difference in Conditions ❑Flood Included ❑Earthquake included ❑Excludes Faulty Workmanship, Faulty Construction or Faulty Design but no loss resulting therefrom ❑Covers Transit by Land ❑Covers Boiler Explosion during installation, Temporary Operation and Testing ❑Covers Owner as Additional Named Insured ❑Grants Permission for Occupancy prior to completion ❑Waiver of Subrogation Against Named Insureds ❑30 Days Notice of Cancellation or Material Change ❑ ❑ ❑ ❑
CONTINGENT EMPLOYERS LIABILITY	**CONTRACTORS EQUIPMENT**
❑30 Days Notice of Cancellation of Material Change ❑	❑Subrogation Waived Against Owner ❑Subrogation Waived Against Owner, Construction or Project Manager, Architects and Engineers ❑30 Days Notice of Cancellation of Material Change ❑ ❑ ❑
AUTOMOBILE	**NON-OWNED AUTOMOBILE**
❑15 Days Notice of Cancellation or Material Change ❑	❑15 Days Notice of Cancellation of Material Change ❑
MARINE/AIRCRAFT ❑30 Days Notice of Cancellation **MARINE/AIRCRAFT/CARGO** ❑30 Days Notice of Cancellation or Material Change ❑	**OTHERS** ❑ ❑ ❑ ❑ ❑
❑INDICATES THAT THE COVERAGE/ENDORSEMENT INDICATED IS INCLUDED	

REMARKS (STATE DEDUCTIBLE IF ANY)

TERMS AND CONDITIONS

This Certificate is issued for convenience only. All of the terms and conditions of the Policies referred to are contained in the original document which are not modified or amended by this Certificate.
In the event of cancellation or material change of the Policies referred to herein, the Insurer and/or the undersigned will provide written notice as indicated above.

DATED: _____

_____
Authorized to sign on behalf of Insured

1.0 REVISIONS TO GENERAL CONDITIONS

The General Conditions are hereby revised as follows:

1.1 ARTICLE 1. DEFINITION OF TERMS

Delete the second paragraph and add the following:

"Contractor" shall mean the Prime Contractor as defined by the Occupational Health and Safety rules and regulations, for this project.

The successful Tenderer is designated as the Prime Contractor and shall fulfill the Prime Contractor responsibilities as defined in:

a) WorkSafeBC Occupational Health and Safety Regulation, Notice of Project, Section 20.2, and Coordination of multiple employer workplaces, Section 20.3;
b) Workers Compensation Act (BC), Coordination at multiple-employer workplaces, Section 118, Subsections (1) & (2); and
c) General Requirements, Section 3.10 WorkSafe BC.

The Prime Contractor must have the necessary qualifications be willing to accept the responsibilities as Prime Contractor for the project. They will be required to coordinate the safety of all workers on the work site.

1.2 ARTICLE 4. DOCUMENT CONFLICT

Delete the list of precedence and add the following list of precedence:

.1 Contract Agreement
.2 Supplementary General Conditions
.3 General Conditions
.4 Duly executed Tender Form
.5 Addenda
.6 Specifications,
.7 Drawings
.8 Appendices
.9 Other relevant documents such as but not limited to letters of clarification and any reports, standards or the like.
.10 The duly executed Bonds

1.3 ARTICLE 7. LOCATION OF THE WORKS

Delete and replace with the following:

.1 Where location dimensions for the proposed works are not shown on the drawings or digital file, the locations are intended to be approximate.

.2 Unless otherwise specified, the Engineer will provide the contractor with a copy of the digital drawing file for the Contractor and/or their surveyor to create a point file to be used for layout to perform the construction works.

.3 The Contractor shall perform all layout as required from the digital drawing file and shall be responsible for all dimensions and elevations determined from the digital information.

.4 The Contractor shall satisfy themselves, before commencing any work, as to the meaning, intent, and accuracy of the information in the digital drawing file as it relates to control points, control lines, benchmarks, and the construction drawings.

.5 Should the Contractor discover or suspect any errors in the digital drawing file provided by the Engineer, they shall at once discontinue the affected work until such errors are investigated by the Engineer and, if necessary, rectified.

.6 The Contractor shall carefully preserve bench marks, reference points and stakes. In case of willful or careless destruction or disturbance of such markers, they shall be charged with the expense of replacing them and shall be responsible for any mistakes that may be caused by their destruction, loss or disturbance.

.7 In any dispute between the Contractor and the Engineer on the correctness of grades, locations, elevations of the installations or constructed works, the Contractor shall be responsible for proving by means of cut sheets and undisturbed stakes, that they have made the installation or construction in accordance with the layout provided.

.8 The Contractor shall be required to maintain a "record drawings" set for the project, with all changes and notes marked in red ink and a "record" digital survey file. This information shall be available to the Engineer for review on request, and shall be submitted to the Engineer prior to issuing the Notice of Acceptance.

.9 Legal survey markers, disturbed or removed by the construction operation that existed at a horizontal distance of 1.0 m or more from the maximum allowable trench width as shown on the standard drawings, shall be replaced at the Contractor's expense. If it is necessary to remove or disturb existing legal survey markers that are within the above limits, the Engineer shall be so notified a minimum of three working days before such removal or disturbance and replacement will be at the Owner's expense.

1.4 ARTICLE 18. CONTRACTORS'S TERMINATION OF THE CONTRACT

In the third paragraph, delete twenty (20) days and replace with thirty (30) days.

1.5 ARTICLE 23. MATERIALS BY CONTRACTOR

Delete the last paragraph:

"All materials provided by the Contractor in order to complete the Work shall vest in and become the property of the Owner as soon as the same are delivered to the site of the Works, but shall remain in the custody and at the risk of the Contractor."

1.6 ARTICLE 34. PERMITS AND REGULATIONS

Add the following paragraph:

" Working hours for construction shall be in accordance with the Regional District of Nanaimo Bylaw No. 1054. Unless approval is obtained from the District, no equipment shall be started prior to 7:00 am, and all equipment must be shut off prior to 10:00 pm. Unless approval is obtained from the District, with no Work performed on Sunday; no Work shall take place on any statutory holiday."

1.7 ARTICLE 36. NOTICE TO PROCEED

Add the following:

The Notice to Proceed will not be issued until the Contractor has provided the Owner with a copy of the "Notice of a Construction Project" required by the WorkSafeBC as filed by the Contractor with the Board and a Weekly Construction Schedule listing the work tasks and their expected duration.

1.8 ARTICLE 43. PROGRESS PAYMENT CERTIFICATES

In the second paragraph, delete the last sentence and replace with "The amounts withheld to comply with the applicable mechanics' or builders' lien legislation will be retained by the Owner or held in a holdback trust account, as required by the applicable lien legislation."

1.9 ARTICLE 44. PAYMENT WITHHELD

Fifth paragraph (item 4), delete in its entirety

Delete the following:

"Where subcontractors or suppliers of material are not receiving prompt payment, the Owner, in its discretion, may make payment to such subcontractors or suppliers directly and deduct the amount of such payments from amounts otherwise due to the Contractor."

2.0 ADDITIONS TO GENERAL CONDITIONS

The following Articles are hereby added to the General Conditions:

2.1 ARTICLE 52. INSURANCE

The Contractor shall, at his own expense, provide the following insurance and pay any deductibles that may be required. Each policy shall contain a clause stating that: This policy will not be cancelled or materially changed without the Insurer giving at least thirty (30) days' notice by registered mail to the Owner. A Certificate of Insurance shall be issued by an insurance company licensed to conduct business in the province or territory wherein the work is located and shall be provided on the form contained within the Contract Documents. The Certificate of Insurance or certified copy thereof shall be provided by the Contractor to Owner at the time of his execution of the Contract Agreement.

1. Liability Insurance

The Contractor shall buy and keep in force during the course of this Contract and until twelve (12) months after issuance of the Notice of Acceptance, Personal injury, Bodily Injury, and Property Damage Liability Insurance. Such insurance shall be in the name of the Contractor and the Owner, and shall include a Cross Liability or Severability of Interests clause. Such insurance shall be on a form and with an Insurer acceptable to the Owner. Both Personal Injury and Property Damage sections are to provide coverage on an "Occurrence Basis."

The term Personal Injury shall include:

1. Bodily injury, sickness, disease, or death therefrom.
2. Libel, slander, or defamation of character.
3. False arrest, detention or imprisonment, or malicious prosecution.
4. Invasion of privacy, wrongful eviction, or wrongful entry.

Such insurance shall cover, subject to acceptable exclusions, liability claims arising out of all premises, operations, subcontracted operations, elevators (if any), products, completed operations, broad form property damage, and liability assumed by the Contractor under any contract or agreement, including this Contract.

Where applicable, exclusions to the following operations to be performed by the Contractor or anyone on his behalf are to be deleted:

1. Blasting or use of explosives.
2. Pile driving.
3. Excavation.
4. Underpinning, shoring or removal, or rebuilding of support.
5. Demolition.
6. Operations that could cause the accidental pollution or contamination of any property, land, air, or water.

7. Use of any industrial machine such as a forklift, crane, front end loader, grader, earth remover, prime mover, or road building machine that is licensed, specially licensed (x plate), or operating under permit.
8. Use of any machinery or equipment such as hydraulic cranes, compressors, lift gates, or winches that may be attached to or mounted on a licensed motor vehicle when such use is not insured by any form of automobile insurance specified in this Article.

Such insurance shall include by endorsement contingent employer's liability insurance in the name of the Contractor for the limits specified in this section. Such insurance shall be for the following minimum limits:

Bodily Injury and Property Damage $5,000,000 Inclusive.

Note: Property Damage Deductible to not exceed $2,500.00 per occurrence.

The following parties and any of their employees, servants or agents shall be added to the liability policy as additional insured:

The Regional District of Nanaimo
Koers & Associates Engineering Ltd.
PBX Engineering Ltd.
Sorenson Trilogy Engineering Ltd.

2. Automobile Insurance

The Contractor shall buy and keep in force until all conditions of the Contract have been fully complied with, a standard Automobile Policy covering all licensed vehicles owned by him, registered in his name, or leased to him. Such insurance shall include liability insurance for the following minimum limits:

Bodily Injury and Property Damage $5,000,000 Inclusive.

The Contractor shall furnish proofs of insurance of ICBC Form APV 47 or its equivalent.

3. Non Owned Automobile Insurance

The Contractor shall buy and keep in force until all conditions of the Contract have been fully complied with, a standard Non Owned Automobile Policy. Such insurance shall be for the following limits:

Bodily Injury and Property Damage $5,000,000 Inclusive.

The Contractor shall furnish proofs of insurance on ICBC form APV 29, or its equivalent.

4. Contractor's Equipment Insurance

The Contractor shall buy and keep in force until ten (10) days after issuance of the Notice of Acceptance a standard Equipment Insurance Policy insuring at fair market value all equipment owned and non owned which is to be utilized on the project.

Notwithstanding anything contained elsewhere herein, it is understood and agreed that the Owner and/or Engineer will not be liable for any loss or damage to Contractor's equipment, including loss of use thereof. Each and every policy insuring Contractor's equipment to be used on this project shall contain the following clause:

"Waiver of Subrogation: It is understood and agreed that the Insurers hereby waive all rights which they may acquire by payment of claim under this policy to recover the amount so paid from the Owner and the Engineer or any of their parent, subsidiary, affiliated companies or corporations or any employee thereof, provided, nevertheless, that a subrogated right arising out of professional errors by any such person shall not be waived."

5. Pollution/Environmental Liability Insurance

The Contractor shall buy and keep in force during the course of this Contract Pollution/Environmental Liability Insurance Policy. Such insurance shall be for the following limits:

Policy $2M per occurrence
$5M aggregate
$50K maximum deductible.

6. Course of Construction Builder's Risk Insurance

Coverage on an All Risks basis in the amount of not less that the amount of the Contract Price; subject to a deductible provision for the Contractor's account not exceeding $10,000.00 each loss. Coverage to include the Owner as additional insured:

2.2 ARTICLE 53. LIEN LEGISLATION

Liens will be administered in accordance with the Builder's Lien Act as proclaimed on February 1, 1998. Where inconsistencies exist between the General Conditions and the Builder's Lien Act, the Builder's Lien Act will apply.

2.3 ARTICLE 54. LETTER OF CREDIT FOR GUARANTEE PERIOD

The Contractor shall, prior to issuance of the final progress certificate, deposit with the Owner a Standby Irrevocable Letter of Credit in the amount of FIVE PERCENT (5%), of the final contract value, or $30,000 dollars, whichever is greater, to be drawn on a bank, which may be used by the Owner for the rectification of the defects or deficiencies for twelve (12) months from the Notice of Acceptance. The letter of credit shall be automatically renewing, and in a form acceptable to the Owner.

The guarantee amount held during the warranty period will be released to the Contractor no earlier than fifteen (15) months from the date of the Notice of Acceptance, subject to the results of the one year inspection. No interest will be allowed.

Prior to the expiration of the twelve month guarantee period and subsequent release of guarantees, the Owner, Engineer and Contractor shall conduct an inspection to determine that all deficiencies have been corrected, and that no new defects or deficiencies exist in the materials or workmanship in respect to the works. Any faults corrected at this time will be covered, as set out in Article 29 and sufficient guarantees retained for an additional one year period from acceptance of the replacement materials or rectified work.

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ARTICLE 1. DEFINITION OF TERMS

"CONTRACT DOCUMENTS" or "CONTRACT" Shall mean the entire agreement between the Owner and Contractor and shall include all those documents set out in the Table of Contents to the Contract including, without limitation, the Contract Agreement, the General Conditions, Specifications and Drawings, Tendered Documents as well as any Addenda incorporated therein.

"CONTRACTOR" Shall mean the Contractor named in the Contract.

"ENGINEER" Shall mean Koers & Associates Engineering Ltd., acting when necessary through a project manager or other delegate duly appointed to act on its behalf, or such other engineer as may from time to time be duly authorized and appointed in writing by the Owner.

"EQUIPMENT" or "PLANT" Shall mean anything and everything except persons used by the Contractor in performance of the Work and except material as defined herein.

"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.

"INSPECTOR" Shall mean a person or company authorized by the Engineer or by the Owner to inspect the Work or any part of it.

"MATERIAL" OR "MATERIALS" Shall, unless otherwise specified, mean anything and everything other than persons or the Contractor's equipment which is manufactured, processed, or transported to the site, or existing on the site, and incorporated into the completed Works.

"PERSON" Shall mean a person as defined in the Interpretation Act (British Columbia).

"SUBCONTRACTOR" Shall mean any person, firm, or corporation having a contract with the 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.

"SUPPLY" or "PROVIDE" Shall mean supply and pay for or provide and pay for.

"WORK" or "WORKS" Shall, unless the context otherwise requires, mean the whole of the Work, equipment, materials, labour, matters, and things required to be done, furnished, and performed by the Contractor under this Contract.

ARTICLE 2. INTENT OF CONTRACT

The intent of the Contract is that the Contractor shall provide all materials, supervision, labour, equipment, and all else necessary for or incidental to the proper execution of the Work unless specifically noted otherwise. The Contractor shall do everything shown on the drawings and/or described in the specifications and all other things necessary to complete the Work.

ARTICLE 3. DRAWINGS AND SPECIFICATIONS FURNISHED

Except as provided for otherwise, a maximum of six (6) copies of drawings and specifications for the execution of the Work shall be furnished to the Contractor without charge. Additional instructions may be issued by the Engineer during the progress of the Work by means of drawings or otherwise for clarification of the drawings and specifications, or as may be necessary to explain or illustrate changes in the Work to be done. One (1) complete set of all drawings and specifications shall be maintained at the job site and shall be available to the Engineer at all times.

ARTICLE 4. DOCUMENT CONFLICT

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. Contract Agreement
2. Supplementary General Conditions
3. General Conditions
4. Specifications
5. Drawings
6. Executed Tender Form
7. Instructions to Tenderers
8. Invitation to Tender
9. All other Documents

Figured dimensions on a drawing take precedence over measurements scaled from the drawing, and large-scale drawings take precedence over those of 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. In case of conflict in materials and methods, the specifications govern.

The drawings and specifications complement each other and anything called for by one will be as binding as if called for by both.

ARTICLE 5. DISCREPANCIES

Any discrepancies found between the drawings and specifications or any errors or omissions in the drawings or specifications shall immediately be reported to the Engineer, who shall promptly correct such error or omission in writing. Any Work done after discovery of such discrepancies, errors, or omissions shall be done at the Contractor's risk.

ARTICLE 6. SHOP DRAWINGS

The Contractor shall furnish to the Engineer, at proper times, all shop drawings including diagrams, illustrations, schedules, performance charts, brochures, and other data necessary to clarify the Work intended or to show its relation to adjacent Work or other trades. The Contractor shall provide such additional drawings and shall make any changes or additions to such drawings or diagrams which the Engineer may require consistent with the Contract and will submit sufficient copies of the revised prints for review, all but three (3) of which shall be returned to the Contractor following review.

Prior to submission to the Engineer the Contractor shall review all shop drawings. By this submission the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers, and similar data and that he has checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents.

The Contractor shall submit shop drawings to the Engineer for his review with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the Work of other contractors. If either the Contractor or the Engineer so requests, they shall jointly prepare a schedule fixing the dates for submission and return of shop drawings. Shop drawings shall be submitted in the form of a reproducible transparency or prints as the Engineer may direct. At the time of submissions, the Contractor shall notify the Engineer in writing of any deviations in the shop drawings from the requirements of the Contract Documents.

The Engineer will review and return shop drawings in accordance with any schedule agreed upon, or otherwise with reasonable promptness so as to cause no delay. The Engineer's review shall be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the shop drawings has been specifically approved in writing by the Engineer.

The Contractor shall make any changes in shop drawings which the Engineer may require consistent with the Contract Documents and resubmit unless otherwise directed by the Engineer. When resubmitting, the Contractor shall notify the Engineer in writing of any revisions other than those requested by the Engineer.

ARTICLE 7. LOCATION OF THE WORKS

Where location dimensions for the Works are not shown on the drawings, the locations are intended as being approximate.

Unless otherwise specified, the Engineer will set out two (2) base lines adjacent to the Work, together with an elevation bench mark. The Contractor shall perform all detailed layout and shall be responsible for all necessary detailed layout dimension and elevations measured from the Engineer's base lines and bench mark.

The Contractor shall provide reasonable and necessary opportunities and facilities to enable the Engineer to complete his surveys. He shall not proceed until he has made timely demands upon the Engineer for, and has received from him, such points and instructions as may be necessary for the Work to progress.

The Contractor shall carefully preserve bench marks, reference points, and stakes. In case of willful or careless destruction or disturbance of such markers, he shall be charged with the expense of replacing them and shall be responsible for any mistakes that may be caused by their destruction, loss, or disturbance.

ARTICLE 8. CONTRACTOR'S INVESTIGATION OF CONDITIONS AFFECTING THE WORK

The Contractor shall, by personal inspection, examination, calculations or tests, or by any other means, satisfy himself with respect to the local conditions to be encountered and the quantities, quality, and practicability of the Work and of his methods of procedure. No verbal agreement or conversation with the Engineer or any officer, agent, or employee of the Owner, either before or after the execution of the Contract, shall affect or modify any of the terms or obligations herein contained.

ARTICLE 9. ENGINEER'S STATUS

The Engineer will be the Owner's representative during the construction period and will observe Work in progress on behalf of the Owner. He will have authority to act on behalf of the Owner only to the extent expressly provided in the Contract Documents or otherwise in writing. The Engineer will have the authority to stop the Work whenever such stoppage may be necessary, in his opinion, to ensure the proper execution of the Work in accordance with the provisions of the Contract.

If, at any time, the Engineer is of the opinion that there exists a danger to life or to property, he may order the Contractor to stop Work or to take such remedial measures as he considers necessary. The Contractor shall obey such orders immediately. Neither the giving or carrying out of such orders shall thereby entitle the Contractor to any extra payment.

The Engineer is the sole interpreter of the Contract and the sole judge of its performance. The Contractor shall obey, perform, and comply with the Engineer's orders or instructions with respect to the Work or concerning the conduct thereof, promptly, efficiently and to the satisfaction of the Engineer. However, if the Contractor is of the opinion that the Engineer's orders and instructions are not authorized under the provisions of the Contract or involve a change for which a change order should be issued as described in Article 39, he 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 Contractor does not so notify the Engineer within the time so limited, he 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 Contractor of his obligations to carry out and obey the Engineer's orders and instructions.

The Engineer may delegate to other persons such of the powers of the Engineer as the Engineer deems appropriate.

The Engineer or the Owner may appoint any person to be an Inspector. Such Inspector shall have the authority of the Engineer to reject materials, procedures, workmanship, or all or part of the Work as not complying with the provisions of the Contract and to order the Contractor to stop Work until the materials, procedures, workmanship, or the Works comply with the Contract.

ARTICLE 10. INSPECTION OF WORK

The Contractor shall allow the Engineer and/or Owner or their duly appointed Inspector access and provide adequate facilities for access to any part of the Works at all times. If the specification, Engineer's instructions, laws, regulations, bylaws, or any public authority requires any of the Work to be specially tested or approved, the Contractor shall give the Engineer advance notice of his preparedness for such inspection, and if the inspection is by an authority other than the Engineer, of the date fixed for such inspection. The Engineer will inspect the Work promptly and without causing unreasonable delay to the Contractor. Extra payment will not be made to the Contractor for delay occasioned by any inspection, and extension of completion time will not be allowed for delay resulting therefrom.

On request by the Engineer, the Contractor shall open for inspection any part of the Work that has been covered up. If the Contractor refuses to comply with such request, the Owner may employ other persons to uncover the Work. If the Work is found to be in accordance with the Contract requirements then the cost of uncovering and recovering the Work shall be borne by the Owner. If any of the Work was covered by the Contractor in contravention of the Engineer's instructions, or if the uncovered Work is found not to be in accordance with the Contract requirements, then the cost of uncovering and recovering the Work shall be charged to the Contractor.

The acceptance, or the lack of comment on the part of the Engineer, of methods of construction employed by the Contractor shall not relieve the Contractor of his responsibility for any errors therein, and shall not be regarded as an acceptance of responsibility for any part of the Work done by the Contractor.

ARTICLE 11. SUPERVISION AND LABOUR

The Contractor shall keep on the project at all times during its progress a competent superintendent who is approved by the Engineer, which approval may be withdrawn at any time. The superintendent shall represent the Contractor in his absence and directions given to him shall be held to be given to the Contractor. The superintendent shall give efficient and effective supervision to the Work until its completion. The nominated Superintendent shall remain on the project throughout its duration, and may not be withdrawn without written approval from the Engineer.

When competent personnel are available locally they shall, whenever possible, be employed by the Contractor.

ARTICLE 12. LANDS BY OWNER

The Owner will provide the lands upon which the Work is to be performed. Where the Work is to be performed on lands owned by others, the Owner will obtain the necessary easements or rights-of-way. Delay in providing these lands, or in obtaining easements or rights-of-way which, in the opinion of the Engineer, delays the Work or results in extra cost to the Contractor, will be deemed proper cause for adjustment in the time of completion and adjustment of the Contract amount to cover the extra cost to the Contractor.

ARTICLE 13. LANDS BY CONTRACTOR

Any lands other than those which are to be provided by the Owner and which may be required by the Contractor for temporary facilities, storage purposes, or access to the project site shall be obtained by the Contractor at no cost to the Owner.

ARTICLE 14. PRIVATE LAND

It shall be the Contractor's responsibility to ascertain the boundaries within which the Work must be confined. The Contractor shall not enter upon lands other than those provided by the Owner for any purpose without obtaining prior written permission of the land owners and occupiers. The Contractor shall not enter upon lands owned by others on which the Owner has easements or rights-of-way without having received the written authorization of the Owner for such entry. It shall be the Contractor's responsibility to ascertain from the Owner the conditions on which easements or rights-of-way have been granted on private lands and to abide by these conditions throughout the course of construction.

ARTICLE 15. ASSIGNMENT OF CONTRACT

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

ARTICLE 16. SUSPENSION OF WORK BY OWNER

The Owner may at any time suspend the Work, or any portion thereof, provided he gives the Contractor five (5) days written notice of suspension. The 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 Contractor for costs and expenses incurred by the Contractor necessitated by such suspension of Work or portion thereof, but the Contractor shall not recover from the Owner payment for any loss of profits or damages.

ARTICLE 17. OWNER'S TERMINATION OF THE CONTRACTOR'S RIGHTS

17.1 The Owner will have the right to terminate the Contractor's right to continue with the Work if the 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.

If at any time the Engineer is of the opinion and so states in writing to the Owner that the Contractor:

1. has failed to commence the Work or to recommence Work after a suspension within the time specified in the contract documents;

2. has failed or is failing to furnish or to maintain a detailed project schedule and plan of operation as required by Article 38 hereof;

3. has failed or is failing to use diligence or has failed to comply with the instructions of the Engineer to expedite his Work or is otherwise failing to make such progress with the Work as is necessary to ensure the completion of the Work or any part thereof in the time specified in the contract documents;

4. has failed or is failing to supply enough competent workers, management, supervision, materials, or suitable equipment; or

5. has become in any way unable to carry on the Work or any part thereof;

the Owner may give notice in writing to the Contractor of such opinions and requiring that such default or defaults be remedied forthwith. If, within ten (10) days of such notice, such default or defaults are not remedied to the satisfaction of the Engineer, the Owner may terminate the Contractor's right to perform further the Work under the Contract. Such termination shall be effective immediately.

17.2 Upon such termination, the Owner may take all the Work out of the Contractor's hands and employ such means as it may see fit to complete the Work. In such cases:

1. The Contractor shall have no claim for any further payment in respect of any of the Work performed, but shall be liable for all damages and expenses which may be suffered by the Owner by reason of such default or delay, or the noncompletion by the Contractor of the Work;

2. No objection or claim shall be raised or made by the Contractor by reason of or on account of the ultimate cost of the Work so taken over for any reason proving greater than, in the opinion of the Contractor, it should have been;

3. 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 Contractor for the purposes of the Work under the provisions of this Contract will become or remain and be the property of the Owner for all purposes incidental to the completion of the Work and may be used, exercised, and enjoyed by the Owner as fully to all intents and purposes connected with the Work as they might therefore have been used, exercised, and enjoyed by the Contractor; and

4. The Owner may forthwith enter into possession of all the Contractor's equipment on the site of the Work and may use the same in any way it sees fit in order to complete the Work without the Owner being in any way liable for damage or any other cost in connection with such use by the Owner. Upon completion of the Work, such equipment may be returned to the Contractor or may be sold by the Owner and the net proceeds of such sale credited to the Contractor's account.

If the Contractor's right to perform the Work is terminated in accordance with the provisions of this Article, the Contractor shall not be entitled to receive any further payment until the Work is completed.

17.3 Upon completion of the Work the Engineer shall determine:

1. the amount which would have been due to the Contractor under the Contract if all of the Work had been performed by him;

2. the costs and expense borne by the Owner in completing the Work and damages for delay in completion, if any.

The Contractor shall be entitled to receive the balance of the contract price less such costs and expense, or if such costs and expense exceed such price the Contractor shall pay the amount of such excess to the Owner on demand.

The Owner shall have the option, under the provisions of this Article, to be exercised in its absolute discretion, to terminate the right for the Contractor to perform any part or parts of the Work and permit the Contractor to continue to perform the rest of the Work. All the provisions of this Article shall apply to such part or parts of the Work with such modifications as the circumstances may require.

ARTICLE 18. CONTRACTOR'S TERMINATION OF THE CONTRACT

The 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 exceeds ninety (90) days, and when such stoppage or suspension occurs through no act or fault of the Contractor, his agents, or servants.

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 Contractor's written notice to do so.

In either event, the Contractor will receive from the Owner payment for all of the Work performed and losses sustained in respect of any materials. For termination under clause 1. above, the Owner will not be liable for any loss of profits, damages, or expenses incurred by the Contractor as a result of such stoppage or suspension, but under clause 2. above, the Contractor will be paid for loss of profits, damages and expenses directly attributable to the Owner’s breach of its covenant to pay. Such termination shall be effective upon the Contractor giving notice thereof.

The amount due to the Contractor for Work performed and losses sustained shall be determined by the Engineer and certified by him to the Contractor and to the Owner.

ARTICLE 19. SEPARATE CONTRACTS

The Owner reserves the right to let other contracts in connection with the Work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work and shall properly connect and coordinate his Work with theirs.

If any of the Work of the Contractor as specified in the Contract and shown on the drawings depends upon the Work of any other contractor, the Contractor shall inspect and measure the Work in place and determine whether anything in such Work renders it unsuitable for proper execution of the Work of the Contractor. The Contractor shall promptly report the results of such inspection and measurement to the Engineer if anything in such Work renders it unsuitable for proper execution of the Work of the Contractor. The Contractor's failure to inspect and report promptly shall constitute an acceptance of the other contractor's Work and he shall have no claim against the Owner by reason of anything in such Work rendering the same unsuitable for proper execution of the Work of the Contractor.

ARTICLE 20. SUBCONTRACTS

The subcontractors named in the Tender Form, and others as may be approved by the Engineer following execution of the Contract Agreement, shall not be changed nor shall additional subcontractors be employed except with the written approval of the Engineer. The Contractor is responsible to the Owner for the acts and omissions of his subcontractors and of their employees, to the same extent that he is responsible for the acts or omissions of persons employed by himself. Nothing in the Contract Documents shall create any contractual relation between any subcontractor and the Owner. The Contractor shall bind every subcontractor to the terms of the Contract Documents.

All subcontracts in relation to the Work shall contain the following provisions:

1. The certificate of the Engineer in respect of completion of the Work by the Subcontractor shall be binding on the Contractor and the Subcontractor.

2. The certificate of the Engineer as to the subcontract price shall be binding on the Contractor and the Subcontractor.

3. An acknowledgment by the Subcontractor that payment of the appropriate sum by the Owner shall be made to the Contractor.

ARTICLE 21. ORAL AGREEMENTS

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 whatsoever, other than by a waiver or modification thereof in writing and agreed to by the parties to the Contract.

ARTICLE 22. NON-WAIVER

Any failure by the Owner or the Engineer at any time, or from time-to-time, to enforce or require the strict keeping and performance of any of the terms or conditions of the Contract will not constitute a waiver of such terms or conditions and will not affect or impair such terms or conditions in any way or the right of the Owner or the Engineer at any time to avail itself or himself of such remedies as it or he may have for any breach or breaches of such terms or conditions.

No provision in the Contract which imposes or may be deemed to impose extra or specific responsibilities or liabilities on the Contractor will restrict the general or other responsibilities or liabilities of the Contractor in any way.

ARTICLE 23. MATERIALS BY CONTRACTOR

The Contractor shall supply all materials unless it is expressly specified to the contrary. Materials used in the Work shall meet the requirements of the specifications, or where not detailed in the specifications, shall be to the Engineer's satisfaction. Unless otherwise specified, all materials shall be new.

Unless otherwise specified, the Contractor shall provide all water, light, power, heating and equipment necessary for the execution of the Work.

Schedules of piping, fittings, reinforcing, or other materials indicating quantity and/or dimension, which are shown on the drawings or in the applicable sections of the specifications, are intended only to assist the Contractor in his quantity takeoff. Quantities and dimensions shown therein are not guaranteed to be accurate and shall be checked by the Contractor prior to placing an order of such materials.

No variations between the quantities shown on the schedules and those actually installed shall give rise to any claim by the Contractor or to any right for additional payment in a lump sum price contract or to a variation in unit price in a unit price contract.

All materials provided by the Contractor in order to complete the Work shall vest in and become the property of the Owner as soon as the same are delivered to the site of the Works, but shall remain in the custody and at the risk of the Contractor.

ARTICLE 24. MATERIALS BY OWNER

The Owner will provide only such materials as are specifically listed as being supplied by the Owner.

ARTICLE 25. MATERIALS STORAGE

The Contractor, at his own expense, shall store all materials provided for the Work either by himself or the Owner until they have been incorporated into the completed Works. Materials shall be so stored as to ensure the preservation of their quality and fitness for the Work, and shall be so protected from vandalism and theft. Stored materials shall be located so as to facilitate prompt inspection. Faulty materials shall not be stored on the site, and any material in storage found to be faulty shall promptly be removed from the site by the Contractor.

ARTICLE 26 REJECTED WORK AND MATERIALS

All materials which do not conform to the requirements of the Contract Documents, are not approved by the Engineer, or are in any way unsatisfactory or unsuited to the purpose for which they are intended, will be rejected. Any defective Work, whatever the cause thereof, and without limiting the generality of the foregoing, whether the result of poor workmanship or use of defective materials, shall be removed within ten (10) days after written notice is given by the Engineer, and the Work shall be re-executed by the Contractor. The fact that the Engineer may have previously overlooked such defective Work shall not constitute an acceptance.

The removal of Work and the re-execution thereof shall be at the expense of the Contractor, and he shall pay the cost of replacing the Work which shall include materials of other contractors destroyed or damaged by the removal of the rejected Work or materials and the subsequent replacement with acceptable Work. The Contractor shall also reimburse the Owner for any additional engineering, inspection, testing or other contractor's costs incurred in respect of rejected Work or materials, whether such Work or materials are replaced or not or are accepted at a lower price.

If, in the opinion of the Engineer, it is not expedient to re-execute defective Work, the Owner may deduct from the Contract price the difference in value between the Work as done and that called for by the Contract, the amount of which shall be determined by the Engineer.

ARTICLE 27. OWNER'S RIGHT TO CORRECT DEFICIENCIES

Upon failure of the Contractor to perform the Work in accordance with the Contract Documents, and after ten (10) days written notice to the Contractor, or without notice if an emergency or danger to the Work or public exists, the Owner may, without prejudice to any other remedy he may have, correct such deficiencies. The cost of Work performed by the Owner in correcting deficiencies shall be paid by the Contractor.

ARTICLE 28. SKILL AND CHARACTER OF WORKERS

All workers must have sufficient knowledge, skill and experience to perform properly the Work assigned to them. Any supervisor or worker employed by the Contractor or subcontractor who, in the opinion of the Engineer, does not perform his or her work in a skilful manner, or appears to be incompetent or to act in a disorderly or intemperate manner shall, at the written request of the Engineer, be removed from the site of the Work immediately and shall not be employed again in any portion of the Work without the approval of the Engineer.

ARTICLE 29. GUARANTEE PERIOD

Neither the Notice of Acceptance nor a Notice or Partial Acceptance nor payment by the Owner shall relieve the Contractor of responsibility for faulty materials or defective workmanship. The Contractor guarantees to maintain the Work against any defects arising from faulty installation, faulty materials supplied under the Contract or faulty workmanship which may appear within one (1) year of the date of the Notice of Acceptance. If a Notice of Partial Acceptance has been issued, the guarantee period shall begin from the date of such Notice except for that part of the Work still to be performed and the defects and deficiencies still to be corrected which are listed on such Notice. Faulty materials shall be replaced and defects discovered and failures which occur during the guarantee period shall be rectified to the satisfaction of the Engineer and in accordance with the Contract Documents, including, if deemed necessary by the Engineer, replacement or rectification of all or a portion of the Work. The same guarantee as is herein provided and for the same period shall attach to such replacement materials or rectified Work and the period shall begin on the date the Engineer accepts such replacement material or rectified Work.

If the Owner observes through use of the Works, or if it is discovered by tests or inspection of the Works prior to the end of the guarantee period, that a deficiency or defect exists in the materials or workmanship in respect to the Works, the Owner shall immediately notify the Contractor, by whatever means are available, of the defect or deficiency and instruct him to rectify the fault. Such notification shall be confirmed by the Owner in writing to the Contractor. In the event that this Work, in the opinion of the Owner, must be done immediately to prevent serious damage, injury, or loss of life, the Owner may perform or cause to be performed, the necessary Work and shall notify the Contractor accordingly. Work required under guarantee shall, except as otherwise provided herein for emergencies, be carried out by the Contractor or his representative within ten (10) days of the Owner's written instruction to perform the Work. In the event that this Work is not done by the Contractor within the ten (10) day period, or such period as may be approved by the Engineer, the Owner may take whatever action is necessary to have the Work done.

All costs resulting from the necessity to do Work under the guarantee requirement, whether it be done by the Contractor, his representative, or the Owner, as provided herein, shall be borne by the Contractor. The Contractor shall, in addition, be liable to the Owner for all expenses, losses or damages incurred by the Owner as a result of such faulty materials and defective workmanship as are referred to in the first paragraph of Article 29, or as a result of the Contractor's failure to meet the guarantee requirements as specified herein, including, but without limiting the generality hereof, all costs of engineering, inspection and testing Work.

A partial release of holdback for completed subcontracts, or the certificate of the Engineer that a subcontract has been completed shall not relieve the Contractor of his obligations under this Article 29, Guarantee Period.

ARTICLE 30. DAMAGE TO WORK

The Contractor shall be responsible for all loss and damage whatsoever which may occur on or to the Works, completed or otherwise, until such time as the entire Works have been completed and the Notice of Acceptance has been issued by the Owner. In the event of any loss or damage occurring, the Contractor shall, on notice from the Engineer, immediately put the Works into the condition it was immediately prior to such loss or damage, all at the Contractor's expense, except where such loss or damage was caused solely by an act of the Owner.

ARTICLE 31. INDEMNITY

The Contractor shall release, indemnify and save harmless the Owner and its elected and appointed officers, employees, agents, and Engineer from and against all claims, actions, costs, expenses, judgements, damages, fines, and fees of whatever kind, including solicitors fees on a solicitor and own client basis, which the Owner or any other person may have or incur and which arises out of or in connection with any act or omission or alleged act or omission of the Contractor, its agents, employees or subcontractors in the execution of the Work and other wise in the performance of or failure to perform the Contract.

ARTICLE 32. BONDS

To ensure the faithful execution and proper fulfilment of this Contract, the Contractor shall provide the Owner with the following bonds at the time of his execution of the Contract Agreement:

1. A Performance Bond in the amount of fifty percent (50%) of the total Contract amount covering the faithful performance of the Contract and

2. A Labour and Material Payment Bond in the amount of fifty percent (50%) of the total Contract price.

The above bonds must be issued by a surety company licensed to conduct business in the Province of British Columbia and shall be provided in quadruplicate on the forms contained within the Contract Documents.

Notwithstanding anything contained elsewhere in the Contract Documents, the Owner shall not be required to make any payment whatever to the Contractor until the above bonds, duly executed, have been delivered to the Owner.

ARTICLE 33. PATENTS AND ROYALTIES

The Contractor shall pay all royalties and licence fees with respect to and shall assume the defence of and indemnify the Owner and the Engineer, their employees, officers and agents from all claims relating to inventions, copyrights, trademarks or patents used in doing the Work and in the subsequent use and operation of the Work or any part thereof upon completion. The Contractor shall not be liable hereunder with respect to any claims arising from a construction method, process or equipment specified by the Owner in the documents submitted to the Contractor before he submitted his tender.

ARTICLE 34. PERMITS AND REGULATIONS

The Contractor shall, at his own expense, procure all permits, certificates and licences required by law for the construction of the Work and shall comply with all federal, territorial, provincial, and local laws, regulations and bylaws affecting the execution of the Work, save insofar as the Contract Documents specifically provide otherwise.

The Owner will obtain all necessary governmental approvals for the design of the completed Work, and all permits and licences required by law for the completed Work.

ARTICLE 35. INJURY OR DAMAGE TO PERSONS OR PROPERTY

The Contractor shall use due care and take all necessary precautions to ensure the protection of persons and property and shall comply with the provisions of the Workers' Compensation Act (British Columbia). The Contractor shall be liable for any and all injury or damage which may occur to persons or to property due to any act, omission, neglect, or default of the Contractor, or of his employees, workers or agents.

The Contractor shall, without further order, provide and maintain at all times during the progress or suspension of the Work, suitable barricades, fences, signs, signal lights, and flag persons as are necessary to ensure the safety of the public and those engaged in the Work.

Notwithstanding the provision of Article 9, in an emergency which threatens the safety of any person, or the Works, or adjoining property, the Contractor, without the necessity of authorization from the Engineer, shall act in a reasonable manner to prevent loss or injury.

The Work shall be carried out in a manner that will cause the least interruption to vehicular and pedestrian traffic. Where the Work is to be carried out on highways or properties other than those of the Owner, the Contractor shall familiarize himself with the requirements of the owner or controllers of those highways or properties which pertain to traffic control and safety or which place limitations on the Work and shall comply with such requirements.

ARTICLE 36. NOTICE TO PROCEED

Following the execution of the Contract Agreement by the Contractor and the provision of the required bonds and insurance policies, written Notice to Proceed with the Work will be given to the Contractor by the Owner. The Contractor shall begin Work promptly following receipt of the Notice to Proceed and shall prosecute the Work regularly and uninterruptedly thereafter, unless otherwise directed in writing by the Engineer or Owner, in such a manner as to secure completion of the Work within the time stated in the Contract Agreement. Time shall be of the essence of the Contract.

If, however, when the Notice to Proceed is given a strike or lockout affecting workers of a classification required to organize or begin performance of the Work, reasonably prevents the Contractor from beginning Work promptly, the completion date stated in the Contract Agreement will be extended by the same number of days as the number of days between the giving of Notice to Proceed and the end of the strike or lockout. If the strike or lockout affects workers of several classifications and such strike or lockout ends on different dates, the end of the strike or lockout will be deemed to occur when all workers of a classification required to organize or begin performance of the Work are permitted to Work for the Contractor. No extension of time herein provided for shall be grounds for any claim whatsoever by the Contractor for extra payment.

ARTICLE 37. FAILURE TO COMPLETE ON TIME

If the Contractor fails to complete the Work within the time required by the Contract Documents, the Owner, in addition to any other rights and remedies he may have, shall be entitled to deduct from any payments due to the Contractor the additional costs to the Owner of the engineering services incurred as a result of the Contractor's failure to complete on time.

No bonus will be allowed by the Owner for completion of the Works in less time than specified in the Contract Agreement.

ARTICLE 38. SCHEDULE OF COMPLETION

The Contractor shall prepare, in consultation with the Engineer, a detailed project schedule and plan of operation. The schedule and plan of operation, unless otherwise approved by the Engineer, shall be submitted to the Engineer not later than two (2) weeks after the date of the Notice of Award. The schedule and plan of operation shall describe the proposed labour force and equipment, sequence and methods of operation, and projected weekly progress to show completion of all Work within the Contract time for completion. Upon receipt of such schedule and plan of operation by the Engineer, the schedule shall become the approved construction schedule. Neither the plan of operation nor the approved construction schedule shall be changed without the prior approval of the Engineer.

If the Engineer should be of the opinion and so state in writing to the Contractor that the rate of progress of the Work is insufficient to enable the whole of the Work or any part or parts thereof to be completed within the time or times specified for such completion in the approved construction schedule, the Contractor shall take whatever steps the Engineer may in his absolute discretion specify in writing to the Contractor to expedite the progress of the Work. Such steps may include, but shall not be limited to adoption of shift work and/or the provision of additional workers or equipment. The Contractor shall not be entitled to any extra payment by reason of such order of the Engineer.

ARTICLE 39. CHANGES IN THE WORK

The Owner or Engineer, without invalidating the Contract, may make changes by altering, adding to, or deducting from the Work. The Contractor shall proceed with the Work as changed and the Work shall be executed under the provisions of the Contract. No change shall be undertaken by the Contractor, without written order of the Engineer, except in an emergency endangering life or property, and no claims for additional compensation shall be valid unless the change was so ordered.

If, in the opinion of the Engineer, such changes affect the time of Contract completion or the Contract amount, these will be adjusted at the time of ordering the changes. The value of the addition or deduction from the Contract amount, and the method of determining such value, shall be decided by the Engineer. The Engineer will use one (1) or more of the following methods in deciding such value:

1. by unit prices or combinations of unit prices of the Tender Form;

2. by unit prices submitted by the Contractor and accepted by the Owner;

3. by lump sum submitted by the Contractor and accepted by the Owner;

4. on a force account basis as specified in the next succeeding Article.

If the Contractor and the Owner cannot agree on the unit prices to be used or on any of them or on the lump sum, the Engineer shall decide and certify the unit prices or lump sum to be used which are or is in his opinion fair and reasonable to both parties and his decision shall be final.

ARTICLE 40. FORCE ACCOUNT WORK

Compensation for Work done on a force account basis shall be made as follows:

1. Force account rates for personnel and equipment as specified in the Tender Form will form the basis of payment to the Contractor.

2. On subcontract Work, the Contractor will be paid the subcontractor's proper bill, exclusive of GST, for such Work performed plus ten percent (10%) thereof as his fee.

3. Materials supplied by the Contractor shall be paid for at the supplier's invoice price (exclusive of GST) 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 indirect overhead) as his fee.

4. 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 approved or adjusted by the Engineer. No claim for compensation for extra Work or materials shall be considered or allowed unless such report shall have been made, or the Engineer shall have extended the time for such reports or released the Contractor therefrom.

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

ARTICLE 41. EXTENSION OF CONTRACT TIME

The time for completion of the Work under the Contract may be extended in the event of one (1) or more of the following:

1. Where extra Work as herein provided is added to the Work under this Contract.

2. Where the Work is suspended as provided for in Article 16 of the General Conditions.

3. Where the Work is delayed on account of conditions which could not have been foreseen or which were beyond the control of the Contractor and which were not the result or the fault or negligence of the Contractor, his agents, or employees, provided, however, rain, wind, flood, or other natural phenomena of normal intensity for the area shall not be construed as cause for an extension of time for completion of the Work.

4. Where delay occurs in the progress of the Work as a result of the act of neglect of the Owner or his employees, or by other contractors employed by the Owner.

5. Where delay occurs as a result of an act of a public authority.

6. Where the Engineer causes delay in furnishing of drawings or necessary information.

7. Where strikes, lockouts, or labour disputes prevent or substantially interfere with the progress of the Work.

8. Where, in the opinion of the Engineer, the Contractor is entitled to an extension of time.

A claim for extension of Contract time shall only be considered when submitted by the Contractor to the Engineer in writing within seven (7) days of the occurrence of the delay on which the claim is based, provided, however, that in the case of a continuing cause of delay only one (1) claim shall be necessary. Within a reasonable period after the Contractor submits a request for an extension of time, the Engineer will present his written recommendation to the Owner stating his opinion on whether or not the delay justifies an extension of time; and, if so, the number of days extension due to the Contractor. The Owner will make the final decision on all requests for extension of time.

The granting of additional time to complete the Work pursuant to this Article shall not give the Contractor grounds to make any claims whatsoever for additional payment, save on the grounds set out in clause 2. above, or as a result of the act or neglect of the Owner or his employees.

ARTICLE 42. USE OF COMPLETED PORTIONS

The Owner will have the right to take possession of and use any completed or partially completed portions of the Work, whether the time for completing the entire Work or such portions has or has not expired, but such taking possession and use will not be deemed an acceptance of any Work so taken possession of or used. If such prior use increases the cost of, or delays the completion of, uncompleted Work or causes refinishing of completed Work, the Contractor shall be entitled to such extra compensation or extension of time, or both, as the Engineer may determine.

ARTICLE 43. PROGRESS PAYMENT CERTIFICATES

The Engineer will calculate all progress payments and will prepare certificates for payment by the Owner. Where unit prices apply, payment will be calculated on the basis of the tendered prices and the units of Work completed as determined by the Engineer. Where a lump sum price applies, payment will be calculated on the basis of the Engineer's estimate of the percentage of Work completed.

The payment certificate shall show as of the end of the last day of the preceding month the value of all labour and materials incorporated into the Works and all proper materials stored at the site thereof, including extras, and all adjustments previously made whether additions or deductions. The certificate shall also show the aggregate of previous payments, the amounts withheld to comply with the Builders Lien Act (British Columbia), and the amount, if any, of the holdback released in respect of completed subcontracts. Except in respect of the final progress payment, the gross amount shown on such certificate, less the aggregate of all previous payments, previous sums withheld, and the amount then required to be withheld to comply with the applicable Builders Lien Act (British Columbia) as set out below, shall become due and be payable by the Owner to the Contractor thirty (30) days after the date the Owner has received the original payment certificate recommended by the Engineer. In those cases where Work is such that the Builders Lien Act (British Columbia) does not apply or does not require the retention of a holdback, the Owner will nevertheless retain holdbacks to the same extent as if such legislation applied to the Work. The amounts withheld to comply with the applicable Builders Lien Act (British Columbia) will be retained by the Owner until payment is due in accordance with the provisions of Article 50.

The amounts to be withheld in respect of the Builders Lien Act are as follows:

1. The Owner shall withhold, in accordance with the Builders Lien Act (British Columbia), 10% of each progress payment to be held in a holdback trust account in accordance with the Builders Lien Act (British Columbia).

The monthly estimates shall not bind the Owner or Engineer in any manner in the preparation of the final estimate of the Work done, but shall be construed and held to be approximate only, and shall in no case be taken as an acceptance of the Work or as a release of the Contractor from his responsibility therefore.

ARTICLE 44. PAYMENT WITHHELD

Upon receipt of a certificate in writing from the Engineer stating that, in his opinion, justification exists and stating the basis and the amount of such deduction, the Owner may withhold or nullify, on written notice to the Contractor specifying the ground or grounds relied on, the whole or part of any progress payment to the extent necessary to protect himself from loss on account of one (1) or more of the following:

1. That the Contractor is not making satisfactory progress in the opinion of the Engineer.

2. That defective Work is not being remedied at all or in a manner satisfactory to the Engineer.

3. That there are affidavits (or an affidavit) of claim of lien, or liens (or a lien) filed, against the lands and premises on which the Work is done or is being done, or reasonable evidence of the probable filing of such affidavits (or an affidavit) of claim of lien or of filing or registration of liens (or a lien).

4. That the Contractor is failing to make prompt payments as they become due to subcontractors or for material or labour.

5. That there exists unsatisfied claims for damages caused by the Contractor to anyone employed on the site or in connection with the Work.

Where subcontractors or suppliers of material are not receiving prompt payment, the Owner, in its discretion, may make payment to such subcontractors or suppliers directly and deduct the amount of such payments from amounts otherwise due to the Contractor.

ARTICLE 45. BUILDERS LIEN ACT (BRITISH COLUMBIA)

The Contractor shall remove or cause to be removed all liens filed or registered against the lands and premises on which the Work is being performed or has been performed which claim of lien or liens arise out of anything done or to be done under the Contract. Such removal shall be effected by the Contractor forthwith upon demand by the Owner or the Engineer.

In places where the applicable lien legislation permits the Owner to make a partial release of holdback in respect of completed subcontracts, the Owner will only make such release when all the statutory provisions have been met.

Notwithstanding anything elsewhere contained in the contract documents, the Contractor shall indemnify and hold harmless the Owner from all demands, damages, costs, losses and actions arising in any way out of claims of lien or liens which arise out of anything done or to be done under the Contract whether the lien period binding on the Contractor has expired or not.

The obligations imposed on the Contractor by the provisions of this Article shall not extend to claims of lien or liens properly filed by the Contractor himself.

ARTICLE 46. COMPLETION

When the Contractor is of the opinion that he has completely performed the Work, he shall inspect the Work to ensure that all Work has in fact been performed, that it is in a clean and tidy condition and that it is ready in all respects for acceptance by the Owner. He shall then submit a written request to the Engineer that he make a final inspection.

The Engineer will make an inspection and will notify the 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 have been corrected and the Contractor has submitted to the Engineer a written statement that all claims and demands of the 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 Notice of Acceptance be issued to the Contractor. The Owner, subject to his acceptance of his recommendation, will issue the Notice of Acceptance.

ARTICLE 47. PARTIAL COMPLETION

If the Contractor considers that, by reason of climatic or similar problems beyond his reasonable control, not all the Work can be performed or defects or deficiencies corrected promptly, he may in writing request the Engineer for a Notice of Partial Acceptance. Such request shall be accompanied by a written statement that all claims and demands of the Contractor for extra Work or otherwise in connection with the Work to be accepted have been presented in writing. If the Engineer considers such request to be reasonable, he will carry out an inspection and will notify the Contractor in writing of any defects or deficiencies which require to be corrected before he will recommend partial acceptance. He will prepare an additional list of defects and deficiencies which in his opinion do not impair the usefulness to the Owner of the whole Work and the correction of which may reasonably be deferred. This list shall show the amount which the Engineer considers to be the cost of completing such Work and correcting such defects and deficiencies. When all Work has been performed and defects and deficiencies corrected other than those on this list, he will recommend to the Owner that a Notice of Partial Acceptance be issued to the Contractor. If the Owner accepts this recommendation, he will issue a Notice of Partial Acceptance which shall list the Work to be performed and the defects and deficiencies to be corrected and the estimated costs thereof. The Notice of Partial Acceptance shall fix a date within which all such Work shall be performed and the defects and deficiencies corrected.

In considering the Engineer's recommendation, the Owner will consider the effect of the deferred performance of Work on the provisions of the applicable mechanics' or builders' lien legislation and may make his acceptance conditional on the Contractor providing written consents of sureties under any Performance or Labour and Materials Payment Bonds or other evidence that no guarantor or surety will be relieved of his obligations.

When all such Work has been performed and the defects and deficiencies corrected, the Contractor shall call for final inspection in accordance with Article 46, Completion.

If all the Work is not performed and all defects and deficiencies are not corrected by the date set out in the Notice of Partial Acceptance, the Owner may have the Work performed and the defects and deficiencies corrected by any means he thinks suitable and may recover the costs thereof from any money withheld from the Contract or from the Contractor if such money is insufficient.

ARTICLE 48. FINAL PROGRESS PAYMENT

The final progress payment certificate will be prepared following the issuance of the Notice of Acceptance. The Engineer will review with the Contractor all Work quantities and all claims and demands of the Contractor for extra Work in connection with the Contract. The final progress payment certificate will show the total amount of the payment due to the Contractor less the amount required to be retained under the applicable lien legislation whether a lien can be filed or not.

The final progress payment shall be made by the Owner within thirty (30) days of the date of the final progress payment certificate.

ARTICLE 49. PROGRESS PAYMENT AFTER PARTIAL COMPLETION

If the Owner issues a Notice of Partial Acceptance, the Engineer will prepare a progress payment certificate in the same detail as required for a final progress payment certificate. From the amount shown on such certificate to be due to the Contractor shall be deducted the amount required to be retained under the applicable lien legislation and twice the amount shown on the Notice of Partial Acceptance to be the estimated cost of performing the Work and correcting the defects and deficiencies. Payment of the net amount due to the Contractor shall be made by the Owner within thirty (30) days of the date of this progress payment certificate. If the amount to be withheld in respect of Work still to be performed or defects and deficiencies still to be corrected exceeds the amount otherwise payable to the Contractor, the excess shall be withheld from the amount of the lien holdback to be paid under the provisions of Article 50, Release of Holdback.

ARTICLE 50. RELEASE OF HOLDBACK

A Notice of Partial Acceptance or where none is issued, a Notice of Acceptance, shall be conclusively deemed between the Owner and the Contractor to start the period within which liens must be filed by the Contractor under the applicable lien legislation. The Statutory Period for filing of liens for British Columbia is forty-five (45) days from completion of the Work; except that in respect of a contract in connection with a mine or quarry, sixty (60) days.

The Owner shall pay the holdback to the Contractor within fourteen (14) days of the expiry of the statutory time for filing liens under the applicable lien legislation, provided that:

1. The Contractor shall furnish to the Owner a statutory declaration, dated not earlier than seven (7) days after the expiry of the statutory lien period stating that no lien claim has been filed against title to the lands of the Owner or the lands of any other person and stating that all materials, labour, work, and services incurred directly or indirectly on account of the Work have been paid for by the Contractor.

2. The Contractor has complied with any conditions imposed by the Owner in his acceptance of the recommendation of the Engineer to issue a Notice of Partial Acceptance.

3. The Workers' Compensation Board has, at the request of the Contractor, filed with the Owner a certificate that all assessments due to the Board by the Contractor have been paid; such certificate shall be dated after the expiry of the statutory period for filing liens.

ARTICLE 51. ARBITRATION

In the case of any dispute between the Owner or the Engineer on his behalf, and the Contractor, during the progress of the Work or afterwards, or after the determination of breach of Contract, as to any matter arising thereunder, either party hereto shall be entitled to give to the other notice of such dispute and to demand arbitration thereof. Such notice shall be in writing and shall specify the matter to be submitted to arbitration, and in it said party shall name a person to act as arbitrator; thereupon within fifteen (15) days after receipt of such written notice the other party by written notice shall choose and name a second arbitrator; the two (2) arbitrators so chosen shall forthwith jointly select a third arbitrator, giving written notice to both parties of the choice so made, and fixing a place and time for meeting not later than thirty (30) days thereafter, at which both parties may appear and be heard, touching such controversy relating to the matters aforesaid. In case the two (2) arbitrators shall fail to agree upon a third arbitrator, or in case the party notified of the demand for arbitration shall fail to name the second arbitrator within the time stipulated, such third arbitrator (or such second arbitrator as the case may be) upon the application of either party, of which the other may be given notice, shall be named by a Justice of a Superior Court of the Province of British Columbia. The parties may agree to submit the matter to one (1) arbitrator, whose award shall be as binding as that of three (3) arbitrators.

The submission and the arbitration proceedings shall be under the provisions of the Arbitration Act of the Province of British Columbia provided nevertheless that any statutory limitation on the fees payable to the arbitrator or arbitrators shall be waived. The decision of the said arbitrator(s) shall be made in writing within thirty (30) days after the completion of hearings thereon, and when signed by a majority of them shall be final and conclusive upon the parties thereto.

Arbitration proceedings shall not take place until after the completion, or alleged completion, of the Work, except;

1. On a question of certificate for payment.

2. In a case where either party claims that the matter in dispute is of such a nature as to make immediate arbitration proceedings necessary while the evidence is available.

The arbitrator(s) in their decision shall determine which party shall bear all, or a portion of, the costs and expenses of the arbitration including the fees of the arbitrator(s), and said arbitrator(s) may in such decision allocate such costs and expenses between the parties in such amounts as they may deem fair and equitable by reason of such decision.



Seal #1
Cody Morris, P.Eng.
Koers & Associates Engineering Ltd.
Division 00-01, 31-33 Specifications

Permit to Practice: 1001658

(refer to Specifications section 01 11 00 General Requirements, for relevant specification sections)



2023-07-26
Seal #2
Michael Scopick, P.Eng.
PBX Engineering Ltd.
Division 26 Specifications

Permit to Practice: 1000208

(refer to Specifications section 26 05 00 Common Work Results, for relevant specification sections)

NOTES:

Each Engineer that has applied a seal above shall indicate which sections of the specifications he or she is certifying and the engineering company they work for. Alternatively, the Engineer may indicate which engineering discipline he or she is certifying as long as the name of the of the engineering company they work for (the source) is shown on the applicable technical specifications.

1.0 GENERAL

1.1 RELATED SECTIONS

.1 Technical Specification Section 00 01 07 – Certification Page

.2 Technical Specification Section 01 11 00 – General Requirements

.3 Technical Specification Section 01 29 00 – Measurement and Payment

.4 Technical Specification Section 01 33 00 – Submittals

.5 Technical Specification Section 01 42 00 – Reference Standards

.6 Technical Specification Section 01 57 00 – Temporary Pumping

.7 Technical Specification Section 01 57 10 – Site Treatment

.8 Technical Specification Section 01 57 20 – Sequencing and Tie-in Requirements

.9 Technical Specification Section 01 73 00 – Execution

.10 Technical Specification Section 31 01 30 – Existing Structures and Utilities

.11 Technical Specification Section 31 11 00 – Tree & Vegetation Removal

.12 Technical Specification Section 31 23 33.01 – Excavation & Backfill

.13 Technical Specification Section 32 12 16 – Asphalt Paving

.14 Technical Specification Section 33 05 16 – Manholes and Miscellaneous Structures

.15 Technical Specification Section 33 31 11 – Sanitary Sewer Piping

.16 Technical Specification Section 33 32 13.00 – Welding

.17 Technical Specification Section 32 32 13.13 – Sanitary Pump Station

1.2 SCOPE OF WORK

.1 Work under this Contract includes the supply of all materials, labour, and equipment to construct:

.1 Supply and installation of sanitary forcemain piping complete with fittings, and related appurtenances.

.2 Supply and installation of sanitary gravity piping complete with fittings, manholes and relates appurtenances.

.3 Removal of the existing check valves and associated piping and equipment outside and inside the existing wet well.

.4 Supply and installation of new equipment inside wet well, including pump bases, piping, ultrasonic level sensor, floats and all associated appurtenances.

.5 Supply and installation of a new kiosk (Owner Supplied) complete with new valves, piping and electrical equipment, while keeping the station operational.

.6 Reinstate the existing pumps (2) on new discharge connections.

.7 Supply, installation and commissioning of all electrical, instrumentation, control equipment and wiring.

.8 Provide temporary bypass pumping as needed for the duration of the Contract.

1.3 CONTRACT METHOD

.1 Construct the Work under a unit price contract that includes some lump sum pricing.

1.4 OWNER SUPPLIED EQUIPMENT

.1 The Owner has two 5Hp (600V) pumps in the wet well. These pump motors are to be removed, inspected by qualified personnel, and reinstalled onto the new discharge connections.

.2 The Owner has pre-purchased the kiosk and electrical equipment required for this project. Delivery of this equipment is expected August 31, 2023.

.3 The Owner shall reinstall the existing backflow preventor and flow meter onto the water service as shown on the Drawings.

.4 The Owner's existing PLC control panel and existing security system panel shall be delivered to the RDN.

.5 The Contractor shall be responsible for loading, delivering, receiving, unloading, and installing all of the Owner supplied equipment.

.6 The Owner will not be responsible for any incurred costs as a result of any supply chain disruptions which result in any delays.

1.5 CONTRACTOR USE OF PREMISES

.1 Contractor has unrestricted use of the Site until Notice of Acceptance is issued.

.2 Contractor to ascertain boundaries of Site within which Work must be confined.

.3 Contractor to obtain written authorization from the land owner or appropriate government authority to enter private lands, crown lands, easements, or right-of-ways located adjacent to the project.

.1 The Contractor's attention is called to the note on Drawing NBPS6-C-002, indicating encroachment on the property of 3274 Renwick Place. The Contractor to obtain written authorization from this land owner prior to any Work occurring on private property.

.4 Prior to final inspection, the Contractor shall obtain and submit to the Engineer written signed releases from all owners of lands which were affected during the project, confirming that properties have been left in an acceptable condition and that owners have no further claims in this respect.

1.6 DRAWINGS AND SPECIFICATIONS FURNISHED

.1 Owner Responsibilities:

.1 Provide 6 copies of Drawings and specifications to Contractor.

.2 Contractor Responsibilities:

.1 Pay for additional copies of Drawings and specifications if required.

.2 Maintain at Site one complete set of Drawings and specifications to be made available to the Engineer at all times.

1.7 TIMING OF THE WORK

.1 All Work under the Contract shall be completed in a timely manner, to meet the Schedule of Completion specified in the Tender Form.

.2 Work is to commence within seven (7) days of receipt of the Notice to Proceed.

.3 The Contractor is expected to provide full and continuous operations without delay once construction has commenced.

.4 Timing of tie-ins and Work inside the wet well shall be coordinated with all Utilities, the RDN, and conducted at a time of low demands. The Contractor will be responsible for implementing a temporary bypass system.

1.8 NOTIFICATION TO RESIDENTS

.1 The Contractor will be responsible for notifying the residents prior to the start of Work and of any potential disturbances that may occur during construction. The Contractor shall notify local residents by knocking on doors and hand delivering notices to explain potential disturbances caused by the Work.

.2 The local residents shall be given a minimum of 7-days notice prior to the start of construction.

.3 The Contractor will be responsible for providing all signage that will be required to inform the public of the Work occurring within their neighbour.

1.9 CONSTRUCTION SCHEDULE

.1 Prior to the pre-construction meeting, the Contractor shall provide the Engineer with a Baseline Construction Schedule showing anticipated progress stages and final completion of Work within the time period required by the Contract Documents.

.2 Interim reviews of Work progress based on Construction Schedule will be conducted as decided by the Engineer and the schedule updated by the Contractor in conjunction with and to the approval of the Engineer.

.3 The Contractor shall immediately advise the Engineer of any proposed changes to the Construction Schedule.

1.10 EMERGENCY CREWS

.1 Before commencement of construction, the Contractor shall provide the Engineer with a list of names and telephone numbers for Contractor's representatives who can be called outside the normal working hours to act for the Contractor during emergency "call-outs" in conjunction with Work under the Contract.

1.11 PROJECT MEETINGS

.1 The Engineer will administer the pre-construction meeting and progress meetings to be held at intervals of approximately once per month, or as necessary.

.2 The Contractor's Superintendent shall attend all meetings.

.3 The Contractor shall provide physical space for meetings.

.4 The Engineer shall record minutes of meetings and circulate to attending parties, and affected parties not in attendance, within 7-days of meeting.

.5 The Contractor shall arrange the time and place for the pre-construction meeting and provide a minimum of 5-days notice to all concerned parties. The pre-construction meeting shall occur within 15-days after award of the Contract.

.6 The following items will be covered at the preconstruction meeting:

- .1 Obtain contact information from all concerned parties, including emergency crew contact information;
- .2 Appointment of official representatives of participants in the Work;
- .3 Review Contractor's previously submitted Construction Schedule;
- .4 Review requirements for residential notices and signage;
- .5 Review Contractor's Erosion & Sediment Control Plan, AC Pipe Safe Handling Procedures, Emergency Bypass Pumping Plan, and Traffic Management Plan;
- .6 Schedule submission of Shop Drawings and samples;
- .7 Review requirements of temporary facilities;
- .8 Delivery schedule of specified equipment;
- .9 Issues related to Cash Allowance Work;
- .10 Site safety, security, Site access, and access gate protocol;
- .11 Mark-up of Record Drawings;
- .12 Monthly progress claims, administrative procedures, and holdbacks;
- .13 Appointment of inspection and testing agencies and review testing requirements;
- .14 Required Insurance;
- .15 Other business; and
- .16 Time and date for next meeting.

.7 The following items will be covered at progress meetings:

- .1 Review and approval of minutes from previous meeting;
- .2 Review of Work progress since previous meeting;
- .3 Field observations, problems, conflicts;

.4 Problems which impede Construction Schedule;

.5 Review of off-site fabrication and delivery schedules;

.6 Review of pending changes, substitutions, and Contemplated Change Orders;

.7 Other business; and

.8 Time and date for next meeting.

1.12 ENVIRONMENTAL PROTECTION

.1 The Contractor must conduct themself in accordance with all Federal, Provincial, or local pollution and environmental protection legislation and regulations. If requested by these authorities, the Contractor shall improve their methods and procedures, and rectify any damage done in contravention of such legislation.

.2 Silt laden water from construction activities shall not be directed into existing drainage courses that pass through the working areas of this Contract. Silt laden water generated during dewatering of trenches must be pumped to a settling area to ensure that silt, or any other deleterious materials do not enter sensitive environmental areas.

.3 Prior to the commencement of any excavation or drainage work, the Contractor shall provide, or have available, all environmental protection measures that may be necessary to control erosion and siltation. These measures may include silt fencing, hay bales, sediment ponds, silt traps, sandbags, tarpaulins, pumps, and piping.

.4 Without limiting the obligations of the Contractor under the Contract Documents, the Contractor shall carry out the Work in compliance with all environmental laws affecting the Work and with the recommendations contained in the most recent edition of the "Land and Development Guidelines for the Protection of Aquatic Habitat" published jointly by the Ministry of Land, Water, and Air Protection and Fisheries and Oceans Canada.

.5 In this section 'environmental laws' means all statutes, regulations, orders, and bylaws relating in any way to the natural environment or its ecosystems, public or occupational health, transportation, storage or handling of contaminants or hazardous materials.

1.13 REGULATORY AUTHORITIES & PERMITS

.1 This project is located within the Regional District of Nanaimo and Ministry of Transportation and Infrastructure jurisdiction. The Contractor shall comply with all bylaws on this project. In particular the Contractor shall review all bylaws relating to noise, construction traffic, and working hours.

.2 The Contractor shall obtain all pertinent permits and licences as required to execute the Work, for the duration of the project.

.3 The Contractor shall be responsible for obtaining all Electrical Permits as required for the duration of the project.

.4 The Contractor shall be responsible for obtaining any special permits or exemptions that may be required from the Ministry of Forests with regard to working during high-risk forest fire conditions if such permits are obtainable.

1.14 SAFETY

.1 The Contractor shall be responsible for Site safety, including confined space regulations and safe work procedures.

.2 The Contractor shall follow WorkSafeBC regulations, including work in the sanitary sewer wet well.

.3 The Contractor shall comply at all times with the current Worker's Compensation Board Industrial Health and Safety Regulations and Public Health Regulations.

.4 The Contractor is the "Prime Contractor" as defined by the Worker's Compensation Board's Health and Safety Regulations.

.5 The Contractor shall provide and maintain on Site, in a clean orderly condition, completely equipped First-Aid facilities readily accessible at all times to the Contractor's employees. Facilities and staffing shall be in accordance with the Industrial First Aid Regulations of the Workers' Compensation Board.

.6 The Contractor shall ensure warning signs are in place instructing the public to stay out of the area during all hazardous construction activities. Where designated public walking trails pass through the project area, the Contractor shall (where possible) provide alternate public access around the project Site.

.7 The Contractor shall provide secure barricades, hoarding, and Site fencing as required to protect the public and workers from open excavations and hazardous areas on the construction Site.

.8 The Contractor shall prepare and submit an Occupational Health and Safety plan for this project.

1.15 TEMPORARY FACILITIES

.1 Clean, sanitary, latrine accommodations shall be provided at the Contractor's expense, and shall be located and maintained such that they are not offensive to any property owner or member of the public.

.2 The temporary facilities shall be removed on completion of the Contract at the Contractor's expense, and the Site left in a tidy condition.

1.16 TEMPORARY POWER REQUIRED

.1 The Contractor shall provide and maintain temporary power as required for the Work.

1.17 SITE MAINTENANCE AND CLEANUP

.1 The working area shall be maintained in an orderly manner and shall not be encumbered with equipment, materials, or debris. Cleanup shall be a continuing process from the start of the Work to final acceptance of the project.

.2 The Contractor shall at all times, and without further order, keep property on which Work is in progress free from accumulations of waste materials or rubbish caused by employees or by the Work. Accumulations of waste materials that might constitute a fire hazard will not be permitted.

.3 At completion, the Contractor shall remove all temporary structures, rubbish, and waste materials resulting from their operations.

.4 The Contractor shall restore the ground surface to a condition equal or better than it was at the start of the project.

1.18 PROJECT RECORD DOCUMENTS

.1 The Contractor shall co-operate with the Engineer in recording field information necessary for the completion of the Record Drawings for the project.

.2 In particular the following information shall be recorded by the Contractor and provided to the Engineer:

.1 Approved field changes including dimensions and details.

.2 Changes made by Change Order.

1.19 CONSTRUCTION SIGNS AND TEMPORARY FENCING

.1 The Contractor shall erect and maintain signage and temporary fencing for the duration of the project.

.2 No signs shall be erected without prior approval of the Owner. All signs, including warning signs, shall be removed on completion of the Work.

1.20 TRAFFIC CONTROL

.1 Traffic control shall be accomplished by the use of appropriate signs and other control devices where vehicles are allowed to proceed normally in two directions. However, where traffic in both directions must use a single lane for a limited distance, a provision shall be made for single lane alternating traffic (SLAT) through the area. At spot obstructions, movement may be regulated by the use of signs. For one-way sections of any length, however, designation of right-of-ways through the restricted section shall be achieved by the use of detours and/or qualified traffic control persons.

.2 It is generally expected that traffic control persons will be required in the following situations:

.1 When pedestrian traffic is required to pass working vehicles or equipment which may block all or part of the travelled pathway;

.2 When public traffic is required to pass working vehicles or equipment which may block all or part of the travelled roadway;

.3 When it is necessary to institute a SLAT system through the construction area or other blockage, where traffic volumes are heavy, approach speeds are high, and a traffic signal system is not in use;

.4 Where workers and/or equipment are employed on the travelled way over the brow of a hill, around a sharp curve or at any other location where oncoming traffic would not otherwise have adequate warning of their presence;

.5 In high-speed, high-volume areas where temporary protection is required while other traffic control devices (barricades, cones, signs, etc.) are being erected or taken down;

.6 For emergency protection when other traffic control devices are not readily available;

.7 In all situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices; or

.8 As otherwise directed by the Engineer.

.3 Traffic control persons and their equipment shall conform to Worker's Compensation Board regulations.

.4 All traffic control measures shall be in accordance and compliant with Ministry of Transportation and Infrastructure standards and procedures.

.5 Prior to commencing construction, the Contractor shall submit to the Engineer a proposed Traffic Management Plan, outlining their methods for controlling traffic, including all signs and other traffic control devices required for identification of the Work, in areas affected by their operations. The proposals shall show the intended detours, temporary road closures and other measures to protect the general public.

.6 Full road closures must be authorized by the Ministry of Transportation and Infrastructure and may not be permitted.

.7 The Contractor shall provide all signs and traffic control devices required for proper identification of the construction activities in accordance with the Ministry of Transportation and Infrastructure standards and procedures.

.8 The Contractor shall maintain all signs and control devices through the duration of the Contract. The Contractor shall check signs regularly for legibility, damage, suitability, and location, and remove or replace signs as required.

.9 Each approach to the construction zone during the detour period shall include a large clearly legible detour route map with a painted white background, black lettering and line Work, and red arrows describing the route and is to be mounted on movable Class 3 barriers with sand bag ballast.

1.21 RELICS AND ANTIQUES

.1 Relics and antiques or objects of historical significance found on Site shall remain the property of the Owner or as governed by any Federal or Provincial law. The Contractor shall protect such articles and request directions from the Engineer.

1.22 MAINTAINING PUBLIC ROADS

.1 During hauling activities, any spillage from haul trucks onto public roads adjacent to the project shall be cleaned up by the Contractor. Tracking of mud and dirt onto public roads shall be cleaned up by the Contractor on a regular basis.

2.0 MEASUREMENT AND PAYMENT

.1 No measurement will be made for Work specified in this section. Payment for all Work under this section is to be included in the lump sum price shown in the Schedule of Quantities and Prices for General Requirements.

.2 Payment for General Requirements on month-end progress payment certificates will be pro-rated and paid out as a percentage of the overall Work completed.

.3 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 GENERAL

.1 Work completed under this Contract will be paid for at the unit or lump sum prices set out in the Schedule of Quantities and Prices.

.2 Incorporate all costs associated with finding and supplying all material and performing all Work specified herein in the prices set out in the Schedule. Include Contractor's overhead and profit.

.3 No claim by Contractor for extra payment on grounds that Work performed, or materials supplied in accordance with the Drawings and/or specifications could not be properly charged to items listed in the Schedule will be considered by the Owner.

.4 Include costs for Work and material not expressly listed in the Schedule, but included in the Drawings and/or specifications by either direct mention or implication, in items to which they pertain most closely.

.5 Prorate costs of a general nature that do not pertain to any one item among all items.

1.2 MEASUREMENT FOR PAYMENT

.1 For each unit price item, the Engineer will calculate payment based on tendered unit price and the Engineer's determination of units of work item completed.

.2 For each lump sum price item, the Engineer will calculate payment based on tendered price and the Engineer's estimate of percentage of Work item completed.

.3 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor’s price under the Item which it most closely relates to.

.4 Payment will be made at the unit or lump sum prices shown in the Schedule of Quantities and Prices, and shall include all costs to the Owner to complete the Work.

1.3 PROGRESS CLAIMS

.1 Monthly progress payments will be made in accordance with Article 43 of the Contract General Conditions.

.1 Contractor’s Responsibilities:

.1 Submit progress claim to Engineer within 5 working days after each month end. Claim to cover preceding month.

.2 Progress claim to show estimate of percentage of Work completed against each item of Schedule of Quantities and Prices.

.3 Progress claim to include all labour and materials incorporated in the Work and all materials stored at the Site.

.4 Progress claim to include all agreed extras, Force Account, and deductions.

.5 Supply documentation to support claim for materials on site in the form of itemized lists or unpriced purchase orders showing quantities.

.6 Supply other evidence required by Engineer in support of the progress claim.

.7 Submit statutory declaration that all sub-trades have been paid.

.8 Submit WorkSafeBC clearance letter.

.2 Engineer's Responsibilities:

.1 Review Contractor's claim, prepare Progress Payment Certificate and issue to Owner within 10 working days following receipt of Contractor's claim.

.2 Engineer's estimate of percentage of Work completed will govern calculation of payment on all Progress Payment Certificates.

.3 Inform Contractor of amendments to claim by copy of Progress Payment Certificate.

1.4 RELEASE OF HOLDBACK

.1 Payment of holdback amounts will be made in accordance with the current Builder's Lien Act and Article 50 of the General Conditions.

1.5 CHANGE ORDERS AND FORCE ACCOUNT WORK

.1 Work may be required which is not covered by the Contract, compensation will be as described in Articles 39 and 40 of the General Conditions.

.2 Change Orders:

.1 Complete and promptly return all change price requests issued by Engineer, quoting unit and/or lump sum prices as requested. Include appropriate supporting documentation to verify prices.

.2 Do not proceed with Work affected by price request until authorized to do so by Change Order.

.3 Make no change in Work unless a Change Order is issued. Change Order is only valid when signed by the Engineer, Owner and Contractor.

2.0 MEASUREMENT AND PAYMENT

.1 No measurement will be made for Work specified in this section. Payment for all Work under this section is to be included in the lump sum price that it most closely relates to in the Schedule of Quantities and Prices.

.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 REQUIREMENTS INCLUDED

.1 Construction Schedule

.2 Erosion & Sediment Control Plan

.3 Traffic Management Plan

.4 Emergency Bypass Pumping Plan

.5 Commissioning Plan

.6 Leakage Test Procedures and Test Results

.7 Occupational Health & Safety Plan

.8 Signed RDN Contractor-Supplier Package

.9 Emergency Crews

.10 Shop Drawings

.11 Samples

.12 Record Drawings

.13 Operations and Maintenance Manual

1.2 ADMINISTRATIVE

.1 The Contractor shall deliver submittals to the Engineer for review. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in the Work.

.2 The Contractor shall not proceed with Work affected by the submittal until review is complete.

.3 The Contractor shall review Shop Drawings 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 co-ordinated 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.

.4 The Contractor shall verify field measurements and affected adjacent Work shall be co-ordinated.

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

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

.7 The Contractor shall keep one reviewed copy of each submission on Site.

1.3 CONSTRUCTION SCHEDULE

.1 Seven days prior to the pre-construction meeting, the Contractor shall submit to the Engineer a Construction Schedule showing anticipated progress stages and final completion of Work within

the time period required by the Contract Documents. The schedule will be discussed at the pre-construction meeting and the Contractor shall make any agreed revisions to the schedule.

.2 The Engineer will review the schedule and return a copy within 10-days after receipt, and the Contractor shall finalize the schedule within 7-days of receiving the reviewed copy.

.3 Interim reviews of Work progress based on Construction Schedule will be conducted as decided by the Engineer and the schedule updated by the Contractor, in conjunction with, and to approval of the Engineer.

.4 The Contractor shall immediately advise the Engineer of any proposed changes to the Construction Schedule.

.5 The Contractor shall distribute copies of the finalized schedule to the Site office, Subcontractors, the Owner, and the Engineer.

.6 Any concerns about the finalized schedule will be discussed at the next Site meeting.

.7 If, during the Work, an extension of Contract Time is authorized, the Contractor shall revise the Construction Schedule accordingly.

.8 In preparing the schedule, the Contractor shall include the Work required to implement and maintain the temporary bypass system.

1.4 EROSION & SEDIMENT CONTROL PLAN

.1 Without limiting the obligations of the Contractor under the Contract Documents, the Contractor shall carry out the Work in compliance with all environmental laws affecting the Work and with the recommendations contained in the most recent edition of the "Land and Development guidelines for the Protection of Aquatic Habitat", published jointly by the Ministry of Land, Water, and Air Protection, and Fisheries and Oceans Canada.

.2 In this section 'environmental laws' means all statutes, regulations, orders, and bylaws relating in any way to the natural environment or its ecosystems, public or occupational health, transportation, storage or handling of contaminants or hazardous materials.

1.5 TRAFFIC MANAGEMENT PLAN

.1 The Contractor is advised that the work Site is located within Ministry of Transportation & Infrastructure Road right-of-way. The Contractor is responsible for notifying the Ministry of Transportation and Infrastructure of the Work and obtaining approval and permits should they be required.

.2 The Traffic Management Plan shall be in accordance with Ministry of Transportation and Infrastructure requirements and permit.

.3 The submission of an acceptable Traffic Management Plan shall outline all methods that will be used to safely manage traffic within, and next to the Work area and should include content for the following items:

.1 Areas of interruption to be minimized.

.2 Access to any of the individual lots must be maintained for local traffic.

.3 All applicable emergency services are notified.

.4 All appropriate signage and warning devices are implemented and or relocated in an approved manner.

.5 Adequate notice is supplied to the affected residents.

.6 Coordinate any alternative means necessary to accommodate the needs of Ministry of Transportation and Infrastructure, and the Regional District of Nanaimo transit.

.7 Work in multiple areas of the Site shall not create conflicting traffic patterns.

.4 The Traffic Management Plan must be approved in writing by the Owner prior to closure of any Public roadway, or private accesses.

1.6 EMERGENCY BYPASS PUMPING PLAN

.1 The Contractor shall provide an Emergency Bypass Pumping plan. This plan should outline the procedures and methodology necessary to implement bypass pumping in the event of an emergency and/or component failure.

.2 The Emergency Bypass Pumping Plan is independent from the Temporary Bypass Pumping Plan, which is Owner Supplied.

1.7 COMMISSIONING PLAN

.1 The Contractor shall provide a Commissioning Plan for the permanent and temporary control systems. See Section 33 32 13.13 – Sanitary Pump Station, for additional information.

1.8 LEAKAGE TEST PROCEDURES

The Contractor shall submit recommended leakage testing procedures from the pipe manufacturer to the Engineer for approval. Testing procedures shall include the maximum test pressure for each type of pipe to be tested. No testing shall be performed without written approval of the testing methods from the Engineer.

The Contractor will be responsible for implementing these testing procedures and recording the results for submission to the Engineer.

1.9 EMERGENCY CREWS

.1 Before commencement of construction, the Contractor shall provide the Engineer with a list of names and telephone numbers for the Contractor's representatives who can be called outside the normal working hours to act for the Contractor during emergency "call-outs" in conjunction with the Work under the Contract.

1.10 SHOP DRAWINGS

.1 The term “Shop Drawings” means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.

.2 Detail all Shop Drawings using the metric system. Prepare to a drafting standard equivalent to the Contract drawings.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, wiring diagrams, panel layouts with bills of material, explanatory notes and other information necessary for completion of Work. Where articles and equipment attach or connect to other articles or equipment, indicate that such item have been coordinated, regardless of the Section under which the adjacent items will be supplied and installed. Indicate cross reference to design drawings and specifications.

.4 Adjustments made on Shop Drawings by the Engineer are not intended to change the Contract Price. If adjustments affect the value of Work, state such in writing to the Engineer prior to proceeding with the Work.

.5 Make such changes in Shop Drawings as the Engineer may require, consistent with Contract Documents. When resubmitting, notify the Engineer in writing of any revisions other than those requested.

.6 Submit six (6) copies of product data sheets or brochures for requirements requested in specification Sections and as the Engineer may reasonably request, where Shop Drawings will not be prepared due to standardized manufacture of product.

.7 The Contractor shall submit a minimum of six (6) copies of each drawing to the Engineer for their review. The Engineer will retain three (3) copies of each drawing. Shop Drawings returned to the Contractor shall be included in the Operation and Maintenance Manuals.

.8 Where more than one type of Shop Drawing has been specified for any one item, e.g., wiring diagrams, layout details, and dimensional drawings, the Shop Drawings shall be submitted together, to allow the Engineer to review the drawings as a package.

.9 Catalogue pages or drawings applicable to an entire family or range of equipment will not be accepted as Shop Drawings unless they are clearly marked to show the pertinent data for the particular material.

.10 Manufacturer's catalogues, manuals, or price list will not be accepted as Shop Drawings. Such materials may be used as supplemental information to the Shop Drawings.

.11 Indicate the tag number if applicable and clearly show the features and details applicable to the equipment being supplied.

.12 Determine which Shop Drawings in addition to those drawings specifically mentioned in the Contract, have design elements requiring the seal of a Professional Engineer registered in the Province or Territory where the Work is located, in accordance with the applicable provincial or federal engineering acts or other governing legislation. Seal such drawings before submitting them for review. Submit for review engineering calculations signed by the registered Professional Engineer responsible for the Shop Drawing design elements.

.13 If, upon review by the Engineer, no errors or omissions are discovered, or if only minor corrections are made, three (3) copies will be returned and fabricated, and installation of Work may proceed. If Shop Drawings are rejected, a noted copy will be returned, and resubmission of

corrected Shop Drawings must be performed before fabrication and installation of Work may proceed.

.14 Use only those Shop Drawings on the Work that bear the Engineer's "REVIEWED" notation.

.15 The Owner may deduct from payments due to Contractor, the cost of additional engineering work incurred if correct Shop Drawings are not submitted after one review by Engineer.

.16 Review by the Engineer is solely for the 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 Contractor. Such review does not relieve the Contractor of their responsibility for errors and omissions in the Shop Drawings, or of their responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the Site, for information that pertains solely to the fabrication processes or to techniques of construction and installation, and for coordination of all sub-trades.

.17 The specifications identify those items for which Shop Drawings shall be submitted.

1.11 SAMPLES

.1 The Contractor shall submit review samples in duplicate as requested in the respective specification Sections. Label samples as to origin and intended use in the Work.

.2 Deliver samples prepaid to testing or inspection locations as co-ordinated with the Engineer.

.3 Notify the Engineer in writing at the time of submission, of deviations in samples from requirements identified in the Contract Documents.

.4 Make changes in samples which the Engineer may require, consistent with Contract Documents.

.5 Do not change construction materials consistent with approved samples without written authorization from the Engineer.

1.12 RECORD DRAWINGS

.1 The Contractor shall keep and maintain a record throughout the project of all of the changes made to the original design. The changes and notes will be made in red ink on an "as constructed" drawing set, and shall be available to the Engineer for review upon request. This set shall be submitted to the Engineer prior to the completion of the project.

1.13 OPERATION AND MAINTENANCE MANUAL

.1 The Contractor shall submit three (3) binder copies, and one (1) electronic copy of Operation and Maintenance Manuals for all equipment installed under this Contract, before the final payment is made.

.2 Binder Copies:

.1 Hard cover, extension-type, stiff black Fabrikoid cover with full-metal hinge, slide lock mechanism, 3-hole, loose leaf, for 215 x 280-mm paper. Acceptable product: ACCO Expanding Barlock Catalogue Binder. Acropress, Cerlox, or similar light weight or special hole binders will not be accepted.

.2 Identification: Lettering on front and spine shall be hot stamped in silver with the text identified in Clause 1.12.4 below.

.3 Each binder shall have coloured divider tabs, separating the different sections of the manual, in accordance with Clause 1.12.5 below.

.3 Electronic Copies:

.1 Format: Electronic copies shall be submitted in the format 'PDF/A' (Archival), in accordance with the applicable ISO standards.

.2 Identification: Cover page with the text identified in Clause 1.12.4 below.

.3 The electronic copy shall include bookmarks, separating the different sections of the manual, in accordance with Clause 1.12.5 below.

.4 Title to be included on all copies:

REGIONAL DISTRICT OF NANAIMO

NANOOSE BAY PUMP STATION NO. 6
UPGRADE AND SANITARY FORCEMAIN REPLACEMENT
2023

OPERATION AND MAINTENANCE MANUAL

.5 The Operation and Maintenance Manuals shall be arranged as follows:

Tab 1.0	Title page Project Title and Owner's name Address, Telephone and Fax Numbers, and Complete Name of: Prime Consultant Subconsultants General Contractor Subcontractors Index of all Divider Tabs
Tab 1.1	List of Drawings
Tab 1.2	Description of Systems
Tab 1.3	Operation & Maintenance of Systems
Tab 1.4	Preventative Maintenance and Lubrication of Equipment
Tab 1.5	List of Names and Addresses of Suppliers
Tab 2.0, 2.1, etc.	Certifications, Spare Parts List, Test Results, etc.
Tab 3.0, 3.1, etc.	Manufacturer's Data and Shop Drawings.

.6 Provide the information given below, where applicable for each system and major component. Where the manufacturer's literature covers several models or options, highlight the applicable information, using a non-fading marker, and cross out redundant information.

.1 Index of information in that section in order of appearance.

.2 Description of system, components and technical data.

.3 Maintenance and operating instructions including:

.1 Installation instructions;

.2 Procedures for starting;

.3 Proper adjustments;

.4 Test procedures;

.5 Procedure for operating;

.6 Procedure for shutdown Safety precautions; and

.7 List of electrical relay settings, control and alarm contact settings.

.4 Troubleshooting data.

.5 Preventative maintenance program.

.6 Recommended spare parts list.

.7 Certification, guarantee and warranty.

.8 Service representatives.

.9 Supplier of replacements parts, including contact information.

.10 Test data for piping system including flushing, disinfection, video.

.11 Hydrostatic test performance.

.7 All copies shall include any preventative maintenance program recommended by the manufacturers.

.8 All copies shall include copies of any reports by the manufacturer's representatives.

.9 Electronic copies shall include a high quality scan of the original, for any paper documents, records, or reports, not available in electronic format.

2.0 MEASUREMENT AND PAYMENT

.1 No measurement will be made for Work specified in this Section. Payment for all Work under this section is to be included in the lump sum price shown in the Schedule of Quantities and Prices for Submittals.

.2 Payment for Submittals on month-end progress payment certificates will be pro-rated and paid out as a percentage of the overall Work completed.

.1 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 SPECIFICATIONS, STANDARDS, OR METHODS

.1 When references to the following capitalized abbreviations are made, they refer to specifications, standards, or methods of the respective associations. Abbreviations listed herein but not mentioned in the specifications shall be disregarded.

.2 The number and letters following the abbreviations denote the association's serial designation for the specifications or standards to which reference is made. All references to these specifications, standards, or methods shall, in each instance, be understood to 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.

2.0 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
BCBC	British Columbia Building Code
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
CGSB	Canadian General Standards Board
CISC	Canadian Institute of Steel Construction
CITC	Canadian Institute of Timber Construction
CLA	Canadian Lumberman 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
IAQ	Insures' 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 Inc.
IES	Illuminating Engineering Society
IGMAC	Insulated Glass Manufactures 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
MSMRCA	Master Sheet Metal and Roofing Contractors' Association of British Columbia
NAAMM	National Association of Architectural Metal Manufactures
NBCC	National Building Code of Canada
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
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, Inc.
RTAC	Road and Transportation Association of Canada
SAE	Society of Automotive Engineers
SBI	Steel Boilers Institute Inc.
SJI	Steel Joist Institute
SSPC	Steel Structures Painting Council

TTMAC	Terrazzo, Tile and Marble Association of Canada
UL	Underwriters' Laboratories
ULC	Underwriters' Laboratories of Canada
USFG	United States Federal Government
WCB	Worksafe BC
WCLIB	West Coast Lumber Inspection Bureaus

3.0 CONFORMANCE

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

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

.3 The cost for such testing will be borne by the Owner in the event of conformance with contract documents or by the Contractor in the event of non-conformance.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This specification refers to the supply, installation, operation and subsequent removal of temporary pumps and pipes required to bypass the wastewater flow around the Pump Station during construction of the new works.

.2 The Contractor shall provide a sequencing plan for executing and subsequently dismantling the temporary bypass pumping system, which includes the pump supplier, to the Engineer for review and prior to construction. This plan shall include the size, model and number of pumps, the pump supplier, configuration, pipe size, controls, and power supply. Approved bypass suppliers include, but are not limited to: Stormtec

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Refer to Section 01 33 00 – Submittals, for additional information regarding submittals.

.2 Refer to Section 01 57 20 – Sequencing and Tie-in Requirements, for additional information regarding sequencing.

2.0 MATERIALS

2.1 PUMPS

.1 The temporary bypass shall include a minimum of one lead pump and one stand-by/backup pump. The lead pump(s) shall be capable of conveying the estimated peak flow of 23.1 lps without use of the backup pump(s). The backup pump(s) shall be capable of conveying the estimated peak flow of 23.1 lps without the use of the lead pump(s). Actual flows may vary significantly from the estimated peak flow. No claim for extra cost associated with variations in the flow will be accepted.

.2 Electrically driven pumps are acceptable, diesel driven pumps will not be accepted. The Contractor shall supply a diesel generator as an emergency backup due to power loss. The Contractor shall be responsible for power and fuel supply to the pumps for the duration of their use.

2.2 PIPES, VALVES, AND FITTINGS

.1 The Contractor shall supply Steel Kwik-Lok piping with quick connects, valves, gauges, fittings, and other associated equipment to operate the bypass system.

.2 The pipes, valves, and fittings shall have sufficient capacity to carry the required flows without excessive head loss.

3.0 EXECUTION

3.1 INSTALLATION

.1 The Contractor shall make any necessary alterations to the existing manholes that are required to allow the pumps and piping to be installed.

.2 The Contractor shall supply, install, and close the proposed gate valve shown on the Drawings between 'SMH B' and the Pump Station. The Contractor should install additional temporary plugs as necessary in the sewers, to stop all flow to the Pump Station wet well.

3.2 OPERATION

.1 The Contractor shall provide a temporary automatic control system specifically designed for pumping stations. The control system shall operate based on float switches and automatically transfer to a back-up pump when required. The Contractor shall ensure that the pumping installations are fully functioning 24-hours per day for the duration of the Contract, and shall inspect the system daily at 7:00am and 11:00pm.

.2 The Contractor shall be responsible for ensuring operation of the temporary bypass system does not cause local residents' sanitary services to backup. The Engineer and Owner do not accept responsibility for any damage caused by the operation or failure of the Contractor's temporary bypass system.

4.0 MEASUREMENT AND PAYMENT

4.1 TEMPORARY BYPASS PUMPING

.1 No measurement will be made for Work specified in this section. Payment for temporary bypass pumping will be made at the lump sum price shown in the Schedule of Quantities and Prices.

.2 The lump sum price for temporary bypass pumping shall include all materials, labour and equipment required to bypass the sewage flow around the existing Pump Station for the duration of the Work. This includes pumps, automated controls, generator, fuel, hose/piping, plugs, monitoring, and all other Work incidental thereto.

.3 Payment for Temporary Bypass Pumping on month-end progress payment certificates will be pro-rated and paid out as a percentage of the overall Work completed.

.4 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This section refers to the following work:

- .1 Surface Restoration;
- .2 Erosion and sediment control;
- .3 Maintaining the public streets;
- .4 Stripping surface materials prior to excavation;
- .5 Temporary safety fencing; and
- .6 Final Site grading.

.2 Unless noted otherwise, any disturbed areas shall be returned to original condition or better.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Refer to Section 31 23 33.01 – Excavation & Backfill, for additional information regarding excavating and backfilling.

2.0 MATERIALS

2.1 GRAVEL SURFACING

.1 Gravel surfacing shall be granular base as specified in Section 31 23 33.01 – Excavation & Backfill.

2.2 TOPSOIL AND HYDROSEEDING IN UNTRAVELED AREAS

.1 Topsoil for the restoration in untravelled areas, shall be an approved mix that is available from a local topsoil supplier that is free of noxious weeds or weed seeds, is capable of sustaining vigorous plant growth, is a friable natural loam containing 4% organic matter for clay loams and 2% organic matter for sandy loams.

.2 The topsoil shall have an acidity range (pH) between 6.0 and 7.5.

.3 The topsoil shall contain no debris or stones over 20 mm in maximum dimension.

.4 Grass seed shall be in accordance with the BC Ministry of Transportation and Infrastructure specification 757, and in compliance with the table “Standard Grass Seed Mixes for Re-vegetation of British Columbia Highway Roadsides, or an approved alternative that conforms with the existing lawn types is the area.

2.3 SAFETY FENCING

.1 The Contractor shall supply temporary safety fencing as required to secure the project Site and prevent the public from accessing any active construction areas.

2.4 SITE GRADING

.1 Before the gravel is placed, the existing surface shall be trimmed to lines and levels established by the Engineer, and shall be compacted. Excess materials shall be hauled away.

.2 Base course materials shall be spread and compacted to 95% of Modified Proctor Density, layers not exceeding 150mm thickness.

.3 The finished surface shall be formed within 15mm of the design grade and cross-section.

2.5 TEMPORARY FACILITIES

.1 Clean, sanitary, latrine accommodations shall be provided, and shall be located and maintained such that they are not offensive to any property owner or member of the public.

.2 The temporary facilities shall be removed on completion of the Contract at the Contractor's expense, and the Site left in a tidy condition.

.3 The Contractor shall provide and maintain temporary power as required for the Work.

3.0 EXECUTION

3.1 RESTORATION OF TRAVELLED AREAS

.1 Existing travelled areas that are disturbed during this project shall be reinstated with a minimum of 200 mm granular base, placed and compacted in accordance with Ministry of Transportation Standards and Requirements. Granular material shall be spread evenly to match adjacent ground and existing area grades.

3.2 RESTORATION OF UNTRAVELLED AREAS

.1 Existing untravelled areas that are disturbed during this project shall be reinstated with 150 mm of new topsoil. Topsoil shall be raked out smooth and shall be graded to match the adjacent ground.

.2 Areas reinstated with topsoil shall be seeded by hydraulic seeding.

3.3 EROSION & SEDIMENT CONTROL

.1 The Contractor shall install erosion and sediment control facilities prior to commencing with any excavation work. Erosion and sediment control shall be in accordance with the Contractor's submitted Erosion & Sediment Control Plan. The cost of supplying and installing the erosion and sediment control facilities is the responsibility of the Contractor, and should be included in the appropriate Tender Price.

3.4 MAINTAINING PUBLIC ROADS

.1 All maintenance of Public Roads shall be conducted in accordance with Ministry of Transportation Standards and Requirements.

.2 During hauling activities, any spillage from haul trucks onto public roads adjacent to the project shall be cleaned up by the Contractor. Tracking of mud and dirt onto public roads shall be cleaned

up by the Contractor on a regular basis using a street sweeper. During major hauling activities, the Contractor shall hire a street sweeper to clean the roads at the end of each day.

.3 If weather conditions and delivery of construction materials generate excessive dust, watering will be required. Upon direction by the Engineer, the Contractor shall maintain suitable watering equipment on the Site. Watering shall be performed as directed by the Engineer to control dust.

3.5 STRIPPING SURFACE MATERIALS

.1 The Contractor shall strip any unsuitable organic surface materials (including vegetation) from the excavation footprint before commencing with common excavation of the concrete slab.

.2 Stripped materials shall be removed from Site and disposed of by the Contractor.

3.6 SITE FENCING

.1 The Contractor shall erect temporary Site fencing as required to ensure the public does not wander into hazardous construction areas during the course of this project.

.2 The Contractor shall reinstate any of the existing compound fencing that is damaged or removed during this project.

3.7 FINAL SITE GRADING

.1 Final Site grading shall not be undertaken during snow, heavy rain, freezing or other unsuitable conditions when the native ground is unworkable.

.2 Subgrade shall be kept free of water at all times during final grading. The Contractor shall provide and operate pumps or other temporary drainage systems to ensure the subgrade is not saturated during final grading. Discharge from pumps, well points, or other dewatering equipment shall be located and controlled such that loss, damage, nuisance, or injury to the public and the environment does not result. Additional excavation made necessary by water in the excavations shall be considered unauthorized excavation and shall be performed at the Contractor's expense.

.3 In areas where native backfill materials are permitted, the Contractor will be expected to use suitable materials from stockpiles stored onsite by the Contractor during excavation of the Site. Any stockpiled materials that are not required for final grading shall be removed from Site and disposed of by the Contractor at the end of the project.

.4 On completion, the area around the Pump Station shall be graded as shown on the Drawings and the final surface shall be hand raked prior to final seeding.

3.8 TREE AND PLANT PROTECTION

.1 Unless otherwise identified for removal, protect trees and plants on Site and adjacent properties.

.2 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.3 Minimize stripping of topsoil and vegetation.

3.9 SITE MAINTENANCE AND CLEANUP

.1 The Site shall be maintained in an orderly manner and shall not be encumbered with equipment, materials, or debris. Cleanup shall be a continuing process from the start of the Work to final acceptance of the project.

.2 The Contractor shall at all times, and without further order, keep property on which work is in progress free from accumulations of waste materials or rubbish caused by employees or by the Work. Accumulations of waste materials that might constitute a fire hazard will not be permitted.

.3 At completion, the Contractor shall remove all temporary structures, rubbish, and waste materials resulting from his operations.

.4 The Contractor shall restore the ground surface to a condition at least as good as it was at the start of the project.

4.0 MEASUREMENT AND PAYMENT

4.1 SURFACE RESTORATION WITH GRANULAR BASE

.1 No measurement will be made for Work specified under this section. Payment for surface restoration using granular base will be made at the lump sum price shown in the Schedule of Quantities and Prices. This price shall include all materials, labour and equipment required to reinstate the gravel areas with new granular base in accordance with the Contract requirements.

.2 This price shall include supply, delivery, placement, spreading, grading, compaction, and all other Work and materials incidental thereto.

.3 The new gravel surface shall have a minimum compacted thickness of 200mm.

.4 Payment for Surface Restoration with Granular Base on month-end progress payment certificates will be pro-rated and paid out as a percentage of the overall Work completed.

.5 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

4.2 SURFACE RESTORATION WITH TOPSOIL & HYDROSEED

.1 No measurement will be made for Work specified under this section. Payment for surface restoration using topsoil and hydroseed will be made at the lump sum price shown in the Schedule of Quantities and Prices. This price shall include all materials, labour and equipment required to reinstate grass areas with topsoil & hydroseed.

.2 This price shall include supply, delivery, placing, compacting and shaping of the topsoil, and all Work incidental thereto.

.3 Payment for Surface Restoration with Topsoil & Hydroseed on month-end progress payment certificates will be pro-rated and paid out as a percentage of the overall Work completed.

.4 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This specification refers to the sequencing requirements for the piping installation, tie-ins, electrical Work, instrumentation & control Work, and commissioning on this project.

.2 The Regional District of Nanaimo (RDN) maintains and operates the Nanoose Bay Pump Station No. 6. Pump Station No. 6, located on Schooner Cove Drive, pumps sewage up Schooner Cover Drive to a manhole southwest of the Station, which flows by gravity and is discharged into the Nanoose Bay Pollution Control Center (NBPCC). The sewage catchment area for Pump Station No. 6 includes 79 Lots in the Nanoose Bay Lakes District, as well as pumped sewage from Stations No. 5, 7 & 8. Pump Station No. 6 must remain in service for the duration of this project, except for short periods as approved by the RDN and the Engineer.

.3 Under no circumstances shall sewage be discharged into the environment. In the event of an emergency, the Contractor will be required to implement their Emergency Bypass Pumping Plan.

.4 The tie-ins and associated electrical, instrumentation & control Work required on this project shall be performed as specified below under Subsection 3.0. Alternate Work sequences shall not be carried out unless authorized by the RDN, and the Engineer.

.5 The RDN has two (2) existing 5hp (600V) pumps installed in Pump Station No. 6. The Contractor shall remove and allow the RDN to inspect both pumps, coordinate pump reconditioning by qualified personnel, and re-install the existing pumps into the wet well as part of the Work. Refer to section 3.2 for further clarification.

.6 Electrical Work to include coordination of new 600 Volt electrical power supply for the new electrical and control kiosk, new wiring, supply of temporary pump control system, and if necessary, temporary power and control for bypass pumping. Refer to Section 3.3 for further requirements of sequencing of the electrical Work.

.7 The Contractor will be responsible for keeping two pumps, at a minimum, operational at all times during the project. This will require careful planning by the Contractor and coordination with RDN crews.

1.2 EXTREME CARE REQUIRED

.1 The tie-ins and commissioning on this project must be completed carefully. Performing the Work incorrectly or in the wrong sequence could limit the amount of sewage able to reach the NBPCC. If necessary, the Contractor shall implement their Emergency Bypass Pumping Plan.

.2 Prior to performing the tie-ins, electrical, instrumentation and control Work, the Contractor shall fully coordinate the Work with RDN crews and the Engineer.

2.0 MATERIALS

2.1 MATERIALS REQUIRED FOR WORK

.1 The Contractor shall provide all materials, equipment, and technical expertise required to perform the Work and commissioning on this project.

.2 The Contractor shall provide all materials, safety, monitoring, control and general equipment, and technical expertise required to perform the Temporary Bypass Pumping Plan, as well as their Emergency Bypass Pumping Plan.

.3 The Contractor is advised that the use of new or existing RDN pumps, generator, floats, kiosk, as well as any equipment, instrumentation and controls will not be permitted as part of the bypass pumping. The Contractor shall provide everything necessary for bypass pumping.

3.0 EXECUTION

3.1 WORK SEQUENCE FOR SANITARY FORCEMAIN REPLACEMENT

.1 The Contractor shall be ready to implement their Emergency Bypass Pumping Plan.

.2 The Contractor shall install all the piping and appurtenances prior to performing the tie-ins.

.3 On completion, the Contractor shall complete all testing prior to performing the tie-ins.

.4 The Contractor shall perform the tie-ins at a time of low flow as directed by the RDN and Engineer. This may occur during the night.

.5 Pump Station No. 6 can provide limited volumes of sewage storage. This will be dependant on time of day and time of year and will need to be confirmed with the RDN prior to proceeding with any shut-downs.

3.2 WORK SEQUENCE FOR PUMP RECONDITIONING

.1 The Contractor shall be ready to implement their Emergency Bypass Pumping Plan.

.2 The Contractor shall provide a temporary automatic control system, bypass pumps and all associated appurtenances required to execute the Temporary Bypass Pumping Plan, prior to removing and re-installing the Owner supplied 5hp (600V) pumps.

.3 The Contractor shall coordinate with BC Hydro to establish a temporary 600V service connection, and shall supply a generator with a sufficient capacity to execute the Temporary Bypass Pumping Plan in the event of an outage. The temporary automatic control system shall operate on float switches, to be supplied by the Contractor.

.4 Prior to removing either pump, the Contractor shall execute the Temporary Bypass Pumping Plan, including closure of the proposed valve Between 'SMH B' and Pump Station No. 6 as shown on the Drawings. The Contractor shall monitor fluid levels in 'SMH B' to verify successful operation of bypass pumping. Upon successful execution of bypass pumping, the Contractor shall coordinate with the RDN to pump down the existing wet well. The Contractor shall inspect and verify there no leakage is detected inside the existing wet well prior to proceeding with removal of the existing pumps.

.5 The Contractor shall remove both 5hp existing pumps, and shall coordinate this work with Beaver Electrical to facilitate inspection of both pumps, and if necessary, reconditioning prior to re-installation. The RDN will coordinate payment to Beaver Electrical, who are located at 1475 Island Highway East, Nanoose Bay, B.C.

.6 Following completion of Pump Station No. 6 modifications and upgrades, and prior to completion of all electrical, instrumentation and control work. The Contractor shall re-install both existing 5hp

pumps. Upon completion of clause 3.3.6 below, the Contractor shall connect both existing pumps to the new control kiosk, in preparation for testing and commissioning.

3.3 WORK SEQUENCE FOR ELECTRICAL

.1 Upon successful execution of bypass pumping, including pumping down of the exiting wet well and removal of the existing pumps as identified in Clause 3.4 above. The Contractor shall coordinate with BC Hydro and Telus to disconnect the existing kiosk's electrical and communications service. The Contractor shall coordinate with the RDN to disable and lock-out their existing standby generator.

.2 Upon de-energizing the existing kiosk, The Contractor shall remove connections to the existing Automatic Transfer Switch, following which, ground connections to the kiosk may be disconnected or severed as necessary to facilitate kiosk removal.

.3 The Contractor shall temporarily relocate the kiosk as shown on the Drawings prior to delivering the existing kiosk and all associated equipment to the RDN at the Nanoose Bay Pollution Control Centre, in accordance with the Contract Documents.

.4 The Contractor shall complete all Pump Station No. 6 modifications and upgrades as shown on the Drawings and identified in the Contract Documents.

.5 Upon completion of clause 3.3.4 above, the Contractor shall install and connect the proposed kiosk and all any remaining electrical equipment, controls and instrumentation which was not previously installed. The Contractor shall complete remaining wire pulls, electrical and mechanical connections, installation of the wet well pressurization fan, and all Work incidental thereto.

.6 Upon completion of clause 3.3.5 above, the Contractor shall re-install both existing 5hp pumps. The Contractor shall connect both existing pumps to the new control kiosk, and wire in the new level control and floats, and any remaining equipment. The Contractor shall certify the kiosk has been installed and all associated equipment connected in accordance with the Contract.

.7 The Contractor shall coordinate with BC Hydro and Telus to have the 600V electrical service and communications line connected to the new kiosk, as well as with the RDN for reconnection of the existing standby generator.

.8 Upon energizing the new system, the Contractor shall undertake and perform all tests required of the new system and shall certify that all quality control tests were completed successfully prior to commissioning.

.9 The Contractor in the presence of all required personnel, shall commission the upgraded pump station, and following successful commissioning, the proposed valve between 'SMH B' and Pump Station No. 6 shall be opened, redirecting normal inflow to the wet well.

.10 Upon completion of clause 3.3.9 above, the Contractor may remove their temporary bypass pumps, and disassemble their temporary automatic control system. The Contractor shall coordinate with BC Hydro for disconnection of the Contractor's temporary service connection.

.11 Refer to specification Division 26 specifications for further electrical details.

3.4 COMMISSIONING

.1 The Contractor shall complete commissioning in accordance with Section 32 32 13.13 – Sanitary Pump Station, Clause 3.4 – Pump Station Start Up And Commissioning.

.2 The Contractor shall coordinate to ensure that the equipment manufacturer representative's are onsite, as well as qualified mechanical, electrical, control and instrumentation personnel to confirm the station is operating correctly.

.3 On completion, the Contractor shall provide a written statement indicating that the station has been reviewed by the applicable vendors and disciplines noted above. The Contractor shall certify in writing that the equipment has been installed properly and the station is operating correctly.

.4 Commissioning to be generally conducted in manual mode first, followed by automatic operation.

.5 Period of time for continuous automatic operation for acceptance of commissioning is 80 hours with all systems operating continuously without fault and all process, mechanical, control and electrical equipment free of vibration, overloading or overheating and functioning in accordance with specified rates, methods and performance.

.6 Failure of any part of Work during the period of continuous automatic operation will require restart of that portion or system of Work, following rectification of the fault or failure.

.7 If it is necessary to suspend start-up, commissioning or continuous operation during the commissioning period due to deficiencies or failure in any system, the full cost of interruption, call-back, testing and resumption of start-up, commissioning, or continuous operation shall be paid by Contractor.

4.0 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

.1 No measurement will be made for Work specified in this section. Payment for all Work under this section is to be included in the lump sum price that it most closely relates to in the Schedule of Quantities and Prices.

.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 PRODUCTS AND MATERIALS

.1 Storage, Handling and Protection:

.1 Handle and store Products and Materials in a manner to prevent damage, contamination, deterioration, and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled Products and Materials in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the Work.

.3 Store Products and Materials subject to damage from weather in weatherproof enclosures.

.4 Store cementitious Products and Materials clear of earth and concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in a heated and ventilated room. Remove oily rags and other combustible debris from Site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged Products and Materials at Contractor's own expense and to the satisfaction of the Engineer.

.2 Transportation:

.1 Pay costs of transportation of all Products and Materials required for the performance of the Work.

.2 Pay costs of transportation of pre-ordered Products and Materials, and Owner supplied Products and Materials as described in the Contract Documents.

.3 Fastenings:

.1 Provide metal fastenings and accessories in same texture, colour, and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolyte action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior Work, unless stainless steel or other material is specifically requested in the affected specification section.

.4 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.2 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in the specifications, install or erect Products and Materials in accordance with the manufacturer's instructions. Do not rely on labels or enclosures provided with Products and Materials. Obtain written instructions directly from manufacturers.

.2 Notify the Engineer, in writing, of conflicts between the specifications and manufacturer's instructions, so that the Engineer may establish the course of action.

.3 Improper installation or erection of Products and Materials, due to failure in complying with these requirements, authorizes the Engineer to require removal and re-installation at no increase in Contract Price.

1.3 WORKMANSHIP & EXECUTION

.1 General:

.1 Execute Work by personnel experienced and skilled in the respective duties for which they are employed. Notify the Engineer immediately if required Work is such as to make it impractical to produce required results.

.2 Do not employ any unfit person or anyone unskilled in their required duties. The Engineer reserves the right to require the dismissal from the Site, of workers deemed incompetent, careless, insubordinate, or otherwise objectionable.

.3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Engineer, whose decision is final.

.2 Co-ordination:

.1 Ensure co-ordination of workers in laying out the Work. Maintain efficient and continuous supervision.

.2 Be responsible for co-ordination and placement of openings, sleeves, penetrations, and accessories.

.3 Protection of Work in Progress:

.1 Adequately protect Work completed or in-progress. Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Engineer, at no increase in Contract Price.

.2 Prevent overloading of any part of the structures. Do not cut, drill, or sleeve any load bearing structural member, unless specifically indicated, without written approval of Engineer.

.4 Remedial Work:

.1 Perform remedial Work required to repair or replace the parts or portions of the Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial Work by specialists familiar with the materials affected. Perform in a manner to neither damage nor endanger any portion of Work.

.5 Location of Fixtures:

.1 Consider the location of fixtures, outlets, and mechanical and electrical item indicated as approximate.

.2 Notify the Engineer of a conflicting installation, and install as directed by the Engineer.

.6 Concealment:

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls, and ceilings, except where indicated otherwise.

.2 Before installation, notify the Engineer if there is a contradictory situation, and install as directed by Engineer.

2.0 MEASUREMENT AND PAYMENT

.1 No measurement will be made for Work specified in this section. Payment for all Work under this section is to be included in the lump sum price that it most closely relates to in the Schedule of Quantities and Prices.

.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 RELATED SECTIONS

.1 Technical Specification 26 00 01 Certifications Page for Technical Specifications

.2 Technical Specification 26 05 02 Seismic Restraint

.3 Technical Specification 26 05 10 Testing and Commissioning

.4 Technical Specification 26 05 20 Wire and Box Connectors (0-1000V)

.5 Technical Specification 26 05 21 Wires and Cables (0-1000V)

.6 Technical Specification 26 05 28 Grounding - Secondary

.7 Technical Specification 26 05 29 Hangers and Supports for Electrical Systems

.8 Technical Specification 26 05 31 Splitters, Junction, Pull Boxes and Cabinets

.9 Technical Specification 26 05 32 Outlet Boxes, Conduit Boxes and Fittings

.10 Technical Specification 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

.11 Technical Specification 26 05 43 01 Installation of Cables in Trenches and in Ducts

.12 Technical Specification 26 05 81 Motors 0.746 to 149kW

.13 Technical Specification 26 12 16 01 Dry Type Transformers up to 600V Primary

.14 Technical Specification 26 24 01 Service Equipment

.15 Technical Specification 26 24 02 Service Entrance Board

.16 Technical Specification 26 24 05 Switchboard TVSS Protection

.17 Technical Specification 26 24 16 01 Panelboards Breaker Type

.18 Technical Specification 26 27 16 Electrical Cabinets and Enclosures

.19 Technical Specification 26 27 17 Programmable Logic Controller

.20 Technical Specification 26 27 26 Wiring Devices

.21 Technical Specification 26 28 16 02 Molded Case Circuit Breakers

.22 Technical Specification 26 28 23 Disconnect Switches – Fused and Non-Fused

.23 Technical Specification 26 29 03 Control Devices

.24 Technical Specification 26 29 04 Transmitters and Indicators

.25 Technical Specification 26 29 23 11 Variable Frequency Drive

.26 Technical Specification 26 32 13 01 Power Generation Diesel

.27 Technical Specification 26 33 53 Static Uninterruptible Power Supply

.28 Technical Specification 26 36 23 Automatic Transfer Switches

.29 Technical Specification 26 50 00 Lighting

.30 Technical Specification 26 54 00 Heaters and Ventilation

1.3 REGULATORY REQUIREMENTS

.1 Definitions:

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in this Technical Specification, and on Contract Drawings, are those defined by IEEE SP1122.

.2 Reference Standards:

.1 Canadian Standards Association (CSA International)

.2 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.

.3 CSA C22.2 No. 1-10, General Requirements - Canadian Electrical Code, Part 2, Current Edition.

.4 CAN3-C235-83, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.5 SP-G-0001 General Engineering Requirements Rev B, Regional District of Nanaimo

.6 SP-G-0002 Standard Identification Requirements, Regional District of Nanaimo

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, Current Edition.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 Master Municipal Construction Documents Association (MMCDA)

.1 Master Municipal Construction Documents, Current Edition (MMCD)

.2 Reference :

.1 Requirements outlined in SP-G-0001 General Engineering Requirements Rev B, Regional District of Nanaimo to be met.

1.4 TECHNICAL SPECIFICATION INCLUDES

.1 This Technical Specification covers items common to the Divisions 26 Technical Specifications. This Technical Specification supplements requirements of Division 1.

.2 This Technical Specification 26 05 00 refers to those portions of the Work that are unique to the supply and installation of all electrical, control, and instrumentation and related appurtenances. This Technical Specification must be referred to and interpreted simultaneously with all other Technical Specifications pertinent to the works described herein.

1.5 SCOPE

.1 This project involves the construction of a sanitary pumping station located at 3270 Schooner Cove Dr, Nanoose Bay.

.2 The electrical scope of the pump station includes, but is not limited to, the following items of work:

- .1 Electrical/Civil Construction Services, including:
  - .1 Supply and installation of a new feeder circuit for the station.
  - .2 Coordination with BC Hydro for temporary electrical service to relocated existing kiosk during construction.
  - .3 Trenching and backfilling for underground electrical duct work.
  - .4 Supply and installation of concrete pads for generator and electrical kiosk including gaskets between pad and enclosures.
  - .5 Supply and installation of concrete base for luminaire/antenna pole.
  - .6 Underground ducting.
  - .7 Underground electrical grounding systems.
- .2 Supply and installation of underground and above ground electrical cabling including termination within the electrical kiosk and generator.
  - .1 Contractor to measure and confirm the length of existing cabling is sufficient to reach the new cabling termination point.
  - .2 Contractor to megger pump and pump cables and perform visual inspection to confirm suitable for re-use.
- .3 Supply and installation of a 25kW diesel-powered standby generator complete with sub-base fuel tank, critical grade muffler, and sound attenuated enclosure.
  - .1 Maintain existing generator connection through construction until new generator has been delivered and installed on site.
- .4 Unloading and installation of an electrical kiosk equipped with the following electrical and controls items (**kiosk supplied by Owner)**:
  - .1 Distribution and transformation equipment.

.2 Controls cabinet populated with controls equipment.

.3 Motor control cabinets populated with motor control equipment.

.4 Automatic transfer switch.

.5 Power receptacles.

.6 UPS backup power.

.7 Kiosk lighting and control.

.8 Kiosk heating/ventilation and control.

.5 Installation of a ventilation fan blower enclosure **(Enclosure supplied by Owner)**.

.6 Supply and installation of luminaire pole.

.7 Supply and installation of wet well, and electrical and controls components including, but not limited to, the following:

.1 Hydrostatic level sensor

.2 Float switches

.3 Explosion proof hatch switches

.8 Providing electrical commissioning of external control and power facilities for the standby generator power systems, including:

.1 Adjusting settings on electronic trip circuit breakers.

.2 Commissioning of transfer switch with stand-by generator, including confirmation of status alarm annunciation.

.3 Commissioning of 120V power systems for generator battery charging and heating.

.4 Coordinate commissioning schedule and activities with generator manufacturer.

.9 Providing testing and commissioning services for the VFD equipment including, but not limited to, the following:

.1 Coordinate programming services for the VFD equipment with the electrical kiosk manufacturer prior to commissioning.

.2 Allow for adjusting VFD programming parameters.

.3 Provide VFD parameter sheet for submission to owner.

.10 Providing electrical assistance during the commissioning of the control systems.

.11 Providing testing and commissioning of the electrical services and systems provided under this Contract. Coordinate commissioning services with generator manufacturer and electrical kiosk manufacturer.

.12 The existing lift station is to be decommissioned after the new station is commissioned. The contractor is responsible developing a cut-over plan including a temporary power source for commissioning, if required. Existing wetwell modification will prevent operation

throughout construction. Contractor to account for bypass pumping plan that does not involve existing wetwell.

.13 Provide electrical assistance during the commissioning of the RTU, HMI and SCADA system for the electrical and controls systems within the kiosk (programming by Others).

.14 Provide all permits, licenses and fees required by applicable Governmental Authorities having jurisdiction.

.15 All work described herein shall be performed by qualified personnel.

.16 Provide seismic engineering and associated materials and equipment as described herein.

.17 Provide vibration isolation equipment and materials including seismic restraints and anchoring.

.18 Preparation of operations and maintenance manuals.

.19 Provision of training for the operation and maintenance teams on items specific to the site works.

1.6 MATERIALS SUPPLIED BY OTHERS

.1 The following items will be supplied by the Owner:

.1 Fully populated electrical kiosk including on-site commissioning.

.1 Delivery window: August 31 – September 8, 2023

.2 Fully populated ventilation fan blower enclosure.

1.7 REMOVAL OF REDUNDANT MATERIAL AND EQUIPMENT

.1 Existing electrical kiosk and associated conduit and cabling

.2 Existing generator and associated conduit and cabling to be removed at future date. Expected timeline for new generator is approximately 2 years.

.3 Existing wet well equipment as specified on the Contract Drawings.

1.8 WORK COMPLETED BY OTHERS

.1 All RTU, HMI and SCADA programming and commissioning works will be completed by Others.

1.9 DEFINITIONS

.1 The word ‘Install’ means the Supply, delivery, and installation of device or equipment referenced to the level required to be complete and operational including unloading, unpacking, assembling, erecting, applying, finishing, protecting, and cleaning.

.2 The word ‘Supply’ means to obtain and deliver to the Site, ready for unpacking, assembly, and installation.

.3 AHJ: Governmental Authority having jurisdiction.

.4 Schematic or Elementary Diagram

.1 A schematic (elementary) diagram shows, by means of graphic symbols, the electrical connections and functions of a specific circuit arrangement. The schematic diagram facilitates tracing the circuit and its functions without regard to the actual physical size, shape, or location of the component devices or parts.

.5 Single-Line Diagram

.1 A single-line diagram shows, by means of single lines and graphical symbols, the course of an electrical circuit or system of circuits and the components, devices or parts used therein. Physical relationships are usually disregarded.

.6 Block Diagram

.1 A block diagram is a diagram of a system, instrument, computer, or program in which selected portions are represented by annotated boxes and interconnecting lines.

.7 Wiring Diagram or Connection System

.1 A wiring or connection diagram includes all of the devices in a system and shows their physical relationship to each other including terminals and interconnecting wiring in an assembly. This diagram may be (a) in a form showing interconnecting wiring only by terminal designation (wireless diagram), or (b) by panel layout diagram showing the physical location of devices plus the elementary diagram.

.8 Interconnection Diagram

.1 An interconnection diagram shows all external connections between terminals of equipment and outside points, such as motors and auxiliary devices. References shall be shown to all connection diagrams which interface to the interconnection diagrams. Interconnection diagrams shall be of the continuous line type. Bundled wires shall be shown as a single line with the direction of entry/exit of the individual wires clearly shown. Wireless diagrams and wire lists are not acceptable. Each wire identification as actually installed shall be shown. The wire identification for each end of the same wire shall be identical. All devices and equipment shall be identified. Terminal blocks shall be shown as actually installed and identified in the equipment complete with individual terminal identification. All jumpers, shielding and grounding termination details not shown on the equipment connection diagrams shall be shown on the interconnection diagrams. Wires or jumpers shown on the equipment connection diagrams shall not be shown again on the interconnection diagram. Signal and DC circuit polarities and wire pairs shall be shown. Spare wires and cables shall be shown.

.9 Arrangement, Layout, or Outline Drawings

.1 An arrangement, layout, or outline drawing is one which shows the physical space and mounting requirements of a piece of equipment. It may also indicate ventilation requirements and space provided for connections or the location to which connections are to be made.

1.10 DRAWINGS, MEASUREMENTS, AND NOTATIONS

.1 Contract Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work.

.2 The Contract Drawings show approximate locations of equipment and apparatus, but the right is reserved to make such changes in location before installation or performance of the work as may be necessary to meet the exigencies of construction in any way. No extra will be allowed and conversely, no credit shall be expected for such changes unless for each item of work the distance moved exceeds 3m prior to final installation of same.

.3 Take field measurements where equipment and material dimensions are dependent upon building dimensions.

.4 The Contractor shall supply and install all electrical equipment. Standard notations are used on the Contract Drawings to assist the Contractor in identifying what work needs to be done. These standard notations are defined as follows:

.1 "All equipment is proposed unless noted otherwise" – This notation is used on Contract Drawings where the majority of the equipment on the drawing is to be supplied and installed by the Contractor. The notation means that the Contractor shall perform all work shown on the Contract Drawing except for equipment shown as existing (i.e. to remain).

.2 "All equipment is existing unless noted otherwise": - This notation is used on Contract Drawings where the majority of the equipment is existing. The notation means that the Contractor shall perform only the Work identified on the Contract Drawings.

1.11 RESPONSIBILITY AND COORDINATION

.1 Provide all labour, materials, equipment, tools, and incidentals necessary to provide a complete electrical installation as indicated on the Contract Drawings and as set out in these Technical Specifications.

.2 Without relieving the Contractor of his responsibilities, the Technical Specifications have been divided into approximate trade sections for convenience. The use of these sections do not, however, limit the responsibility of the Contractor or any Subcontractor or Supplier. The onus of defining the extent of the Subcontractors' work remains with the Contractor, who, when awarding subcontracts, will ensure that the area of responsibility of any particular Subcontractor is set out in full detail.

.3 The Contractor shall advise the Contract Administrator of any specified material or equipment which is either no longer available from manufacturers or whose delivery is likely to exceed the requirements of the anticipated Work Schedule. Failure of the Contractor to perform the above shall cause the Contractor to supply, at his own expense, alternate material or equipment as selected by the Contract Administrator at a later date. Alternatively, the Contractor shall procure the specified material or equipment at his own additional expense by means of air freight or other special means of transportation.

.4 Advise the Contract Administrator of any specified equipment, material, or installation of same which appears inadequate or unsuitable or which is in violation of Laws, ordinances, rules, or

regulations of Governmental Authorities having jurisdiction. Provide all labour and materials which are obviously necessary or reasonably implied to be necessary to complete the work as if the work was shown on the Drawings and/or described in the Specifications.

.5 Check drawings of all trades and coordinate the installation of all material and equipment to ensure adequate space and free access and to maintain headroom limitations for all proposed and indicated future work. Work out jointly, with all Subcontractors on the Site, solutions to interference problems. Coordinate all work before fabricating or installing any material or equipment. It is incumbent on all Subcontractors on the Site to ensure that all materials and equipment fit into the allocated spaces and that all equipment can be properly inspected, serviced, and replaced if and when required. Advise the Contract Administrator of space problems before fabricating or installing any material or equipment. Demonstrate to the Contract Administrator on completion of its work that all equipment and material installed by the Contractor can be properly and safely serviced and replaced. Make no deviations from the intent of the design, or any involving additional cost, without the Contract Administrator's written direction.

.6 Ensure that any building structure loaded during the installation is adequate to carry such load.

.7 A contractor is entitled to engage in the regulated work for which the contractor is licensed.

.1 A licensed contractor must not:

.1 Manage or do regulated work that is:

.1 Outside the scope of the license,

.2 Contrary to any term or condition of the license, or

.3 Contrary to any term or condition imposed by the regulations on the use of the license, or

.2 Permit regulated work to be undertaken by persons under the control of the licensed contractor if they are not authorized.

.2 A licensed contractor must:

.1 Maintain current knowledge of the Applicable Laws, relevant regulations, relevant directives, relevant safety orders and any other relevant material that the minister makes publicly available, and

.2 Ensure that individuals who do regulated work for the licensed contractor maintain similar current knowledge.

1.12 COMMON PRODUCT REQUIREMENTS

.1 All products and warranties shall be registered in the Owner’s name.

.2 Products shall be purchased through authorized supply chains to ensure that all warranties and technical support remain valid in British Columbia following installation of the products.

.3 Any products installed that had their warranties or technical support voided for any reason shall be replaced at the Contractor’s expense with an identical replacement product that has a valid

warranty in British Columbia. Any resulting costs from complications that require remediation from products with voided warranties or technical support shall be borne solely by the Contractor to make the Work good.

.4 Contractor is responsible to ensure that all products are purchased from the OEM or an OEM authorized supply chain/channel such as an authorized distributor or reseller. Any non-OEM products installed shall be replaced at the Contractor's expense, even if non-OEM products are discovered after completion of the project. Any resulting costs from complications that require remediation from the use of non-OEM products shall be borne solely by the Contractor to make the Work good.

.5 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections or field reviews. Inspection does not relieve responsibility, but is precaution against oversight or error. Contractor to remove and replace defective products at own expense and is responsible for any delays and expenses caused by rejection.

.6 Contractor shall provide letters of assurance from the OEM manufactures identified throughout the specifications which assure that the products purchased as part of the project were purchased through an OEM authorized channel and that the products are new.

.1 Details on required letters of assurance from OEM manufacturers are provided in Section 1.19 Closeout Submittals.

1.13 TESTING, OPERATION AND SET-UP

.1 Testing in accordance with Technical Specification 26 05 10 Testing and Commissioning.

1.14 PERMITS, FEES, AND INSPECTIONS

.1 Before commencing work obtain and pay for all necessary approvals and permits. The Contract Administrator shall provide any documents required by the Authority Having Jurisdiction to obtain such permits.

.2 Arrange for inspection of the work at rough-in completion, prior to Substantial Completion, and as otherwise required by all applicable Authorities Having Jurisdiction.

.1 Notify Contract Administrator of any changes required by the Authorities Having Jurisdiction prior to proceeding with changes.

.3 Provide Contract Administrator with a certificate of unconditional approval for all electrical work from the appropriate Authorities Having Jurisdiction. Final payment to the Contractor shall not be made prior to submission of the inspection certificate.

1.15 EVALUATION OF CONTRACT CHANGES

.1 In accordance with Division 1 specifications.

1.16 MEASUREMENT AND PAYMENT

.1 Payment for all work performed under this Section will be Lump Sum per the Schedule of Quantities and Prices.

1.17 REVIEW OF WORK

.1 In accordance with the General Conditions.

1.18 SCHEDULING OF WORK

.1 Work shall be scheduled as required to coordinate with other Divisions and Owner's work restrictions.

1.19 ACTION AND INFORMATIONAL SUBMITTALS

.1 In accordance with Division 1 specifications.

1.20 SHOP DRAWINGS

.1 Provide digital copies of shop drawings in PDF format. Organize and separate shop drawings per Technical Specification for review.

.2 The Shop Drawing will be retained by the Contract Administrator for their office use and a copy will be marked and returned to the Contractor for correction if necessary, further reproduction, and distribution as required.

.3 Accompany submissions with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each shop drawing, product data and sample.

.5 Other pertinent data.

.4 Where specifically noted in other Technical Specifications in Division 26, submit drawings stamped and signed by Professional Engineer registered or licensed in British Columbia, Canada.

.5 Contractor shall review all Shop Drawings prior to submittal. All Shop Drawings shall be stamped and signed by the electrical Subcontractor engaged by the Contractor. Unstamped drawings will be marked "re-submit" (R3) without comment.

.6 All Shop Drawings shall use metric dimensions. Scaled drawings shall use metric scale.

.7 Each Shop Drawing shall clearly indicate the equipment ID and equipment type (e.g. Luminaire Type 'A', Panelboard SD-A) where applicable.

.8 Where manufactures' brochures that include multiple equipment or device models are submitted, they shall be clearly labelled with the equipment model and options to be supplied. Submit relevant sections of manufacturer's catalogues only. Submissions of complete catalogues will be rejected.

.9 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.10 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.11 Indicate on Shop Drawings clearance requirements for: operation, maintenance, and replacement of operating equipment devices.

.12 Submit complete Shop Drawing packages for each system. Partial submissions will be returned without comment.

.13 Review of Shop Drawings by the Contract Administrator is for the sole purpose of ascertaining conformance with the general design intent. The review shall not mean approval of the detail design inherent in the Shop Drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of its responsibility for errors or omissions in the Shop Drawings or of its responsibility for meeting all requirements of the Contract Documents. The 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.

.14 Shop Drawings stamped as "Revise and Resubmit" to be corrected and resubmitted by the Contractor within 10 days of the Shop Drawing review.

.15 Ensure that copies of all accepted Shop Drawings are available at the job site.

1.21 CLOSEOUT SUBMITTALS

.1 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.2 Operation and Maintenance Manuals:

.1 Provide draft version of Operations and Maintenance Manual to Contract Administrator two weeks prior to Substantial Performance Review.

.3 Upon completion of all electrical, control, and instrumentation work, submit Record Drawings, including all as-built information and changes. All drawings to be supplied as independent documents with the drawing number as the file name.

.4 Manufacturer Letters of Assurance: Contractor shall provide letters of assurance from the following manufactures identified throughout the specifications which assure that the products purchased as part of the project were purchased through an OEM authorized channel and that the products are new:

.1 Schneider Electric

.2 Allen Bradley

1.22 AS-BUILT DOCUMENTS AND SAMPLES

.1 Maintain at Site for Contract Administrator one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction in secure location.

.3 Label record documents and file in accordance with section number listings in list of contents of this project manual.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Contract Administrator.

.6 Obtain and pay for three sets of white prints. As the project progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the Site at all times and present for scrutiny at each project meeting.

.7 Show on the Record Drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.

.8 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.

.9 Maintain in the site office in up-to-date condition, one (1) complete set of whiteprints of each of the electrical Contract Drawings and one (1) set of Technical Specifications, including revisions to the Contract Drawings, marked clearly and indelibly in red, indicating as-built conditions where such conditions deviate from the original directions of the Contract Documents, and indicating final installation of feeders and branch circuits.

.10 ”As-Built” markings shall include the following:

.1 All changes in circuiting.

.2 Size and routing of all conduits for branch circuits including power, lighting, and systems. Note that branch circuit wiring is generally not shown on Contract Drawings. Accurately record on "As-Built" drawings the size and routing of all installed raceways and cables.

.3 Number and size of conductors in raceways and cables

.4 Location of all junction and pull boxes

.5 Location of all access panels

.6 Location of all conduit or duct stubs, installed equipment, devices, and fixtures

.7 All changes to electrical installation resulting from Addenda, Change Orders, and Field Instructions (Architectural / Engineering Instructions)

.8 Exact location of all services left for future work

.9 Location by accurate horizontal and vertical dimensions of the routes and terminations of all raceways and cables installed underground beyond the building.

.10 Exact labeling of each communication system cable at each data outlet location. Locate label numbers adjacent each communication outlet indicated on Contract Drawings. Label numbers to match those at the communication room cable end.

.11 Where extensive changes have been made to an area to the point where it is not practical to update the original Contract Drawing, the area in question shall be enclosed with a heavy dotted line and reference made to the applicable Change Order, Instruction, and/or associated Revision Drawing.

.12 For each and every "As-Built" drawing, reference shall be neatly drawn inside the framed space above the title block, listing all Contemplated Change Orders, Instructions, and Revision Drawing Numbers applicable to the particular "As-Built" drawing in question.

.13 Each "As-Built" drawing as defined above shall bear the Contractor's identification and signature, the date of record, and the notation: "We hereby certify that these drawings represent the work as built."

.14 All Addenda and Revision Drawings not having their details transferred onto the submitted "As-Built" drawings shall be included in the submission using the same drawing format as previously described.

.11 Recording Information on Project Record Documents.

.1 Record information on set of Contract Drawings.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.

.4 Do not conceal Work until required information is recorded.

.5 Contract Drawings and Shop Drawings: mark each item to record actual construction, including:

.6 Changes made by Change Orders.

.7 Details not on original Contract Drawings.

.8 References to related Shop Drawings and modifications.

.9 Specifications: mark each item to record actual construction, including:

.10 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.11 Changes made by Addenda and Change Orders.

.12 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, as required by Technical Specifications.

.13 Provide digital photos, if requested, for site records.

1.23 OPERATION AND MAINTENANCE MANUAL

.1 Submission:

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned after final inspection, with Contract Administrator's comments.

.3 Revise content of documents as required prior to final submittal.

.4 As a condition of Substantial Completion submit to the Contract Administrator, four final copies of operating and maintenance manuals in English.

.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.6 If requested, furnish evidence as to type, source and quality of products provided.

.7 Defective products will be rejected, regardless of previous inspections. The Contractor shall replace products at their own expense, with no increase to the Contract Price.

.8 Pay costs of transportation.

.2 Format

.1 Organize data in the form of an instructional manual.

.2 Provide a digital copy of the O&M manual in PDF format.

.3 Arrange content by systems under Technical Specification numbers and sequence of Table of Contents.

.4 Provide organized digital bookmarks for content by systems under Technical Specification Numbers and sequence of Table of Contents.

.3 Contents – Each Volume:

.1 Table of Contents: provide title of Project;

.1 Date of submission; names,

.2 Addresses, and telephone numbers of Engineer and Contractor with name of responsible parties;

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of Subcontractors and Suppliers, including local source of supplies and replacement parts.

.3 Product Data

.1 Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings

.1 Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text

.1 As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.6 Guarantees, Warrantees and Bonds

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List Subcontractor, Supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by Subcontractors, Suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Owner's permission, leave the date of when the warranty begins blank until the Substantial Completion Date is determined. The beginning date of the warranty will then be updated to state the Substantial Completion Date.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.7 Equipment and Systems:

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.12 Additional requirements: As specified in the Contract Documents.

1.24 DELIVERY, STORAGE, AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to Site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.1 Except for equipment intended for installation outdoors, store equipment indoors in dry location.

.2 Store and protect equipment and materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.3 Packaging Waste Management: remove and dispose of all packaging waste materials.

.1 Where possible, return packaging materials to supplier for re-use.

.2 Divert all recyclable materials from landfill.

1.25 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with the Contract and the Division 1 Technical Specifications.

.2 Qualifications: electrical work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Electrical Safety Regulation within the Electrical Safety Act and the Building Code and By-Laws.

.1 Employees registered in provincial apprentices' program: permitted, under direct supervision of qualified licensed electrician, to perform installation tasks.

.2 Submit list showing names and qualifications of key supervisory personnel.

1.26 SAFETY AND PRECAUTION

.1 Safety practices shall include the following requirements:

.1 Compliance with safety requirements provided in the Contract Documents

.2 Workers' Compensation Board Regulations

.3 Municipal By-Laws

.4 Canadian Electrical Code

.5 Electrical Safety Act of BC

.6 Municipal, Provincial and Canadian Building Code

.2 Tests shall be performed with apparatus de-energized unless otherwise specified (e.g., rotation, phasing).

.3 Power circuits shall have conductors shorted to ground by an approved hotline grounded device.

.4 In all cases, work shall not proceed until the Contractor's safety representative has determined that it is safe to do so.

.5 The Contractor shall have sufficient protective barriers and warning signs available, where necessary, to conduct specified tests safely.

.6 The Project safety procedures shall be reviewed and accepted by the Contractor and all sub-trades.

1.27 CARE, OPERATION, AND START-UP

.1 Instruct Contract Administrator and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 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.

.3 Review SP-G-0001, Regional District of Nanaimo General Engineering Requirements for additional start-up requirements.

1.28 APPROVALS

.1 Without limiting or restricting the contents of the Contract Documents, requests for approval of the substitution of materials pertaining to electrical work must be submitted to the Contract Administrator and the Owner in accordance with the Review Procedure.

.2 All submissions shall include the following information:

.1 Name and identification of specified item.

.2 Manufacturer, brand name, and catalogue number of the alternative item proposed.

.3 Detailed technical data and characteristics of alternative item such as dimensions, voltage, power requirements, performance characteristics, etc.

.4 Request for lighting fixture substitutions must be followed by photometric data and Shop Drawings.

.5 A list of any and all changes to the installation which may be required as a result of the substitution.

.3 Materials, equipment, apparatus, light fixtures, or other products specified by manufacturers' brand name, type, or catalogue number are so specified in one of two ways:

.1 Specified item followed by the words “or equal” or “approved equal” or preceded by the words “equivalent to” or “equal to”; when the Technical Specification is so worded, it is intended to establish a specific standard of quality and style but the item may be substituted for, provided the Contract Administrator provides its written approval. It is the responsibility of the Contractor to assure the Contract Administrator that all features of the specified items are supplied as part of the substitute item. If the Contract Administrator does not provide its written approval for a substitute item, the item shall be supplied precisely as specified in the Contract Documents.

.2 Specified items not followed or preceded by any such qualifying phrases: When the Technical Specification is so worded, the item shall be supplied as specified and no approved equals or equivalents will be allowed.

.4 Review by the Contract Administrator of alternate materials as permitted above is only a general approval in principal and shall not relieve the Contractor of its responsibility to ensure that any approved alternate materials perform in the same manner and with the same intent as the originally specified material would have otherwise performed.

.5 Where such substitutions alter the design or space requirements indicated on the Contract Drawings, include all material, labour, design, and engineering costs for the revised design and construction including costs of all other trades affected and those incurred by the Owner and Contract Administrator.

.6 It is the Contractor's responsibility to ensure substituted products are approved and that Suppliers have written approval indicating conditions of any such approval. Alternate manufacturers who do not have such approval shall not be used in the work. If requested by the Contract Administrator, the Contractor for Division 26 shall submit for inspection, samples of both the specified and the proposed substitute items on short notice.

2.0 PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates for control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Equipment and material shall be new and certified by a certification body accredited by the Standards Council of Canada (SCC). Where there is no alternative to supplying equipment which is not certified, obtain special approval and pay all associated fees. Notify Contract Administrator prior to supplying material that is not SCC approved.

.2 Factory assemble control panels and component assemblies.

.3 Substitution of Products

.1 After acceptance of the list of products, no substitution of any item will be permitted unless the approved item cannot be delivered in time to comply with the work schedule and the Contract Administrator accepts the change in items.

.2 To receive acceptance, proposed substitutes must equal or exceed the quality, finish and performance of those specified in the Contract Documents and/or shown in the Contract Drawings, and must not exceed the space requirements allotted on the Contract Drawings.

.3 Provide to the Contract Administrator documentary proof of equality, difference in price (if any) and delivery dates, in the form of certified quotations from suppliers of both specified items and proposed substitutions.

.4 Include costs for any required revisions to other structures and products to accommodate such substitutions.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated in the Technical Specifications and Contract Drawings.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction and Contract Administrator.

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

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify equipment as identified by Regional District of Nanaimo SP-G-0002 Standard Identification Requirements.

3.0 <u>EXECUTION</u>

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Technical Specifications are acceptable for installation in accordance with manufacturer's written instructions.

.2 Visually inspect substrate in presence of Contract Administrator.

.3 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Contract Administrator.

3.2 INSTALLATION

.1 Complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise in the Contract Drawings.

3.3 NAMPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 plastic, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise in the Contract Drawings.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.7 FIELD QUALITY CONTROL

.1 Refer to Technical Specification 26 05 10 Testing & Commissioning.

3.8 SUBSTANTIAL PERFORMANCE REVIEW

.1 Prior to the Contractor submitting an Application for Substantial Completion, the Contractor will submit written confirmation that:

.1 All wiring devices, cover plates, motor controls, lighting fixtures, and other equipment are operational, plumb, clean, and correctly labelled.

.2 All distribution equipment (cabinets, panels, distribution transformers, etc.) has been cleaned and vacuumed.

.3 All test reports have been submitted.

.4 All auxiliary systems have been tested as required and are in good and proper working order.

.5 All certificates of final acceptance from the authorities having jurisdiction have been received and submitted to the Contract Administrator.

.6 Factory finished equipment has been cleaned, touched up, or refinished as necessary to present a new appearance.

.7 All sealing of conduits, cables, cable trays, wireways, etc. at wall, ceiling, and floor penetrations have been completed.

.8 All lighting fixtures including lenses and reflectors have been properly cleaned as specified in the Contract Drawings.

.9 All loose equipment including spare parts and replacement parts have been turned over to the Owner and receipts obtained for same.

.10 The operations and maintenance manuals have been submitted.

.11 All demonstrations and instructions to the Owner have been completed.

.12 Verification letter from Seismic Engineer has been submitted.

.2 Provision of the above shall not be construed as compliance with all administrative documentation required.

.3 Notwithstanding any other provisions of the Contract, failure if the Contractor fails to complete all of the requirements in this section 3.7 the Contract Administrator may refuse to issue a Certificate of Substantial Completion.

3.9 SYSTEM START-UP

.1 Arrange and pay for services of manufacturer's factory service representative to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.2 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 aspects of its care and operation.

3.10 CLEANING

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Where work is performed in a phased manner, or Owner will take partial occupancy of the area of Work, perform final cleaning at the end of each Phase or prior to Owner taking occupancy of each area.

.4 Waste Management: separate waste materials for reuse and recycling.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 It is the responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

.2 Manufacturer's shop drawings to be submitted with seismic information on equipment structure, bracing and internal components and as required by the Specifications.

.3 Provide restraint on all equipment and machinery, which is part of the building electrical services and systems, to prevent injury or hazard to persons and equipment in and around the structure. Restrain all such equipment in its normal position in the event of an earthquake.

.4 When manufacturer mounting requirements and seismic information are not available to suit the application, the Contractor will ensure that the total electrical seismic restraint design, field review and inspection will be by a B.C. registered professional structural engineer who specializes in the restraint of building elements (the “Seismic Consultant”). Contractor to allow for coordination, provision of seismic restraints, as well as all costs for the services of the Seismic Consultant. The Seismic Consultant will provide normal engineering functions as they pertain to seismic restraint of electrical installations.

.5 The Contractor shall be aware of, and comply with, all current seismic restraining requirements and make provision for those that may come into effect during construction of the Project. Any changes in conditions will not result in an increase to the Contract Price, unless otherwise stated in the Contract Documents.

.6 The Seismic Consultant shall provide detailed seismic restraint installation shop drawings to the Contractor when required. Copies of the shop drawings to be included in the Project Binder.

.7 Provide seismic restraints on all equipment, and/or installations or assemblies, which are suspended, pendant, shelf mounted, freestanding and/or bolted to the building structure or support slabs per manufacturer instructions or the Seismic Consultants direction as required.

.8 The Seismic Consultant shall provide inspections during and after installation when their services are required. The Contractor shall correct any deficiencies in accordance with the General Conditions of the Contract.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 29 Hangers and Supports for Electrical Systems

1.4 REGULATORY REQUIREMENTS

.1 Restraints shall meet the requirements of the latest edition of the British Columbia Building Code and amendments.

.2 The Contractor's seismic consultant shall submit original signed BC Building Code Letters of Assurance Schedules S-B and S-C to the Contract Administrator together with Shop Drawings submission.

.3 Importance Factor: 1.5.

.4 Use the Electrical Contractors Association of BC details in the absence of any local requirements.

.5 The above requirements shall not restrict or supplant the requirements of any Applicable Laws, including local bylaws, codes, or other certified agencies which may have jurisdiction over all or part of the installation.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

.2 Submit shop drawings of all seismic restraint systems including details of attachment to the structure, either tested in an independent testing laboratory or approved by the Seismic Consultant.

.3 Submit all the proposed types and locations of inserts or connection points to the building structure or support slabs. Follow the directions and recommendations of the Seismic Consultant.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 GENERAL

.1 Seismic Restraint Systems (SRS) shall be designed to avoid high impact loads.

.2 SRS shall restrain seismic forces in all directions.

.3 Fasteners and attachment points shall resist same load as seismic restraints.

.4 SRS utilizing cast iron and other brittle materials is not acceptable.

.5 Equipment assemblies required to be vibration/noise isolated shall be provided with seismic rated isolators and restraints which are certified as being rated for the specification application requirements.

.6 Seismic control measures shall not interfere with integrity of fire stopping.

2.2 SLACK CABLE SYSTEMS

.1 Slack shall prevent sway in a horizontal plane, rocking in a vertical plane, sliding and buckling in axial direction.

.2 Hanger rods shall withstand compressive loading and buckling forces.

.3 Slack cable systems to allow normal maintenance of equipment and shall not create additional hazard by their location or configurations. Contractor shall rectify any such installations at no additional cost, all to the satisfaction of the engineer and inspection authority having jurisdiction.

.4 Coordinate requirements of slack cables with suppliers prior to installation.

3.0 EXECUTED

3.1 GENERAL

.1 All seismic restraints systems shall conform to Governmental Authorities, including local authority having jurisdiction and all Applicable Laws and applicable code requirements.

3.2 CONDUITS

.1 Provide restraint installation information and details on conduit and equipment as indicated in Section 3.2 of this Technical Specification:

.2 Vertical Conduit

.1 Attachment - Secure vertical conduit at sufficiently close intervals to keep the conduit in alignment and carry the weight of the conduits and wiring. Stacks shall be supported at their bases and, if over 2 stories in height, at each floor by approved metal floor clamps.

.2 At vertical conduit risers, wherever possible, support the weight of the riser, at a point or points above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 9.2 m o.c.

.3 Riser joints shall be braced or stabilized between floors.

.3 Horizontal Conduits

.1 Supports - Horizontal conduit shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.

.4 Do not brace conduit runs against each other. Use separate support and restraint system.

.5 Support all conduits in accordance with the capability of the pipe to resist seismic load requirements indicated.

.6 Trapeze hangers may be used. Provide flexible conduit connections where conduits pass through building seismic or expansion joints, or where rigidly supported conduits connect to equipment with vibration or seismic isolators.

.7 A conduit system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.

.8 Provide large enough conduit sleeves through walls or floors to allow for anticipated differential movements with firestopping where required.

.9 The Contractor will ascertain that an appropriate size restraint device be selected for each individual piece of equipment. Submit details on Shop Drawings. The Contractor will review the Shop Drawings with Seismic Consultant and submit Shop Drawings to the Contract Administrator for their reference.

3.3 FLOOR MOUNTED EQUIPMENT

.1 Bolt all equipment, (including transformers, kiosks, switchgear, generators, motor control centres, free standing panelboards, control panels, capacitor banks) to the structure. Seismic Consultant shall design anchors and bolts.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Provide testing and commissioning services and equipment to assure that all electrical equipment is operational within industry manufacturers' tolerances, calibrated per the power system studies, complies with all applicable codes, is installed in accordance with design specifications, and functions in the system in the manner designed by the Consultant.

.2 Inspections, calibrations, and acceptance tests for all equipment systems shall be performed. The inspections and testing activities shall be divided among the following groups, as specified in this Section:

.3 The original equipment manufacturer's authorized service representative shall provide special equipment, labour, and technical supervision, when required, in addition to what is supplied by the Contractor.

.4 Inspections, calibrations, and acceptance tests for equipment and systems not requiring the services of the manufacturer's representative shall be performed by the Contractor.

.5 In cases where equipment and systems require the involvement of two or all of the parties, the parties mentioned above shall coordinate and perform all inspection and testing requirements. The Contractor shall be responsible for coordination of the work and ensuring that the requirements of this Section are met.

.6 All testing and commissioning to be carried out in accordance with the terms of this Contract.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 27 16 Electrical Cabinets and Enclosures

.3 Technical Specification 26 36 23 Automatic Transfer Switches

.4 Reference Standards:

.1 All inspections and tests shall be in accordance with, but not limited to, the following applicable codes and standards except as provided otherwise in this Section.

.1 International Electrical Testing Association - NETA

.2 National Electrical Manufacturer's Association – NEMA

.3 Canadian Electrical Manufacturers Association - CEMA

.4 American Society for Testing and Materials - ASTM

.5 Institute of Electrical and Electronic Engineers – IEEE

.1 1584-2018, Guide for Performing Arc-Flash Hazard Calculations

.6 American National Standards Institute – ANSI

.1 ANSI Z535.4-2011, Product Safety Signs and Labels

.7 Canadian Electrical Code - Parts 1 and 2

.8 Canadian Standards Association – CSA

.1 CSA Z462-18, Workplace electrical safety, provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment to protect against shock and arc flash hazards.

.9 Insulated Power Cable Engineers Association - IPCEA

.10 National Fire Protection Association - NFPA

.11 ANSI/NFPA 70B: Electrical Equipment Maintenance

.12 WCB Regulations

.13 CANICSA-B72-M87: Lightning Protection Code

.14 Municipal By-Laws

.2 All inspections and tests shall utilize the following references:

.1 Project design drawings and specifications

.2 Shop drawings and submittals

.3 Manufacturer's instruction manuals applicable to each particular apparatus

.4 Applicable NETA acceptance testing work scope sections per NETA ATS (Latest Edition)

1.4 SUBMITTALS

.1 Submit the qualifications of the individual(s) doing testing and commissioning according to this Section for approval.

.2 Submit the coordinated test schedule for approval.

.3 Submit detailed test procedures corresponding to the requirements in this Section for approval. The test procedures shall be detailed test instructions, written with sufficient step-by-step information to allow a test to be repeated under identical conditions. List all setpoint values and acceptable results for each condition tested.

.4 Submit a preliminary copy of the hand-written field test results to the Consultant and the Owner within one (1) week after the test is completed.

.5 Prior to energization of equipment, submit a letter certifying that the electrical installation being energized complies with contract documents, applicable codes, and proper system operation.

.6 The test reports shall be compiled and submitted in formal form with a summary.

1.5 OPERATIONS AND MAINTENANCE (O&M) MANUALS

.1 Operations and Maintenance Manuals shall be in accordance with 26 05 00 Common Work Results – Electrical.

1.6 SAFETY AND PRECAUTIONS

.1 Safety practices shall include, but are not limited to, the following requirements:

- .1 Workers' Compensation Board Regulations
- .2 Municipal By-Laws
- .3 Canadian Electrical Code
- .4 Electrical Safety Act of BC
- .5 Municipal, Provincial and Canadian Building Code

.2 Tests shall be performed with apparatus de-energized unless otherwise specified (e.g., rotation, phasing).

.3 Power circuits shall have conductors shorted to ground by an approved hotline grounded device.

.4 In all cases, work shall not proceed until the Contractor's safety representative has determined that it is safe to do so.

.5 The Contractor shall have sufficient protective barriers and warning signs available, where necessary, to conduct specified tests safely.

.6 The Project safety procedures shall be reviewed and accepted by the Contractor and all sub-trades.

1.7 TEST EQUIPMENT

.1 All test equipment shall be furnished by the Contractor.

.2 Test instrument calibration

- .1 The Contractor shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.
- .2 The accuracy shall be traceable to the National Bureau of Standards in an unbroken chain.
- .3 Up-to-date calibration labels shall be visible on all test equipment.

.3 Use of torque wrenches

.1 Use calibrated torque wrenches for all bolted connections on buses and power cable terminations. Mark the head of the bolt with a coloured marking pen after its being torqued to manufacturer's recommended value.

2.0 MATERIALS

2.1 NOT USED

3.0 EXECUTION

3.1 REQUIREMENTS

.1 Perform acceptance tests in accordance with manufacturer's recommendations, WCB regulations, and testing specifications NETA ATS (Latest Edition).

.2 Voltage adjustments shall be in accordance with CSA CAN3-C235.83, Preferred Voltage Levels for AC Systems, to 50,000 V.

.3 The test plan, procedures, test results, and reports shall be reviewed, under the supervision of and approved by the Consultant.

.4 Division of responsibility

.1 Factory Acceptance and Site Acceptance Testing:

.1 End to end testing for all communications and power cabling installed as part of the contract between end devices, any intermediate splice/ terminal junction boxes, and the distributions panels, control panels, and RTU panels.

.2 Individual distribution component testing within the factory and in the field following installation including the following:

.1 Transformers,

.2 Electrical panels,

.3 Auto transfer switch,

.4 Motor circuit breakers,

.5 VFD Panels; and,

.6 All other electrical components as indicated on the Contract Drawings.

.3 Individual control panel component testing within the factory and in the field following installation including the following:

.1 Push buttons,

.2 Pilot lights,

.3 Control relays,

.4 Control timers,

.5 Control circuit breakers and fuses,

.6 HMI screens (test power up),

.7 Hour meters,

.8 E-stop buttons,

.9 Signal amplifiers,

.10 Signal math modules,

.11 RTU controller (test power up),

.12 Pump protection modules,

.13 Hydrostatic level sensor,

.14 Flow meter transmitters; and,

.15 All other components contained within the control panel.

.4 Individual field component testing once installed and powered including the following:

.1 Verification of labelling and identification of field components,

.2 Flow meters,

.3 Hydrostatic pressure transmitters,

.4 Float switches,

.5 Heat detectors,

.6 Door contacts,

.7 Motor sensors including temperature sensors, and leakage sensors

.8 Variable frequency drives,

.9 Security panel,

.10 and all other instrumentation and control components shown on the Contract Drawings.

.5 The Contractor shall confirm that all devices are powered, and signals are being transmitted between the field devices and the control panel prior to control system integration and testing.

.6 Contractor to configure and setup all Instrumentation (Hydrostatic pressure sensor, flow meter).

.7 The Contractor shall coordinate tests to ensure proper functionality of the system.

3.2 GENERAL TESTING REQUIREMENTS

.1 Contractor shall coordinate and pay for all testing required by the Contract Documents including any additional testing required by authorities having jurisdiction.

.2 All deficient equipment/devices shall be replaced and retested.

.3 Testing for each system shall be performed after the system installation is complete and prior to the system being put into continuous operation.

.4 Advise the Contract Administrator a minimum of five (5) Business Days in advance of each test and carry out tests in the presence of the Contract Administrator.

.5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of Work.

.6 Submit detailed typewritten test reports to the Contract Administrator within five (5) Business Days after the completion of each test. Include all test reports in the Project Binder.

.1 Test reports shall clearly indicate each component that has been individually tested, test results, and whether the results are within acceptable limits.

.2 Each test report shall be accompanied by a cover sheet outlining the test and summarizing any items that have failed the tests.

.3 Cover sheet shall include names, signatures, and contact information of the individuals who conducted the tests.

.7 Protective Device Setting and Testing

.1 All work shall conform to NETA standards.

.2 Ensure circuit protective devices including overcurrent trips, relays, and fuses are installed to required values per protection and coordination study.

.8 The following is a list of general requirements for testing of equipment and cabling to be completed by the Contractor prior to detailed system testing:

.1 The Contractor shall torque down all accessible bolts, perform routine insulation resistance and continuity tests on branch and feeder circuits, and perform rotational tests for all distribution and utilization equipment, prior to, and in addition to tests performed by the Contractor specified in this Section.

.2 The Contractor shall supply a suitable and stable source of test power at each test site.

.3 The Contractor shall clean all the electrical equipment prior to testing.

.4 The Contractor shall be responsible for implementing all final settings and adjustments on protective devices and electrical equipment in accordance with the equipment calibration requirements or Power System Protective Device Studies.

.9 Any questions or concerns identified shall be promptly addressed to the Consultant.

.10 Any system, material, or workmanship which is found defective on the basis of electrical inspections and tests shall be reported directly to the Consultant.

.11 If a test reveals a fault or problem, the materials of equipment under test will be repaired or replaced and the entire test will be repeated. Tests will not be accepted until the problem is corrected. Submit additional written test reports.

.12 Maintain a written record of all tests and, upon completion of the project, assemble and certify a final test report. The field test reports shall be compiled and signed by the individual performing the testing.

.13 Power systems protective device calibration

.1 Adjustments, settings, and modifications

.1 The Contractor shall calibrate necessary field settings, adjustments, and minor modifications to conform to the coordination study without additional cost (examples of minor modifications are trip sizes within the same frame, the time curve characteristics of induction relays, ranges, etc.).

.2 Adjust or replace protective devices to the values provided in the coordination study.

.3 The trip characteristics, when adjusted to setting parameters, shall fall within the manufacturer's published time-current characteristic tolerance.

.2 The Contractor shall verify that the protective devices have been adjusted and set in accordance with the approved Power System Study.

.14 Acceptance criteria

.1 Each function and test shall be performed under conditions which simulate actual operating conditions as closely as possible.

.1 To that end, the Contractor shall provide all necessary materials, equipment, and temporary system voltages and currents to simulate fault conditions on the system being tested in order to prove and verify proper operation (fuses excepted).

.2 At satisfactory completion of all verified tests, the building electrical system being tested shall be returned to the condition required by the contract documents as a complete and operational system.

.2 The Contractor shall perform general inspections at the job site and shall also review the following:

.1 Assembly of the accessory equipment, and the interconnecting wiring for control circuits.

.2 General inspection of the following: appearance, finish, alignment of doors, covers, and similar parts; quality of workmanship; possible shipping and other damage; missing, broken or incorrectly applied devices; loose or missing accessories, bushings, or hardware; loose or broken wires; proper installation of all equipment; verification that shop drawings and instructions have been shipped with all equipment and are available.

.3 Support of electrical equipment: inspect and check all electrical equipment for support and seismic bracing.

.4 Spare equipment: The Contractor shall inspect and verify spare equipment inventory as specified by Division 26.

.3 The Contractor shall provide technical verification of systems installed including the following:

.1 Technical verification: Purpose to ensure that all systems and devices are properly installed and free of defects and damage. Technical verification includes:

.1 Measurements of tension and power.

.2 Connecting joints and equipment fastening.

.3 Measurements of signals (dB, lux, baud rate, etc).

.4 Compliance with manufacturer's specification, product literature and installation instructions.

3.3 SYSTEM OPERATIONAL TESTING REQUIREMENTS AND PROCEDURES

.1 Distribution System Testing:

.1 The following equipment and systems shall be inspected and tested by the Contractor per manufacturer's instructions and additional requirements noted.

.2 The following tests require that the Contractor provide materials, tools, and labour (qualified personnel) to prepare equipment and devices for testing and to perform tests and to make adjustments and recalibrations for re-testing as necessary and to reconnect systems after the testing is completed. Include in the Tender, all costs associated with the provision of labour to remove and re-install panel plates, to disconnect/reconnect cables, and perform any labour other than testing, and to provide any materials and tools.

.1 Transformers

.1 Oil and Dry type rated equal to and greater than 600 V.

.2 Tests

.3 Inspect for physical damage, proper installation, anchorage, and grounding.

.4 Verify transformer is supplied and connected in accordance with the Contract documents.

.5 Insulation-resistance (Megger test) test all windings, high to low and ground, low to high and ground.

.6 Verify phase rotation sequence of transformer secondary windings.

.7 Adjust the transformer taps to the nominal system voltages per CSA CAN3-C235.83.

.8 Inspect and check for operation of all other overcurrent protection devices (switch/fuses, circuit breakers). Verify fuse/circuit breaker sizes in accordance with the Drawings.

.9 Insulation resistance (Megger) test of all incoming bus ducts and feeders and extensions to all relocated outgoing feeders and all new outgoing feeders. Ensure that all electronic and other voltage sensitive equipment is

disconnected before the tests are applied and reconnect same at completion of test.

.10 After each switchboard has been energized, manually operate each and every circuit breaker or switch and prove that when operated, the device in fact opens all underground conductors at the load end of the feeder and that the device and load have been labeled correctly.

.2 Cables

.1 Apply grounds for a time period adequate to drain all insulation-stored charge.

.2 Insulation Resistance test per NETA ATS 2017 standards.

.3 Megger test existing pump feeder cables to be reused and comment on condition and status.

.3 Other utilization equipment

.1 Switches

.1 Verify correct wire bending radii at terminations per wire manufacturer's recommendations and CEC.

.2 Protective relays and devices

.1 Conduct tests according to the manufacturer's recommended testing procedures.

.2 Calibrate and set all settings according to the Protective Device Coordination Study.

.3 The following equipment shall be inspected and tested by the Contractor. Coordinate activities with the manufacturer's authorized service representatives.

.1 The Contractor shall coordinate with the suppliers and Subcontractors to perform the following tests:

.1 Test secondary voltage levels of all transformers and adjust taps to within 2% of the rated operating voltage of the connected equipment unless directed otherwise by the Consultant. Test reports shall include phase and neutral currents.

.2 Control and switching - all circuits shall be tested for the correct operation of devices, switches, and controls, including sequenced operation of systems where applicable.

.3 Include in the written reports to the Consultant, the time and date on which each load was measured and the voltage at time of test.

.2 General power system tests

.1 Insulation Resistance test all 120 V and higher circuits, feeders, and equipment.

.2 Check resistance to ground before energizing any equipment.

.3 Low voltage feeder and branch circuit conductors (600 V and below)

.1 Test for continuity of each lighting and heating circuit originating from branch distribution panels.

.2 Test for grounds in each circuit; test shall consist of the physical examination of the installation to ensure that all required ground jumpers, devices, and appurtenances do exist and are mechanically firm.

.3 Perform a 500V M-Ohm meter test on each circuit between the conductor and ground. The insulation resistance shall not be less than 2 megohms for circuits under 120V, 6 M-Ohms between conductor and ground on those circuits (120 - 600 V) with total single conductor length of 2,500 feet and over, nor less than 8 M-Ohms for those circuits (120 - 600 V) with single conductor length of less than 2500 feet. If conductor fails test, replace wiring or correct defect and retest.

.4 Perform torque test for every conductor tested and terminated in an overcurrent device or bolted type connection; torque all connections per manufacturer's recommendations.

.5 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.6 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.7 Check resistance to ground before energizing.

.4 Switchgear and Switchboard Enclosures

.1 Carry out visual inspection of enclosure and verify nameplate data against Supplier’s as-built drawings and specifications.

.2 Torque and ductor test all bus connections and torque test all wire terminations to recommend manufacturer's data. All torqued connections to be sealed with red lacquer.

.3 Carry out electrical continuity phasing check of all bus work per three line diagram from incoming end to each termination or take-off point.

.4 Carry out insulation resistance test of all phases to ground and between phases of main bus work. Record results in megohms.

.5 Contact resistance if applicable.

.5 Panelboards

.1 Inspect for physical damage, proper installation, supports, and grounding.

.2 Verify that neutrals are grounded only at the main service.

.3 Load balance tests: Check all panelboards for proper load balance between phase conductors and make adjustments as necessary to bring unbalanced phases to within 15% of average load.

.4 Electronic and adjustable Breakers: provide adjustments as required to align with connected equipment.

.6 Breakers and Load Break Switches

.1 Adjust and set in accordance with power system study.

.2 Clean and lubricate.

.3 Visual inspection.

.4 Manual function test.

.5 Torque test.

.6 Contact resistant test (100 amp resistance tester).

.7 Electrical function test.

.8 Function trip test of all protective relay device.

.7 Breakers: Molded Case Breakers 150 Amp Frame and Larger:

.1 Visually inspect.

.2 Ductor test.

.3 Megger test.

.4 Mechanical function test.

.5 Set all units with adjustable magnetic trip units.

.6 Where solid state protection is provided with large breakers, test units as follows:

.7 Inspect and test in accordance with manufacturer's most recent installation and maintenance brochure.

.8 Perform tests using manufacturer's relay test unit as applicable, with corresponding test instruction.

.9 If manufacturer's tester is not available, use an approved relay tester unit with proper test data and test accessories.

.10 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test trip operation.

.11 Check C/T and P/T ratios and compare to coordination data.

.8 Fused or Unfused Disconnect Switches:

.1 Visually inspect and clean.

.2 Ductor test across switch blade contact surfaces.

.3 Megger test.

.4 Mechanical function test.

.9 Transformers

.1 Visual inspection of enclosure and all accessories.

.2 Torque test all bus connections and cable terminations and seal with red lacquer.

.3 Megger test.

.4 Dielectric power factor test.

.5 Core ground test.

.6 Ratio test in all tap positions.

.7 Test operation of temperature and operation of all associated alarm contacts.

.8 Test and calibrate ground fault relays and function test to trip associated breakers.

.9 Make voltage and power factor checks throughout building. If directed by the Contract Administrator, adjust transformer tap settings. Readings taken at this time to be logged, tabulated and any adjustments made to be suitably logged and incorporated in the Project Binders.

.10 Transfer Switch - Low Voltage

.1 Torque test all bus joints and cable terminations and seal with red lacquer.

.2 Ductor test.

.3 Megger test.

.4 Power up control circuits, simulate loss of normal power and function all devices including timers.

.5 Apply device settings as specified.

.6 Wiring Checks as listed:

.7 Check all control, relaying and instrumentation wiring against vendor wiring schematics, three line diagrams and Technical Specifications.

.8 Test each circuit for continuity using a buzzer or similar device.

.9 All current circuits shall be injected, all voltage circuits shall be powered at 120 Volts, all devices functioned and checked against control schematic diagram.

.10 Check polarity and verify phase relationships on all three phase metering circuits.

.11 Where errors are discovered and changes are required, mark up and note required corrective action on vendor prints.

.12 Operation tests in accordance with Section 26 32 13 01 – Power Generation – Diesel.

.11 Microprocessor Type Relays

.1 Mechanical Inspection:

.2 Remove cover from relay case carefully. Trip circuit is live circuit and on some relays it is possible to cause an instantaneous trip while removing relay cover. Inspect cover gasket. Check glass for tightness and cracks.

.3 Eliminate unwanted tripping, short circuit current transformer secondary by careful removal of relay test plug or operation of appropriate current blocks.

.4 Check connections, circuit boards and modules for tightness.

.5 Check output relay coils for signs of overheating and brittle insulation.

.6 Cleaning:

.1 Clean glass inside and out.

.2 Clean relay compartment as required. Clean relay plug in contacts if applicable, using proper tools.

.3 Remove dust and foreign materials from interior of relay using small brush or low pressure 3.2 kg blower of nitrogen.

.4 Inspect for any signs of moisture and corrosion.

.5 Clean relay output contacts with burnishing tool or non residue contact cleaner.

.7 Electrical Testing: Function tests for typical overcurrent relays include:

.8 Energize relay from an appropriate DC power source and check "ON" indication.

.9 Time current function test and trip flag operation.

.10 Instantaneous pickup functional trip and flag operation.

.11 Use tests listed above for most microprocessor overcurrent type relays.

.12 Check C/T and P/T ratios and compare to coordination data.

.12 Solid State Relays

.1 Inspect and test in accordance with manufacturer's most recent installation and maintenance brochure.

.2 Perform tests using manufacturer's relay test unit as applicable, with corresponding test instructions.

.3 If manufacturer's tester is not available, use an approved relay tester unit with proper test data and test accessories.

.4 Proof test each relay in its control circuit by simulated trip tests to ensure total and proper operation of breaker and relay trip circuit by injection of relay circuit to test the trip operation.

.5 Check C/T and P/T ratios and compare to coordination data.

.13 Motors

.1 Megger Test existing pumps to be reused and comment on condition and status.

.14 Motor Control Centre/Panels

.1 Megger Test all motor feeders.

.2 Check polarity and verify phase relationships on main feeder and all equipment feeders. Bump Test all existing motors fed from the new MCC.

.3 Power up control circuits. Verify operation of all control circuits re-terminated at new MCC.

.4 Test operation of each piece of equipment in 'Hand'

.5 Test operation of each piece of equipment in 'Auto'

.6 Where required, verify shutdown of equipment on fire alarm.

.15 Bus Duct - Low Voltage

.1 Visually inspect.

.2 Torque test all bolted connections and seal with red lacquer.

.3 Megger test.

.4 Contact resistance test on total bus duct.

.16 Devices

.1 Test all receptacles for proper polarity, circuitry and grounding.

.17 Grounding systems

.1 Verify that generator neutral is solidly bonded to the building ground by removing the service neutral grounding conductor and insulation resistance test the neutral bus.

.2 Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system-neutral, and/or derived neutral points installed as part of this Contract. Investigate resistance values, which exceed 0.5 ohm. If this resistance cannot be obtained with the ground system, notify the Consultant for further instruction.

.3 The resistance to ground between the equipment enclosures and the grounding grid shall be tested. In soils of low conductivity, additional ground rods, ground plates, and ground wires shall be added, as required. Ground

measurements shall not exceed 25 ohms. Measurements shall be undertaken under dry soil conditions, and when frost penetration has not exceeded 150mm. Test results shall be documented by the Contractor and copies given to the Contract Administrator.

.4 Test Method: 3-Point (Fall-of-Potential) Method per IEEE Standard 81.

3.4 HVAC AND LIGHTING SYSTEMS

.1 The following applies to heating, ventilation, and lighting systems:

.1 Heating and Ventilation Systems

.1 Purpose to ensure that existing systems are functional. Verification includes:

.1 Confirmation of thermostat settings for heating and cooling.

.2 Confirmation of operation of heaters and fans.

.3 Confirmation of all control panel elements for ventilation control panels are operational and functioning.

.2 Lighting Systems

.1 Purpose to ensure that systems are functional. Verification includes:

.1 Confirmation that lighting within each building is activated by the associated switches.

.2 Confirmation that emergency lighting is operational in the event of power failure.

.3 Confirmation that kiosk and enclosure lighting is operating as intended per Contract Drawings.

3.5 CONTROL SYSTEMS

.1 The following applies to control systems and instrumentation:

.1 Loop testing: Purpose is to test all control wiring loops between instrumentation and terminations within the control panel to ensure signal continuity and correct signal polarity. Loop testing to be completed for the following instruments:

.1 Flow meters

.2 Pressure transmitters

.3 Float switches

.4 Door contacts

.5 Heat/ smoke detectors

.6 VFD signals

.7 Surge protection devices.

.8 Power monitoring relay.

.9 And any other devices included within the Contract Documents.

.2 Operational verification: Purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:

.1 Operation of pump starters (VFDs, HOA operation, etc.).

.2 Operation of control system (RTUs, HMIs, relay components, etc.).

.3 Operation of each device individually and within its environment.

.4 Operation of buttons, switches, and pilot lights.

.5 Operation of the external devices, including:

.1 Kiosk controls (heat/ smoke/ security elements)

.2 Float switch

.3 Level sensors

.4 Flow meters

.5 Generator systems

.6 Provide assistance during Owner testing and commissioning activities.

.2 Labels

.1 Upon completion of the inspection, calibration, and testing, attach a label to all devices tested. These labels shall indicate the date tested, the Contractor company name, and tester's initials.

.3 Re-testing

.1 Any fault in material or in any part of the installation revealed by these tests shall be investigated, replaced, or repaired by the Contractor and the same test repeated by the Contractor at Contractor’s expense until no fault appears.

3.6 MANUFACTURER'S FIELD SERVICES:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit manufacturer's field reports to Contract Administrator for review. Include field reports in Project Binders.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Obtain manufacturer’s field services for commissioning of equipment as required in other Sections of Division 26 Technical Specifications.

.4 Conduct additional testing as required in other Sections in Division 26 Technical Specifications.

3.7 Standards

.1 The following tests shall be conducted in accordance with latest CSA, ASTM, IEEE and IPCEA standards, recommendations for power cable and equipment testing and standards of the authority having jurisdiction. Notwithstanding the test levels listed in these standards, in no case shall the maximum DC test level exceed manufacturer's factory test AC level for that equipment.

.2 Where production tests are required by EEMAC or CSA for manufactured equipment, provide records of these tests. All tests shall be completed in accordance with manufacturer's published instructions. If these instructions do not conform to the test requirements as specified herein inform the Contract Administrator prior to proceeding with the test.

3.8 TEST APPARATUS AND INSPECTION REPORT

.1 The Contractor is responsible for furnishing all apparatus and labour required for the test operations.

.2 Inspection and test results to be recorded on a suitable form which shall be furnished by the Contractor. The inspection and report forms shall be submitted to the Contract Administrator. Each form to be signed by the test technician. Space to be provided for noting approved items and their disposition.

.3 The Contractor will submit full commissioning reports and information for as-built drawings and acceptance documents signed by test technician.

.4 Upon completion of the Work, the Contractor will assemble complete sets of inspection/test results/reports to be placed in the operating and maintenance manuals. Reports shall include the following:

- .1 Summary of project
- .2 Description of equipment tested
- .3 Description of test
- .4 Test results including re-testing results
- .5 Test dates
- .6 Tester’s name
- .7 Witnesses (when required)
- .8 Corrective work
- .9 Acceptance criteria
- .10 Conclusions and recommendations
- .11 Appendix, including appropriate test forms

3.9 DEMONSTRATION

.1 Demonstrate and instruct the Owner's personnel on operating and maintenance procedures for all electrical systems using the assistance of specialist sub-trades and manufacturer's

representatives for instruction. Systems to be demonstrated and trained on shall include the following:

.1 Entire power distribution systems (primary and backup).

.2 Operation of circuit breakers, interlocking schemes, etc.

.3 Motor control equipment and associated components.

.4 Instrumentation and field monitoring/control devices.

.5 Manual and automatic station control operation.

.6 Continuity between switches/pilot lights/field devices and the PLC.

.7 Loss of power controls and backup power operation.

.8 Alarming.

.9 Routing and installation of major feeders, grounding and raceways.

.10 Labeling and identification schemes.

.11 Use of the operations and maintenance manuals.

3.10 TRAINING

.1 Arrange an acceptable time with the Owner and the Contract Administrator and submit a program of instruction and demonstration for the Owner's approval. Assume that the Owner's staff are not familiar with any of the special equipment and/or systems installed.

.2 As a condition of Substantial Completion, submit to the Contract Administrator complete list of systems demonstrated and training completed, and state for each system:

.1 Date that instructions were given to the Owner’s staff.

.2 Duration of instruction.

.3 Names of persons instructed.

.4 Other parties present (manufacturer’s representative, Contract Administrator, etc.).

.5 Signature of the Owner’s staff stating that they properly understood the system installation, operation, and maintenance requirements and identifying any systems or equipment which were not demonstrated to their satisfaction and which must be re-demonstrated

3.11 SYSTEM ACCEPTANCES

.1 Prior to requesting inspection, submit, for review by the Contract Administrator letters from the manufacturers of equipment and systems indicating their technical service representatives have inspected and tested the equipment and systems and are satisfied with the methods of installation, connections and operation.

.2 Such acceptance letters shall be submitted for the following:

.1 Switchboards.

.2 Distribution and Power Panels.

.3 Transformers.

.4 Motor Control Centres/Panels.

.5 Auto Transfer Switch

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation for wire and box connectors.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 21 Wires and Cables (0-1000V)

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 18.1-13, Metallic Outlet Boxes
- .2 CAN/CSA C22.2 No. 18.2-06, Nonmetallic Outlet Boxes
- .3 CAN/CSA C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings
- .4 CAN/CSA C22.2 No. 18.4-04, Hardware for the Support of Conduit, Tubing
- .5 CAN/CSA C22.2 No. 65-18, Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

- .1 EEMAC 1Y 2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y 2 to consist of:

- .1 Connector body and stud clamp for copper conductors.
- .2 Clamp for stranded copper conductors.
- .3 Stud clamp bolts.
- .4 Bolts for copper conductors.
- .5 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable and flexible conduit as required to comply with CAN/CSA C22.2 No. 18 (all subsections).

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Consultant or provide photographic evidence of areas of concern.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

- .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
- .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.
- .4 Install bushing stud connectors in accordance with EEMAC 1Y 2.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation for wire and cables.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 20 Wire and Box Connectors (0-1000V)

.3 Technical Specification 26 05 43 01 Installation of Cables in Trenches and Ducts

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 0.3-09, Test Methods for Electrical Wires and Cables
- .2 CAN/CSA C22.2 No. 38-14, Thermoset-insulated wires and cables
- .3 CSA C22.2 No. 49, Flexible Cords and Cables
- .4 CSA C22.2 No. 51, Armoured Cables
- .5 CSA C22.2 No. 52, Underground secondary and service-entrance cables
- .6 CSA C22.2 No. 65, Wire Connectors
- .7 CAN/CSA C22.2 No. 75, Thermoplastic insulated wires
- .8 CAN/CSA C22.2 No. 127-15, Equipment and lead wires
- .9 CSA C22.2 No. 131, Type TECK 90 Cable
- .10 CAN/CSA C22.2 No. 131-17, Type TECK 90 Cable
- .11 1.4.13 CSA C22.2 No. 174, Cables and Cable Glands for Use in Hazardous Locations
- .12 CSA C22.2 No. 2556, Wire and Cable Test Methods

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 POWER WIRING

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG, unless noted otherwise.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Jacketed.

.3 Colour Code:

- .1 AC 3-Phase:
  - .1 Line 1: Red
  - .2 Line 2: Black
  - .3 Line 3: Blue
  - .4 Neutral: White
  - .5 Ground: Green
- .2 AC Single Phase:
  - .1 Hot: Black
  - .2 Hot (Secondary): Red
  - .3 Neutral: White

.4 Grounding conductors to be in accordance with requirements in Technical Specification 26 05 28 Grounding - Secondary.

2.2 TECK 90 CABLE

.1 Conductors:

- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.

.2 Insulation:

- .1 Cross-linked thermosetting polyethylene rated type RW90 XLPE.
- .2 Rating: 1000V

.3 Inner jacket: polyvinyl chloride material.

.4 Armour: interlocking aluminum.

.5 Overall covering: thermoplastic polyvinyl chloride.

.6 Connectors:

.1 Watertight approved for TECK Cable.

.2 Explosion proof in classified areas approved for TECK cable.

2.3 CONTROL AND INSTRUMENTATION CABLE

.1 Internal cabinet control wiring shall be TEW (tinned).

.1 Wire: to CAN/CSA C22.2 No. 127-15.

.2 Minimum Size (unless otherwise noted by Contract Drawings):

.1 120VAC: 14AWG.

.2 24VDC: 18AWG.

.3 Colour Code

.1 AC Hot: Black

.2 AC Hot (Secondary): Red

.3 AC Neutral: White

.4 DC Positive: Red

.5 DC Negative: Blue

.6 Generator Start: Yellow

.7 Ground: Green

.2 Analog instrumentation wiring:

.1 Cable: to CAN/CSA-C22.2 No. 75.

.2 Conductors:

.1 Circuit conductors: 7 strand tinned copper.

.3 Insulation:

.1 Cross-linked thermosetting polyethylene rated type RW90 XLPE.

.2 Rating: 300V and 600V, as required.

.4 Jacket: polyvinyl chloride material.

.5 Shield:

.1 Individual Foil

.2 Tinned copper drain wiring under and in contact with foil.

2.4 ETHERNET CABLES

.1 CAT6 (250MHz) rated, compatible with 1000BaseT networks.

.2 Outdoor rated, installation in conduit approved, UV resistance.

.3 Conductors:

.1 8 x 23 AWG solid copper conductors, arranged in 4 twisted pairs.

.2 RJ45 Termination: TIA 568A

.3 Straight-through (non-crossover) wiring, unless noted otherwise.

.4 Jacket:

.1 Oil and sunlight resistant PVC.

.2 Colour: Blue

2.5 ETHERNET PATCH CABLES

.1 CAT6 (250MHz) rated, compatible with 1000BaseT networks.

.2 8 x 23 AWG solid copper conductors, arranged in 4 twisted pairs.

.3 Straight-through (non-crossover) wiring, unless noted otherwise.

.4 RJ45 male connectors with molded boots.

.1 Termination: TIA 568A

.5 Colour: Blue

2.6 ARMOURED CONTROL AND INSTRUMENTATION CABLE

.1 Cable: to CAN/CSA-C22.2 No. 239-21.

.2 Conductors:

.1 Circuit conductors: 7 strand tinned copper.

.2 Conductor size per Contract Drawings.

.3 Insulation:

.1 Cross-linked thermosetting polyethylene rated type RW90 XLPE.

.2 Rating: 300V and 600V, as required.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride.

.7 Certification:

.1 FT-4 Flame Rated

.2 Temperature: 105°C dry, 75°C wet, and -40°C

.3 Suitable for installation in Class I, Zone 1 and Zone 2, and Class II, Division 1 and 2 Hazardous Locations.

.8 Connectors:

.1 Watertight approved for armoured control and instrumentation cable.

.2 Explosion proof in classified areas approved for armoured control and instrumentation cable.

2.7 TWISTED PAIR SHIELDED (TPSH) ARMOURED CABLES

.1 TPSH cables are to be constructed as follows:

.1 Compliance: CSA C22.2 - No. 38, No. 174 and No. 239

.2 Two copper conductors, stranded, tinned, minimum #16 AWG, PVC-insulated, twisted in nominal intervals of 50 mm. Conductor identification to be by black and white coloured insulation.

.3 100 percent coverage aluminum foil or tape shield and bare stranded, tinned copper drain wire, minimum #16 AWG for each pair.

.4 Separate bare stranded, tinned copper drain wire, minimum #16 AWG for each pair.

.5 Overall shield and bare stranded tinned copper drain wire for multi-pair cables.

.6 Insulated for 600 V, 90 degrees C.

.7 Interlocking aluminum armour.

.8 Overall flame-retardant PVC jacket rated to minus 40 degrees C and meeting low gas emission and FT4 flame test requirements as specified in CSA-C22.2 – No. 0.3 and IEEE 383, and sunlight (UV) resistant rated.

.9 Overall PVC jacket to be grey in colour.

.10 HL rating for hazardous location Class 1 Div. 1 or 2.

.11 Suitable for cable tray installation, indoor and outdoor, for direct burial, and for installations in conduits.

.12 Each pair of multiconductor TPSH cables to be individually shielded and continuously number coded.

2.8 TRIAD SHIELDED ARMOURED CABLES

.1 Triad shielded armoured cables constructed same as Twisted Pair Shielded cables except for:

.1 Three copper conductors per triad group.

2.9 FIBRE OPTIC CABLES

.1 Optic fibre cables to be aluminum clad armored.

.2 Trunk cable to conform with the following:

.1 ANSI X3.166.

.2 62.5/125 µm core/cladding (OM1).

.3 Dual-mode, 850/1300 nm.

.4 Graded-index glass.

.5 Gel-filled, loose-buffer construction.

.6 Bandwidth: 160/500 MHz-km at 850/1,300 nm.

.7 Attenuation: 3.5/1.5 dB/km @ 850/1,300 nm.

.8 Numerical aperture: 0.275.

.9 Strength member: Kevlar.

.10 Pulling tension: 2,000 N.

.11 Rating: Indoor/Outdoor Use, Tray Rated.

.12 Jacket: orange PVC for multimode optic fibre and yellow PVC for single mode optic fibre.

.3 Break-out cables and jumpers to be similar except tight-buffer construction. Jumper cables are to be supplied as factory assembled units.

.4 Optic fibre connectors are to be oven-cured aluminum/ceramic ST type.

2.10 PUMP CABLES

.1 Existing pump cables to be re-used if possible.

.2 Megger Test existing pumps to be reused and comment on condition and status.

3.0 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

3.2 GENERAL CABLE INSTALLATION

.1 Install cable in trenches in accordance with Technical Specification 26 05 43 01 Installation of Cables in Trenches and in Ducts.

.2 Terminate cables in accordance with Technical Specification 26 05 20 Wire and Box Connectors - (0-1000 V).

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 All field wiring/communication cabling that maybe field installed directly onto any cabinet door mounted components shall be suitably routed and protected across the door hinge to prevent possible mechanical damage upon door opening and/or door closing.

3.3 WIRING IDENTIFICATION

.1 Wiring identification as per RDN Standard Identification Requirements SP-G-0002.

.2 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of cable.

.3 Maintain phase sequence and colour coding throughout.

.4 Colour code: to CSA C22.1.

.5 Use colour coded wires in communication cables, matched throughout system.

.6 Wire Labeling:

.1 Motor Control Circuits

.1 The identification format for motor control circuits is as follows:

P	**NNN**	**-**	**WWW**	**S**
Process Area (Optional)	Equipment Number (Optional)	-	Wire Number	Suffix (Optional)

P is the *Process Area*, which is based on Appendix B. It is not required for wires exclusively within the motor starter.

NNN is the *Equipment Number* of the associated equipment. It is not required for wires exclusively within the motor starter.

WWW is the *Wire Number*, an incrementing number.

S is an *optional Suffix* and is utilized where it is desired to utilize the same wire number, but the signal has changed.

.2 Notes:

.1 It is desirable, but not mandatory, that the wire number in a motor starter match the terminal number.

.2 It is deemed acceptable to omit the Process Area and Equipment Number for wires exclusively within the motor starter, as it is common industry practice, and MCC manufacturers only typically provide numeric wire numbers.

.2 Electrical Cables Associated with Identified Equipment

.1 The identification format for power cable

C	**-**	**E***	**-**	**T**	**S**
Cable Designation	-	Equipment Tag	-	Type	Suffix

C is the Cable Designation. For power cables, the letter C is utilized. For busway, BUS is utilized.

E* is the *Equipment Tag Number of the identified load equipment,* as defined in other sections of this document.

T is the cable type and shall be P for power, C for control signals.

S The suffix is a sequential number that uniquely identifies the cables for a piece of equipment. Cables of different type can re-use numbers (if is feasible to have two unique cables -P1, and -C1 on a piece of equipment)

.3 General Purpose Cables – Lighting and Receptacles

.1 The identification format for general purpose cables, for single phase loads, is as follows.

C	**-**	**P**	**NNN**	**-**	**KK**
Cable Designation	-	Process Area	Equipment Number of Source Panel	-	Circuit Number

C is the Cable Designation.

P is the *Process Area*, which is based on Section 6

NNN is the *Equipment Number* of the source panel.

KK is the *Circuit Number* of the source panel

3.4 ANALOG SIGNALS

.1 Use twisted-pair shielded armoured (instrument TECK cable) as applicable, for low-level analog signals such as 4-20 mA, 1-5VDC, 0-10VDC, pulse type circuits 24VDC and under, and other signals of a similar nature.

.2 Use triad shielded armoured cable for connections between RTDs and transmitters or CDAC RTD inputs.

3.5 DIGITAL SIGNALS

.1 Use TPSH armoured cable for input and output signals 24 VDC and under and terminate in the marshalling panels.

.2 Use Control TECK cable or wire and conduit power to instruments, for 120 V signals other than those mentioned above and as otherwise shown in the Contract Drawings.

3.6 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Technical Specification 26 05 43 01 Installation of Cables in Trenches and in Ducts.

3.7 INSTALLATION OF TECK90 CABLE (0-1000V)

.1 Install cabling as follows:

.1 In conduit systems in accordance with Technical Specification 26 05 43 01 Installation of Cables in Trenches and in Ducts.

.2 Install cable exposed, securely supported by straps or hangers.

.1 Group cables wherever possible on channels, individually strapped.

3.8 INSTALLATION OF ARMOURED CABLE

.1 Install cabling as follows:

.1 In conduit systems in accordance with Technical Specification 26 05 43 01 Installation of Cables in Trenches and in Ducts.

.2 Install cable exposed, securely supported by straps or hangers.

.1 Group cables wherever possible on channels.

3.9 INSTALLATION OF CONTROL AND INSTRUMENTATION CABLE

.1 Ground control cable shield at control cabinet only.

.2 Cut and heatshrink shield at terminations to field devices.

3.10 INSTALLATION OF ARMOURED CONTROL AND INSTRUMENTATION CABLE

.1 Install cabling as follows:

.1 In conduit systems in accordance with Technical Specification 26 05 43 01 Installation of Cables in Trenches and in Ducts.

.2 Install cable exposed, securely supported by straps or hangers.

.1 Group cables wherever possible on channels.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation for secondary grounding.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 24 01 Service Equipment

1.4 REGULATORY REQUIREMENTS

.1 CSA C22.1 - Canadian Electrical Code, Part 1: Section 10 Grounding and Bonding

.2 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837-02, Qualifying Permanent Connections Used in Substation Grounding.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 EQUIPMENT

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

.2 Plate electrodes: copper surface area minimum 0.2 m^3, 1.5mm thick, In accordance with the CEC.

.3 Grounding conductors: medium hard drawn, 7 strand, bare stranded copper, size as indicated on Contract Drawings.

.4 Insulated grounding conductors: green, size as indicated.

.5 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.6 Grounding rod inspection well:

.1 High density polyethylene construction

.2 Minimum 250mm top opening.

.3 Bolt down cover with skid resistant surface.

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

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Bonding jumpers, straps.

.5 Pressure wire connectors.

3.0 EXECUTION

3.1 GENERAL INSTALLATION

.1 Install exterior buried grounding loop system as indicated on the Contract Drawings.

.2 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.3 Install connectors in accordance with manufacturer's instructions.

.4 Protect exposed grounding conductors from mechanical injury.

.5 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.

.6 Use mechanical connectors for grounding connections to equipment provided with lugs.

.7 Soldered joints not permitted.

.8 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.9 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.12 Bond single conductor, metallic armoured cables to cabinet at supply end.

.13 Compression fittings standard of acceptance:

.1 Burndy Hyground

3.2 INSPECTION WELL

.1 Install grounding stud, electrode, size as indicated stranded copper conductor in each inspection well as indicated on Contract Drawings.

.2 Install ground rod in each inspection well so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements (25 Ohms).

3.3 ELECTRODES

.1 Install rod electrodes and make grounding connections within inspection wells.

.2 Bond separate, combine multiple electrodes together, if separate.

.3 Size copper conductors for connections to electrodes, sized as indicated on Contract Drawings.

.4 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.4 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral secondary 120V system.

3.5 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.6 JUNCTION BOXES AND VAULTS

.1 Bond lids of in-ground junction boxes and vaults.

3.7 MASTER GROUND BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical kiosk.

.2 Ground items of electrical equipment in electrical kiosk to ground bus with individual copper connections, sized as indicated on the Contract Drawings.

.3 Ground items of water system to ground bus with copper connections, sized as indicated on the Contract Drawings.

3.8 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Technical Specification 26 05 00 Common Work Results – Electrical and Technical Specification 26 05 10 Testing and Commissioning.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Contract Administrator and Government Authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with the Contract Documents.

1.2 SCOPE

.1 Materials and installation for hangers and supports for electrical systems.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 02 Seismic Restraint

1.4 REGULATORY REQUIREMENTS

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837-02, Qualifying Permanent Connections Used in Substation Grounding.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit Shop Drawings in accordance with Section 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 SUPPORT CHANNELS AND STANCHIONS

.1 Select channel as indicated in the Contract Drawings:

.2 U shape, stainless steel, size 41 x 41 mm, 2.5 mm thick, surface mounted and suspended with stainless steel hardware.

.3 All materials to assemble stanchions shall be from same manufacturer.

.2 Wire and cable ties: nylon 'Ty-rap' or approved equal for wiring and control cable. Velcro cable wraps for data cables.

3.0 EXECUTION

3.1 INSTALLATION

.1 Refer to Technical Specification 26 05 02 – Seismic Restraint.

.2 Contractor to note that the intent of this Technical Specification is for the Contractor to provide under the base contract all seismic restraint of electrical equipment.

.3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.1 One-hole stainless steel straps to secure surface conduits and cables 53 mm and smaller.

.2 Two-hole stainless steel straps for conduits and cables larger than 53 mm.

.4 For surface mounting of two or more conduits use channels at 1500 mm on centre spacing.

.5 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.6 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.7 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.8 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.

.9 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation for splitters, junction, pull boxes, and cabinets.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

.3 Technical Specifications 26 27 16 Electrical Cabinets and Enclosures

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

- .1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.
- .2 CSA C22.2 No. 76, Splitters.
- .3 CSA-C22.2 No. 85, Rigid PVC Boxes and Fittings.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 SPLITTERS

.1 Compliance: CSA C22.2 No. 76, Splitters.

.2 Sheet metal enclosure with welded corners, 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 specified.

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

2.2 JUNCTION AND PULL BOXES

.1 RPVC construction sized to suit. Screw on flat covers. All mounting hardware to be stainless steel.

.2 Internal dielectric barrier for separating controls and power terminations only where indicated on Contract Drawings.

2.3 EXPLOSION PROOF JUNCTION BOXES

.1 Aluminum construction sized to suit.

.2 Certification: Class 1, Division 1 & 2.

.3 Internal back panel for terminal block mounting.

.4 Gasketed, front cover.

.5 Stainless steel hardware.

2.4 TERMINAL AND PULL BOXES

.1 Intended for surface mounting, except as otherwise specified.

.2 Weatherproof, Style WP1

.1 Copper-free cast aluminum, Type 4.

.2 Hinged door if any one dimension exceeds 300 mm.

.3 Manufactured breather, designed to maintain weatherproof classification of enclosure.

.4 When used as terminal box, equipped with mounting pan and terminal strip.

.3 Weatherproof, Style WP2

.1 Same features as for Style WP1, except made of sheet aluminum, minimum 2.3 mm thick.

.2 Dripshield.

.4 Weather- and Corrosion-Proof, Style WP3

.1 Same features as for Style WP1, except Type 4X enclosure, made of 316 stainless steel.

.5 Weather- and Corrosion-Proof, Style WP4

.1 Same features as for Style WP1, except non-metallic, Type 4X fibreglass enclosure.

.2 Quick-release latches.

.6 Indoor Dry Location Non-process Area, Style GP5

.1 Welded steel or aluminum Type 12 enclosure.

.2 Hinged cover with quick-release latch or automotive handle, for enclosures that exceed 300 mm in width or height.

.7 Watertight, Style WT

.1 Same as weatherproof styles WP1 to WP 4, except without breather.

.2 Explosion-proof, Style XP

.3 Same features as for Style WP1, except, in addition to being weatherproof, also suitable for the hazardous location specified.

2.5 CABINETS

.1 Intended for surface mounting, except as otherwise specified.

.2 Enclosure rating is to be the higher rating of the rating shown in the drawings and the rating based upon location of installation.

.3 Single - or double-door construction with 316 stainless steel full-length hinge.

.4 Minimum standard: formed and welded Type 12 construction, of minimum 1.8 mm thick sheet steel, with automotive door handle.

.5 For process and outdoor areas and below-grade valve chambers: formed and welded Type 4X construction of minimum 2 mm thick sheet aluminum, with 316 stainless steel door clamps and hardware.

.6 Full-size equipment mounting pan of formed sheet metal.

3.0 EXECUTED

3.1 SPLITTERS

.1 Install splitters and mount plumb, true, and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where specified otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor, unless otherwise indicated.

.3 Install pole mount enclosures as indicated.

.4 Install equipment and terminal blocks as indicated in cabinets.

.5 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Technical Specification 26 05 00 Common Work Results - Electrical.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation for outlet boxes, conduit boxes, and fittings.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

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

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 240V outlet boxes for 240V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

.7 Provide clear while-in-use gasketed cover for interior outlets, where indicated in Contract Drawings.

2.2 CONDUIT BOXES

.1 FD NEMA 4X RPVC boxes with factory-threaded hubs, mounting feet, and gasketed covers, where indicated in Contract Drawings.

.2 Provide clear while-in-use gasketed cover for interior outlets, where indicated in Contract Drawings.

2.3 WEATHER-PROOF OUTLET BOXES

.1 RPVC boxes for outlets rated for outdoor environments.

.2 Connected to TECK 90 cables as required, minimum size 102 x 54 x 48 mm.

.3 Provide weatherproof clear lockable while-in-use covers for all GFI locations, where indicated.

2.4 HAZARDOUS AREA OUTLET BOXES

.1 Certification: Class I, Divisions 1 and 2.

.2 Material: copper-free cast aluminum body and cover

.3 Finish: Aluminum

.4 Size: as required.

.5 Mounting: elevated mounting feet to allow cable connector termination and removal when surface mounted.

2.5 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock out fillers to prevent entry of debris.

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

3.0 <u>EXECUTION</u>

3.1 INSTALLATION

.1 Recess mount lighting and outlet boxes located on building exterior.

.2 Surface mount boxes located in building interior.

.3 Support boxes independently of connecting conduits.

.4 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of the work.

.5 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.6 Vacuum clean interior of outlet boxes before installation of wiring devices.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Technical Specification 26 05 00 Common Work Results - Electrical.

.2 Install identification labels indicating circuit, voltage, and phase.

END OF SECTION

Revision History

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-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation for conduits, conduit fastenings and conduit fittings.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 21 Wires and Cables (0-1000V)

.3 Technical Specification 26 27 16 Electrical Cabinets and Enclosures

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

- .1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.
- .2 CAN/CSA C22.2 No.18.3 12, Conduit, Tubing, and Cable Fittings
- .3 CAN/CSA C22.2 No.18.4-04, Hardware for the Support of Conduit, Tubing and Cable
- .4 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid Tight Flexible Metal Conduit.
- .5 CSA C22.2 No. 45.2-08, Electrical Rigid Metal Conduit – Aluminum, Red Brass, and Stainless Steel.
- .6 CSA C22.2 No. 83-1-04 – Electrical Metallic Tubing
- .7 CSA C22.2 No. 211.2 06, Rigid PVC (Unplasticized) Conduit.
- .8 CAN/CSA C22.2 No. 227.2.1-04, Liquid Tight Flexible Nonmetallic Conduit.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

.2 Quality assurance submittals:

- .1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 CONDUITS

.1 Rigid aluminum conduit: to CSA C22.2 No. 45.2.

.2 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.3 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

.4 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.2.1.

.5 Electrical metallic tubing (EMT) to CSA C22.2 No. 83-1-04.

2.2 CONDUIT FASTENINGS

.1 One hole stainless steel straps to secure surface conduits 53 mm and smaller. Two hole stainless steel straps for conduits larger than 53 mm.

.2 Seismic beam clamps to secure conduits and supports to exposed steel work.

.3 Channel type supports for two or more conduits at 1500 mm oc.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

.5 All conduit fastenings and supports shall be stainless steel.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "elbows" where 90 degree bends are required for 27 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 HAZARDOUS AREA CONDUIT SEALS

.1 Hazardous locations are identified on the Contract Drawings. Provide seal fittings for conduit systems in hazardous locations as required by the Canadian Electrical Code.

.2 Provide explosion proof EYS fittings as indicated.

.3 Sealing compound shall be installed after the conductors are installed, tested, and accepted.

2.6 PULL CORD

.1 Polypropylene

.1 Minimum tensile strength of 1.1kN.

.2 Mildew and rot resistant.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

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

.2 Use rigid PVC conduit underground.

.3 Use liquid tight flexible metal conduit for connection to devices, motors, or vibrating equipment with the exception of connections made using armoured cable.

.4 Install conduit sealing fittings in hazardous areas.

.1 Fill with compound.

.5 Minimum conduit size for lighting and power circuits: 21mm

.6 Bend conduit cold:

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

.7 Mechanically bend steel conduit over 21 mm diameter.

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

.9 Install polypropylene fish cord in empty conduits.

.10 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.11 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Group conduits wherever possible on suspended or surface channels.

.3 Do not pass conduits through structural members except as indicated.

3.4 UNDERGROUND CONDUITS

.1 Refer to Technical Specification 26 05 43 01 Installation of Cables in Trenches and in Ducts for installation of cable procedures.

.2 The Contractor shall provide and install all necessary bends, couplings, reducers, bell end fittings, plugs, caps and adaptors of the same product material as the conduit to ensure a complete installation.

.3 All conduits shall drain towards junction boxes. Spacing between power and communications conduits for longitudinal runs shall be 300mm (unless concrete encased). The spacing may be reduced to 50mm at crossover points and where the conduits enter and exit junction boxes and pull pits.

.4 The Contractor shall not use any factory bends in the conduit runs except where shown on the Contract Drawings or as approved by the Contract Administrator. Where factory 90 degree bends are approved, the radius shall be greater than 900mm.

.5 All conduits shall be verified and cleaned using the following procedure:

.1 To verify integrity of conduit, pull through each conduit duct a hard rubber mandrel, not less than 300mm long and of a diameter 6mm less than the internal diameter of the duct, preceded by a swab of suitable diameter to remove sand, earth and other foreign materials.

.2 Notify Contract Administrator in the event of conduit failure.

.3 Clean ducts before laying. Cap both ends during Construction and after installation to prevent entry of any foreign materials.

.4 Install pull line.

.5 Terminate conduit ends in the junction box.

.6 Clean and vacuum junction boxes.

.7 Locations shall be laid out by the Contractor and field reviewed by the Contract Administrator prior to installation.

.6 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

.7 Trench Markers:

.1 Concrete type cable markers: Minimum 600 mm x 600 mm x 100 mm, with words: "cable," "conduit," or additional circuit identification if so directed by Engineer, impressed in top surface, with arrows to indicate change in direction of conduit runs.

.8 Warning Tape:

.1 Detectable by a pipe/cable locator or metal detector from above the undisturbed ground.

.2 Minimum 50 mm wide with an aluminum foil core laminated between two layers of 3.5 mil thickness polyester plastic.

.3 Plastic colour coding: red for electrical lines, orange for telephone lines, and orange for optic fibre cables.

.4 Imprint a warning continuously along the length, with message reading similar to: "CAUTION – BURIED ELECTRIC (TELEPHONE) LINE BELOW".

.9 Conduit Spacers:

.1 Preformed, rigid plastic spacers designed for direct burial and concrete encasement.

.2 Base and intermediate spacers to suit conduit trade size.

.3 Snap feature or non-metallic ties to obtain required configuration.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

1.3 Installation of cables in trenches and in ducts.

.1 Wherever the term “duct” appears, it also applies equally to conduit; similarly, the term “cable” also means wires and conductors.

1.4 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 21 Wires and Cables (0-1000V)

1.5 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.

1.6 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

.2 Quality assurance submittals:

.1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

.1 Not Used

3.0 EXECUTION

3.1 CABLE INSTALLATION IN DUCTS

.1 Install cables in ducts as indicated in Contract Drawings.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 Install instrumentation (4-20ma analog) cables in separate ducts from other cables as specified in the Contract Drawings.

.6 Install digital communication cables in separate ducts from other cables as specified in the Contract Drawings.

.7 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.8 Allow extra length of cable in loop form at splice boxes, pullpits and manholes as per good trade practice.

.9 Leave a pull rope in each conduit after installation of cables to permit installation of additional cables after the completion of the Work.

.10 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.11 After installation of cables, seal duct ends with duct sealing compound.

.12 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 Common Work Results - Electrical.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre acceptance tests.

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested and result of each test.

.7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Revision History

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-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation of low voltage lighting control devices.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No. 184.1, Solid-State Dimming Controls (Bi-national standard with UL 1472 updates).

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 MANUAL ON/OFF SWITCHING

.1 Individual switches ganged as indicated.

.2 Single or double pole, single or double throw as required to suit switching shown on drawings.

.3 Load rating of device shall be sufficient for size and type of lighting load being switched.

.4 Provide additional control contactors or relays for multi-circuit switching as required.

.5 Key operated where shown on Contract Drawings

.6 Motor rated where shown controlling motor circuit.

.7 Decora style commercial grade. Provide complete with cover plate. Refer to Technical Specification 26 27 26 Wiring Devices for cover plate requirements.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet .

3.2 INSTALLATION

.1 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.

.2 Where lighting control devices are to be located in close proximity, they shall be ganged with a common device box and cover plate, with voltage barriers as required

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests in accordance with Technical Specification 26 05 00 - Common Work Results for Electrical and Technical Specification 26 05 10 Testing and Commissioning.

.2 Demonstrate dimming systems operate as intended and there are no problems in starting lamps, nor in keeping them lit, and free of perceptible flicker at required settings of dimming intensity control.

END OF SECTION

Revision History

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1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation of service equipment.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 28 Grounding - Secondary

1.4 REGULATORY REQUIREMENTS

.1 BC Hydro

.1 Refer to BC Hydro Requirements for Secondary Voltage Revenue Metering (https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/distribution/standards/ds-rmr-secondary-voltage-750v-and-less.pdf)

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Section 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 METER SOCKET

.1 Ratings as indicated in Contract Drawings.

.2 Supplied with screw type ring.

2.2 METER ENCLOSURE

.1 Rating: CSA Type 3R

.2 Construction:

.1 Material: stainless steel

.2 Flip-up padlockable cover

.3 Pole bracket designed for bolt or band-on installation

.4 Suitable for overhead or underground service

.3 Viewing Window: As required when indicated on Contract Drawings.

.1 Material: 1/2 inch thick lexan.

.4 Mount: As indicated on Contract Drawings.

2.3 METERING ANTENNA

.1 Include provision for exterior antenna per BC Hydro standards.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Technical Specification 26 05 00 - Common Work Results for Electrical.

.2 Label size: 2.

.3 Nameplate shall include equipment name, voltage, and phase.

.1 Confirm nameplate wording with Contract Administrator prior to manufacture.

3.0 EXECUTION

3.1 INSTALLATION

.1 Install service equipment as indicated on Contract Drawings.

.2 Connect to incoming service.

.3 Connect to outgoing load circuits.

.4 Make grounding connections in accordance with Technical Specification 26 05 28 Grounding - Secondary

.5 Make provision for BC Hydro's metering.

.6 Allow for BC Hydro coordination, supply and delivery of materials.

END OF SECTION

Revision History

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1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation of the service entrance board.

1.3 RELATED SECTIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 02 Seismic Restraint

.3 Technical Specification 26 24 01 Service Equipment

.4 Technical Specification 26 28 23 Disconnect Switches

.5 Technical Specification 26 28 16 02 Molded Case Circuit Breakers

1.4 REGULATORY REQUIREMENTS

.1 BC Hydro

.1 Refer to BC Hydro Requirements for Secondary Voltage Revenue Metering (https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/distribution/standards/ds-rmr-secondary-voltage-750v-and-less.pdf)

.2 Distribution Standards: Underground Electrical: ES53

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 SERVICE ENTRANCE AND DISTRIBUTION BOARD

.1 Rating: As indicated on Contract Drawings.

- .1 L-Box per BC Hydro standards.
- .2 Horizontal bus assembly.
- .3 Cable clamp assembly.
- .4 Grounding assembly.
- .5 Identify phases with colour coding.

.2 Cable pull section:

- .1 Refer to BC Hydro metering to the Requirements for Secondary Voltage Revenue Metering (http://www.bchydro.com/ext/metering/).
- .2 Refer to BC Hydro Distribution Standards: Underground Electrical: ES53.
- .3 Each bus to have lugs to accept service conductors.

2.2 MAIN CIRCUIT BREAKER

.1 Solid State Electronic Trip Breaker as indicated on Contract Drawings.

.2 Common-trip breaker: with single handle for multi-pole applications.

.3 Moulded case circuit breaker to operate by means of solid state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long-time/short time/instantaneous tripping for short circuit protection.

.4 Programmable electronic solid state trip unit with separately adjustable long time, short time, and instantaneous settings.

.5 Circuit breaker with interchangeable trips as indicated.

.6 Minimum symmetrical RMS interrupting capacity rating: As indicated on Contract Drawings.

.7 Provide NEMA 1 enclosures for breakers where indicated.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Technical Specification 26 05 00 - Common Work Results for Electrical.

.2 Label size: 2.

.3 Nameplate shall include equipment name, voltage, and phase.

- .1 Confirm nameplate wording with Contract Administrator prior to manufacture.

3.0 EXECUTION

3.1 INSTALLATION

.1 Install seismic restraint for all equipment. See Technical Specification 26 05 02 – Seismic Restraint.

.2 BC Hydro metering to be installed as indicated on Contract Drawings per Requirements for Secondary Voltage Revenue Metering.

.3 Connect main service to disconnect switch on service pole and feed to BC Hydro service meter.

.4 Connect load terminals of distribution breakers to feeders.

.5 Check factory made connections for mechanical security and electrical continuity.

.6 Run one grounding conductor bare copper sized per the Contract Drawings from neutral bus to ground bus to main ground.

.7 Check trip unit settings against co-ordination study to ensure proper working and protection of components.

END OF SECTION

Revision History

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1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation of transient voltage surge suppression (i.e. surge protection device).

1.3 RELATED TECHNICAL SPECIFICATION

.1 Technical Specification 26 05 00 Common Work Results – Electrical

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 SURGE PROTECTION DEVICE

.1 Provide for transient voltage surge suppression as indicated on Contract Drawings.

.2 Short Circuit Current Ratings: 200kA

.3 Surge Capacity Rating:

.1 Service Entrance (347/600V) – 200kA per Phase (min.)

.2 Service Entrance (120/208V) – 100kA per phase (min.)

.3 Service Entrance (120/240V) – 50kA per phase (min.)

.4 One (1) form C (NO/NC) dry relay alarm output contacts.

.5 Direct bus mounted.

.6 Standard of acceptance: same manufacturer as panelboard.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Technical Specification 26 05 00 Common Work Results for Electrical.

.2 Label size: 2.

.3 Nameplate shall include equipment name, voltage, and phase.

.1 Confirm nameplate wording with Contract Administrator prior to manufacture.

3.0 EXECUTION

3.1 INSTALLATION

.1 Surge protection device integral to panelboard.

.2 Install conductors between suppressor and point of attachment to service equipment sized in accordance with manufacturer's shop drawings and keep conductor lengths as short as possible, not to exceed 600 mm. Provide information from manufacturers who offer an integrated surge protection device in the main service entrance equipment clearly showing lead lengths, including the neutral and ground connections.

.3 Grounding: bond suppressor ground to the equipment grounding conductor and service entrance ground.

END OF SECTION

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1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation of panelboards and circuit breakers.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 28 16 02 Molded Case Circuit Breakers

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.2 No. 29-11, Panelboards and enclosed Panelboards.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 PANELBOARDS

.1 Panelboards based on CSA C22.2 No. 29.

.2 Product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

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

.3 Bus and breakers rated as indicated on the Contract Drawings. Symmetrical interrupting capacity as indicated on Contract Drawings but not less than 10kA.

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

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

.6 Minimum of 2 flush locks for each panelboard.

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

.8 Copper bus with neutral of same ampere rating as mains.

.9 Mains: suitable for bolt-on breakers.

.10 Trim with concealed front bolts and hinges.

.11 Trim and door finish: baked grey enamel.

.12 Isolated ground bus.

.13 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

.14 Provide minimum additional space for future breakers in panelboards as follows:

.1 Panelboards 120/208V, up to 225A: minimum 10% space and 10% spare 15A breakers or as noted on the Contract Drawings

.2 Distribution boards greater than 208V: minimum 20% or as noted on the Contract Drawings

.15 120/208V Panelboard:

.1 Basis of Design: Eaton PRL1A, or approved alternate.

.16 600V Panelboard:

.1 Basis of Design: Eaton PRL3A, or approved alternate.

2.2 BREAKERS

.1 Breakers: in accordance with Technical Specification 26 28 16 02 Molded Case Circuit Breakers.

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

.3 Main breaker (where applicable): separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Technical Specification 26 05 00 Common Work Results for Electrical.

.2 Label size: 2.

.3 Nameplate shall include equipment name, voltage, and phase.

.1 Confirm nameplate wording with Contract Administrator prior to manufacture.

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

3.0 EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Mount panelboards to height specified in Technical Specification 26 05 00 Common Work Results – Electrical or as indicated on Contract Drawings.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
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1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation for equipment and components housed in cabinets and enclosures.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 05 10 Testing and Commissioning

.3 Technical Specification 26 05 31 Splitters, Junction, Pull Boxes and Cabinets

.4 Technical Specification 26 28 16 02 Molded Case Circuit Brseakers

.5 Technical Specification 26 28 23 Disconnect Switches

.6 Technical Specification 26 29 03 Control Devices

.7 Technical Specification 26 50 00 Lighting

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

- .1 CSA C22.1, Canadian Electrical Code, Part 1, Current Edition.
- .2 C22.2 No. 94.1-15 - Enclosures for electrical equipment, non-environmental considerations
- .3 C22.2 No. 94.2-15 - Enclosures for electrical equipment, environmental considerations.

.2 National Electrical Manufacturers Association (NEMA)

- .1 NEMA 250-2008, Enclosures for Electrical Equipment (1000 Volts Maximum).

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 ELECTRICAL KIOSK

.1 The Electrical Kiosk will be supplied by the Owner for installation this contract.

.2 Gasket: Provide a 12mm thick neoprene closed cell gasket between kiosk base and concrete pad.

.3 Anchors: provide anchors per kiosk manufacturer's anchor requirements.

3.0 EXECUTION

3.1 INSTALLATION OF THE KIOSK

.1 The Contractor shall provide all necessary hoists, skids, temporary supports and beams to assist with installing the kiosk.

.2 Install gasket between kiosk base and concrete pad.

.3 The kiosk will be placed on top of a concrete pad specified elsewhere and anchored per kiosk manufacturer's recommended fastening methods.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

.2 Ensure moving and working parts are lubricated where required.

.3 Operate system to prove satisfactory performance of complete system during 24 hour period.

END OF SECTION

Revision History

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-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

1.4 REGULATORY REQUIREMENTS

.1 Canadian Standards Association (CSA International)

- .1 CSA C22.2 No. 42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CSA C22.2 No. 42.1-13, Cover Plates for Flush Mounted Wiring Devices (Bi national standard, with UL 514D).
- .3 CSA C22.2 No. 55-15, Special Use Switches.
- .4 CSA C22.2 No. 111-10, General Use Snap Switches (Bi national standard, with UL 20).
- .5 CSA-C22.2 No. 177-13, Clock-operated Switches
- .6 CSA-C22.2 No. 184-15, Solid-State Lighting Controls

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 SWITCHES

.1 15A, 120 V, single pole, specification grade switches to: CSA-C22.2 No. 55 and CSA-C22.2 No. 111.

.2 Manually-operated general purpose AC switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 White toggle.

.3 Toggle operated fully rated for tungsten filament, fluorescent, and LED lamps, and up to 80% of rated capacity of motor loads.

.4 Provide switches with occupancy sensors for control of interior lighting.

.5 Switches will be of one manufacturer throughout the Project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R/20R as indicated, 125 V, 15/20 A as indicated, U ground, to: CSA-C22.2 No.42 with following features:

.1 White 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 Triple wipe contacts and riveted grounding contacts.

.2 Other receptacles with ampacity and voltage as indicated in Contract Drawings.

.3 Receptacles will be of one manufacturer throughout the Project.

.4 Ground fault interrupting capabilities as indicated in Contract Drawings.

.5 Ethernet Bulkhead Receptacle:

.1 Application: Feed-thru coupler

.2 Mounting: Jam nut panel mount

.3 Connector: Female RJ45

.4 Rating: IP67-weatherproof with attached cap.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No. 42.

.2 Cover plates will be of one manufacturer throughout the Project.

.3 Stainless steel.

.4 Weatherproof RPVC cover plates for surface-mounted FS or FD Type boxes.

.5 Weatherproof clear, lockable, while-in-use cover plates for all GFI locations, as indicated in Contract Drawings.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

.2 Install identification labels indicating circuit, voltage, and phase.

3.0 EXECUTION

3.1 INSTALLATION

.1 Switches:

- .1 Install single throw switches with handle in "UP" position when switch closed.
- .2 Install switches in gang type outlet box when more than one switch is required in one location.
- .3 Mount toggle switches at height in accordance with Technical Specification 26 05 00 Common Work Results – Electrical or as indicated on the Contract Drawings.

.2 Receptacles:

- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles at height in accordance with Technical Specification 26 05 00 Common Work Results – Electrical or as indicated on the Contract Drawings.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .4 Install GFI type receptacles as indicated on Contract Drawings.

.3 Cover plates:

- .1 Install suitable common cover plates where wiring devices are grouped.
- .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 PROTECTION

.1 Protect installed products and components from damage during Construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Materials and installation for Transmitting and Indicating devices.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 – Common Work Results for Electrical.

1.4 REGULATORY REQUIREMENTS

.1 CSA International

.1 CSA C22.2 No.14, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 1, Industrial Control and Systems: General Requirements.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit documents to the Contract Administrator in accordance with Technical Specification 26 05 00 - Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 - Common Work Results – Electrical.

2.0 PRODUCTS

2.1 GENERAL

.1 Provide each device as a pre-assembled, packaged unit. Upon delivery to the Work Site, each system shall be ready for installation with only final piping and electrical connections required by the Contractor.

.2 Provide power supply to the transmitters and as indicated on the Contract Drawings. Derive any required power for the primary elements from the transmitter.

.3 Install the transmitters to measure the specified process at the ranges and conditions indicated on the Contract Drawings.

.4 Factory-calibrate transmitter to the calibration ranges specified on the Contract Drawings. Calibrate transmitters using NIST-approved bench calibration procedures. Store calibration data digitally in the transmitter. Program transmitter with the instrument tag designation indicated on the Contract Drawings. Submit factory calibration data as described elsewhere in this Technical Specification.

.5 Unless otherwise specified, provide transmitters with integral isolated 4-20 mA output "two wire type" transmitters with operating power derived from the signal loop. Transmitters are to support an external load of up to 600 ohms or greater with a loop power supply of 24 VDC.

.6 Provide transmitters with adequate power output to drive devices associated with that signal loop. Provide signal boosters as required to achieve adequate signal strength.

.7 Transmitter's 4-20 mA output is to be galvanically isolated from the process and the transmitter case.

.8 Provide microprocessor-based transmitters. For the pressure transmitter sensing cells an isolating diaphragm in combination with a sensing diaphragm using silicone oil as a pressure transmission medium.

.9 Transmitters shall not be damaged by reverse polarity.

.10 Transmitters are to have local indication scaled in Engineering Units and are to include a lamacoid label indicating the Engineering Units. Mount the transmitter such that this indication is correctly oriented and visible from the normal operating floor position.

.11 Transmitters are to have a 3½ digit LCD display, calibrated in engineering units.

.12 Transmitter and/or primary element enclosures (or housings) are to be, as a minimum, rated NEMA 4; where located outdoors or in areas specified as corrosive, enclosures to meet NEMA 4X requirements.

.13 Transmitter flanges, adaptors, and associated bolts, nuts, etc. are to be fabricated from 316 stainless steel.

.14 Two spare fuses of each type required.

2.2 MOUNTING HARDWARE

.1 Provide all mounting brackets, cables, connectors, and hardware necessary to install primary elements.

.2 Provide brackets and mounting hardware to allow standard 50mm pipe-stand or wall mounting, unless otherwise noted.

.3 Fabricate brackets from aluminum or stainless steel and all sundry hardware from stainless steel.

.4 Primary elements and transmitters are to be complete with necessary liquid filling, identification, configuration, etc. as necessary to make the unit ready for use.

2.3 INTERCONNECTING CABLE

.1 Provide an interconnecting cable from the element to the transmitter for systems where the primary element and transmitter are physically separated.

.2 The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter.

.3 Length of cable shall be as indicated in the Instrument Specification Sheet, or if not specifically indicated, shall provide a continuous unbroken length sufficient to route via approved supports from the element to the transmitter plus additional length to permit the element to be easily removed and reinstalled.

2.4 PROGRAMMING DEVICE

.1 For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, provide two such programming devices for each class or type of instrument. Include appropriate operation manuals and the programming device in the training requirements.

.2 For systems that allow the programming device functions to be implemented in software, running on a laptop computer, provide two full licensed copies of the software instead of the programming device.

2.5 CONTROL COMPONENTS

.1 Wet Well Float Switches:

.1 Provide float switches with contacts that will activate in the presence of liquid.

.2 Specific Gravity: 0.95 – 1.10

.3 Materials:

.1 Body: Polypropylene (Grey)

.1 Length: 162mm

.2 Strain Relief: EPDM Rubber

.3 Weight: Zinc

.4 Cable:

.1 Conductors: 3C No. 18

.2 Length: to suit installation. 20m minimum.

.3 Coil excess cable on hanger cable support.

.5 Standard of acceptance: Flygt ENM-10 Level Regulator.

.2 Wet Well Hatch Switch:

.1 Enclosure Material: 304 stainless steel with corrosion resistant coating (polyurethane)

.2 Approvals: Class I, Div. 1 & 2, Groups A-D

.3 Contact Form: SPDT (Form C)

.4 Lead Wires: 1829mm (72") minimum

.5 Sensing: End Sensing

.6 Standard of acceptance: Topworx Go Switch 31-17546-A3 c/w AMP3 Magnet

.3 Hydrostatic Level Sensor Equipment:

.1 Housing: Stainless Steel

.2 Application: Wastewater

.3 Sensor Outer Diameter: 42mm

.4 Cable: PUR

.5 Approvals: Class I, Div. 1 & 2, Groups A-D

.6 Standard of Acceptance: Waterpilot FMX21-CE-121GGC51A including Mounting clamp FMX167 and Additional Weight FMX21.

3.0 EXECUTION

3.1 INSTALLATION

.1 Supply a multi-pole receptacle with all instruments.

.2 Mount transmitters so that interference to the function is not caused by surrounding structures.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Technical Specification 26 05 00 Common Work Results - Electrical and Technical Specification 26 05 10 Testing and Commissioning.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1. GENERAL

1.1 DOCUMENTS

.1 This Section of the Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 SCOPE

.1 Supply one outdoor standby diesel generator set and all associated equipment as described in this Technical Specification.

.2 Provide factory testing as described in this Technical Specification.

.3 Provide delivery to Site and offload.

.4 Provide full 24 hour sub-base fuel tank, parts, spare parts, tools, and equipment.

.5 Provide field commissioning services to test a complete and operable standby electric generating system, including all devices and equipment specified herein, or required for the service.

.6 Supply documentation as described in this Technical Specification.

.7 Provide a warranty as described in this Technical Specification.

1.3 RELATED TECHNICAL SPECIFICATIONS

.1 Section 26 05 00 – Common Work Results - Electrical

1.4 REGULATORY REQUIREMENTS

.1 UL-142, Standard for aboveground Tanks and Flammable and Combustible Liquids

.2 CAN/ULC S601, Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids

.3 Canadian General Standards Board (CGSB)

.4 CAN/CGSB 3.6 2010, Regular Sulfur Diesel Fuel.

.5 Canadian Environmental Protection Act (CEPA)

.6 CCME PN 1326, Environmental Code of Practice for Above ground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.

.7 CSA International

.8 CSA B139-Series 19 (R2014), Installation Code for Oil Burning Equipment.

.9 CSA 282-15, Emergency Electrical Power Supply for Buildings.

.10 C22.2 NO. 94.1-15 - Enclosures for electrical equipment, non-environmental considerations

.11 C22.2 NO. 94.2-15 - Enclosures for electrical equipment, environmental considerations.

.12 International Organization for Standardization (ISO)

.13 ISO 3046 1 2002, Reciprocating Internal Combustion Engines Performance Part 1: Declarations of Power, Fuel and Lubricating Oil Consumptions, and Test Methods - Additional requirements for engines for general use.

.14 National Electrical Manufacturers Association (NEMA)

.15 NEMA MG 1-2014, Motors and Generators.

.16 Underwriters' Laboratories of Canada (ULC)

.17 CAN/ULC S601 14, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids 5th Edition.

.18 CAN/ULC S603 14, Standard for Steel Underground Tanks for Flammable and Combustible Liquids.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 26 05 00 - Common Work Results – Electrical.

1.6 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and data sheets for power generators and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submittals:

.1 Submit Shop Drawings for generator, and include:

.1 Engine: make and model, with performance curves.

.2 Alternator: make and model.

.3 Voltage regulator: make, model and type.

.4 Battery: make, type and capacity.

.5 Battery charger: make, type and model.

.6 Main circuit breaker and trip unit: make, type and model.

.7 Load bank circuit breaker and trip unit: make, type and model.

.8 Alternator control panel: make and type of meters and controls.

.9 Governor type and model.

.10 Generator enclosure, model and type.

.11 Exhaust system and muffler model and type.

.12 Fuel tank.

.13 Schematic and wiring diagrams of engine, generator, and control panel, complete with interconnecting wiring diagram for automatic transfer switch.

.14 Single line diagram showing all breakers, switches, metering and protective relays.

.15 Complete bill of materials, including manufacturer's name, catalogue numbers and capacity.

.2 Submit dimensioned Shop Drawing showing complete generating system and fuel tank mounted on steel base, including vibration isolators, exhaust system, cooling system, drip trays, and enclosure. Indicate on Shop Drawings:

.1 Horizontal and vertical dimensions.

.2 Minimum door opening required for moving unit.

.3 Clearance requirements from equipment.

.4 Weight of entire assembly with full tank and fluids.

.5 Exact locations and details where necessary of interconnecting services including house load electrical connections, communications connections, general electrical connections, etc.

.3 Include slab anchoring locations and dimensioned foundation template.

.4 Provide conduit stub-up template for use by the Subcontractor responsible for installation of the diesel generator set and all associated equipment.

.5 Provide proof of seismic certification.

.4 Manuals:

.1 Two (2) sets operations and maintenance manuals - to be submitted on delivery

.2 Two (2) sets Engine Shop Manuals & two (2) sets Complete Parts Manual – to be submitted on delivery

.5 One (1) USB flash drive containing searchable PDF files of all final manuals, including maintenance manuals, engine shop manual, parts manual, and shop drawings.

1.7 WARRANTY

.1 Warranty shall be Five (5) year or Three Thousand (3000)-Hour Comprehensive Limited Warranty which covers parts for 5yrs and labour for 5 years.

.2 Provide terms of warranty.

2. PRODUCTS

2.1 GENERAL

.1 All equipment shall be of current production by a firm who manufacturers the generator and control panel and who assembles the standby generator set as a matched unit. All equipment shall be new, factory tested, and delivered ready for installation.

.2 The supplier shall be the manufacturer's authorized distributor, who shall provide initial start-up services, conduct field commissioning services, and provide warranty service. The supplier shall have 24-hour service availability and factory-trained service technicians authorized to do warranty service on all warrantable products. The supplier shall be able to provide onsite parts and service within 24 hours of initial call.

2.2 SYSTEM DESCRIPTION

.1 Generating system shall consist of a fully automatic diesel engine driven electrical generation plant completely equipped with the following:

- .1 Diesel engine.
- .2 Alternator.
- .3 Alternator control panel.
- .4 Generator control panel and annunciator.
- .5 Main electronic trip circuit breaker.
- .6 Load bank electronic trip circuit breaker.
- .7 Battery charger and battery.
- .8 Fuel supply system, including sub-base fuel tank.
- .9 Exhaust system.
- .10 Factory sound attenuated enclosure.
- .11 Steel mounting base.

.2 Generator set to be: 31kVA/25kW, 347/600V, 60Hz, 3 PH., 4W.

.3 Basis of design: Finning

.4 System designed to operate as standby.

.5 All components necessary for the satisfactory operation of the standby power system shall be included and installed.

.6 Complete unit shall be CSA approved and meet NFPA current regulations.

2.3 DIESEL ENGINE

.1 Diesel engine: to ISO 3046 1.

.2 Diesel engine-generator set is to be a 4-cycle, 1800 rpm, diesel engine generator set with low reactance brushless generator, single phase RMS sensing automatic voltage regulator, set-mounted control panel, and high ambient cooling system 50 degrees C.

.3 Engine shall be designed to operate on #2 diesel fuel. Diesel engine requiring premium fuels will not be accepted.

.4 Capacity:

.1 Rated continuous power in kW at rated speed, after adjustment for system losses in auxiliary equipment necessary for engine operation; to be calculated as follows: Rated continuous output = Generator kW divided by Generator efficiency at full load.

.1 Under following site conditions:

.1 Altitude: refer to project location.

.2 Installed outdoors.

.5 Performance:

.1 The voltage regulation in a steady state shall be within +/-1.5% for any constant load between no load and rated load at 0.8 P.F.

.2 The adjustment range of the voltage regulator shall be tested and shall be at least +/-10% of the nominal voltage.

.3 Maximum transient voltage dip shall not exceed 25% below rated voltage on application of the single largest surge load step at a 0.8 power factor. Refer to Contract Drawings.

.4 Maximum transient voltage rise shall not exceed 12% above rated voltage on removal of full load at 0.8 power factor.

.5 Transient recovery time within +/- 1.5% shall be less than 2 seconds.

.6 Governor:

.1 Stability plus or minus 0.5%.

.2 Speed regulation no load to full load 2.5% maximum.

.3 Automatic frequency regulation shall be isochronous from steady state no load to steady state rated load.

.4 Frequency regulation shall be adjustable from isochronous to 5% droop.

.6 Cooling System:

.1 Engine shall be cooled by a mounted closed loop radiator system rated for full load operation in 50 degrees C ambient as measured at the generator air inlet.

.2 Block heater: thermostatically controlled lube oil or liquid coolant heater to allow engine to start in lowest ambient temperature experienced at installation location.

.1 Switch and fuse in heater circuit, mounted in engine alternator control cubicle.

.3 All coolant hoses, including block heater hoses, silicon type.

.4 Cooling system shall be filled with 50/50 ethylene glycol/water mixture by the equipment supplier.

.5 Factory installed coolant drain extension to exterior.

.7 Fuel system:

.1 Solid injection, mechanical fuel transfer pump, fuel filters and air cleaner, fuel rack solenoid energized when engine running.

.8 Lubrication system:

.1 Lube oil filter: replaceable, full flow type, removable without disconnecting piping.

.2 Lube oil cooler.

.3 Engine sump drain valve.

.4 Oil level dip stick.

.5 Engine oil drain to exterior of sound attenuated enclosure, complete with manual shut-off valve located inside enclosure.

.9 Starting system:

.1 12 or 24V dc electric starting motor.

.2 Heavy duty, 12 or 24V lead-acid battery with a cold cranking amp rating high than the cold cranking amp requirement of the starter motor.

.3 Battery must have sufficient capacity to crank engine at 10°C for 1 min with a battery end voltage of at least 80% of the rated voltage.

.4 Batteries must be accessible and include battery mounting rack and interconnecting cables of generous length.

.5 Battery charger: fully automatic, three stage, trickle type. Charge at standby to boost charge after use.

.1 Equipped with dc voltmeter, dc ammeter and on off switch.

.2 Minimum charger capacity: capable of recharging a battery discharged by two cranking cycles to 80% of capacity within 4 hours and to full capacity within 12 hours.

.3 Charger shall be mounted at the generator enclosure.

Guards to protect personnel from hot and moving parts.

.1 Locate guards so that normal daily maintenance inspections can be undertaken without their removal.

2.4 ALTERNATOR

.1 The Contractor shall confirm the generator rating and physical size with the manufacturer.

.2 The AC generator shall be: synchronous, four pole, revolving field, brushless type, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc(s).

.3 All insulation system components shall meet NEMA MG1 temperature limits for Class H, 130^{o}C insulation system.

.4 A permanent magnet generator (PMG) shall provide excitation power for immunity from voltage distortion caused by non-linear loads. The PMG shall sustain excitation power for optimum motor starting and to sustain short circuit current at approximately 300% of rated current for not less than 10 seconds.

.5 Output at 50 degrees C ambient:

.1 100% full load continuously.

.6 The automatic voltage regulator shall be temperature compensated, solid-state design. The voltage regulator shall be equipped with single phase RMS sensing. The regulator shall control buildup of AC generator voltage to provide a linear rise and limit overshoot.

2.5 MAIN BREAKER AND LOAD BANK BREAKER

.1 Two (2) generator mounted circuit breakers – 100% rated, LSI, 3 pole.

.1 Breaker #1 (Main Breaker)

.2 Breaker #2 (Load Bank)

.2 Minimum 10kA symmetrical rms interrupting capacity rating.

.3 Operate by means of solid state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long/short time/instantaneous tripping for short circuit protection.

.4 Include Form-C contacts to indicate open/closed position. Breaker auxiliary contact to be wired to “Breaker open alarm” on generator controller.

.5 Circuit breaker shall be so located that the feeder conduits rise straight out of the floor into the bottom of the breaker enclosure.

.6 Load Bank Circuit Breaker to come with shunt trip, wired to transfer switch to trip load bank breaker if power fails during load testing.

2.6 CONTROL PANEL

.1 The NEMA 12 weatherproof enclosed control panel shall be mounted on the generator set with vibration isolators, and contain a digital solid-state based generator controller.

.2 Control panel features shall include:

- .1 Engine Oil Pressure Gauge, Coolant Temperature Gauge, DC Voltmeter, and Running Time Meter (hours).
- .2 Voltage adjustment to adjust voltage ±5% from rated value.
- .3 Voltage for each phase, 2% accuracy.
- .4 Current for each phase, 2% accuracy.
- .5 Frequency/RPM, ±0.3 Hz accuracy.
- .6 Panel illuminating light.
- .7 Battery charging ammeter.

.3 Operating indication:

- .1 "Normal power"
- .2 "Emergency power"
- .3 “Auto”
- .4 “Off”

.4 Run/Off/Auto Selection

.5 Fault Annunciation Indication

.6 Communications:

- .1 Controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine.
- .2 Include network interface card: Modbus TCP over Ethernet.
- .3 Include monitoring software, if available.

2.7 SAFETY SHUTDOWNS, ALARMS AND CONTROL

.1 Digital engine controller to be mounted on unit.

.2 Each of the items below shall have configurable shutdown feature and separate fault annunciation:

- .1 Low oil pressure
- .2 Low coolant level
- .3 High engine temperature
- .4 Over temperature on alternator
- .5 Over/under speed
- .6 Overcrank

.7 Over/under voltage

.8 Fuel leakage

.9 Low fuel level.

.10 Low battery voltage.

.11 Short circuit.

.3 Engine start delay (0-240 sec.)

.4 Overcrank delay (0-240 sec.)

.5 All wiring and contacts shall terminate in the generator control panel and shall land on clearly identified and easily accessible terminal blocks intended for customer use.

.6 Form C contacts for the following alarms and operations (refer to Contract Drawings for quantity of contacts required for monitoring purposes):

.1 Generator running: NO/NC contacts that change state on generator run.

.2 Generator Fail: NO/NC contacts that change state on Generator Fail. Include tank leakage as a Generator Fail.

.3 Common Alarm: NO/NC contacts that change state on warning. Warnings are alarms which do not cause the generator to shut down or cause the generator to otherwise be unavailable.

.4 Low Fuel Alarm: NO/NC contacts that change state on a low fuel alarm.

.5 Breaker Open Alarm: NO/NC contacts that change state on a Breaker open position.

.6 Run Mode Relay: NO/NC contacts that change state on ”not in auto” position.

.7 The noted contacts shall be available for customer use and available for connection in the generator control panel in a clearly identified terminal block.

2.8 STEEL MOUNTING BASE

.1 Complete generating set and fuel tank mounted on steel base of sufficient strength and rigidity to protect assembly from stress or strain during transportation, installation and under operating conditions on suitable level surface.

2.9 FUEL SYSTEM

.1 Fuel tank to be sized for 24 hours of continuous operation at full load.

.2 Above-ground fuel tank to be belly-style, included in the generator sub-base and shall be double-contained/double-walled, and be supplied complete with a leakage sensor.

.3 Include fill and vent lines with weatherhoods, fuel level gauge and vent alarm, drain and end plug, feed and return lines, with flexible terminations at engine, shut off cock, renewable cartridge filter, fire valve.

.4 Primary and secondary fuel filters to be spin-on type of easy access.

.5 Low fuel level alarms for remote indication: 1/8, 1/4, and 1/3 fuel level sensors.

.6 Sub-base fuel tank must include all accessories to meet current CSA B139-Series 19 code, including, but not limited to, extension of fuel tank, vents and fill to exterior of enclosure, overfill prevention valve, high fuel alarm and fuel fill alarm.

2.10 EXHAUST SYSTEM

.1 Exhaust silencer with condensate drain, plug and flanged couplings, shall be mounted within the genset enclosure.

.2 Cap on muffler exhaust with additional lockable screen over top to prevent vandals from dropping debris inside.

.3 Fittings and accessories, as required.

.4 Expansion joints: stainless steel, corrugated, of suitable length, to absorb both vertical and horizontal expansion.

2.11 ENCLOSURE

.1 Factory manufactured and installed enclosure shall be weatherproof, sound attenuated, rigid, free-standing, vandal resistant, highly corrosion resistant enclosure complete with heating and lighting.

.2 Enclosure shall be rated UL-2200 and certified to CAN/CSA C22.2 No. 94.1-15 and CAN/CSA C22.2 No. 94.2-15.

.3 All enclosure assemblies shall be from the same manufacturer, shall bear the CSA seal of approval, or other certification mark acceptable in the Province of British Columbia, and be manufactured by an enclosure manufacturer regularly engaged in this type of work

.4 Enclosure dimensions on Contract Drawings are approximate only. Contractor to determine final dimensions to layout of all proposed equipment on Site.

.5 Sound Attenuation:

.1 Sound attenuated on inside surface to obtain 75dBA when measured at a distance of 6 meters from any side of the enclosure and 1 meter above ground.

.2 Compliance with this requirement shall be provided and demonstrated during factory testing.

.3 Compliance with this requirement shall be verified on site.

.4 Sound level verification shall be performed with genset at full load.

.6 General Material Requirements:

.1 All materials shall be new.

.2 Equipment shall be fabricated from marine grade aluminum.

.3 Use stainless steel hardware, unless otherwise noted.

.7 Generator enclosure shall include the following equipment:

.1 Motorized air intake dampers.

.2 Gravity air discharge dampers.

.8 Connecting Hardware:

.1 Miscellaneous hardware other than screws, nuts, bolts and washers shall be stainless steel.

.2 Connecting hardware (i.e. screws, nuts, bolts and washers) 3/8" diameter or smaller and shall conform to the following:

.1 All hardware shall have unified national thread form (ANSI) and shall be stainless steel.

.9 Fabrication Mechanical Requirements

.1 The enclosure shall be fabricated with sufficient bracing to form a structure capable of withstanding transportation, wind, snow and ice loading.

.1 Recommended anchor locations shall be provided on Shop Drawings.

.2 Anchor requirements shall be provided based on wind, snow and seismic loading criteria for the geographic location of the installation.

.3 Importance factor of one (1) shall be considered for the installation.

.2 Doors:

.1 Doors shall have internal bracing when required to prevent excessive distortion. Doors shall be at least 100mm above concrete

.2 All enclosure doors are to be lockable. The latches must contain minimum 13 mm diameter hole to be able to receive padlock.

.3 Handles, latches and padlocks shall be recessed such that they cannot be struck off or cut with a standard hacksaw. Handle shall not protrude from recessed pocket during operation.

.4 Door hardware to be mounted with tamper resistant hardware.

.5 Each door shall have factory installed door restraints.

.6 Hinges shall be hidden and not accessible from the outside with the door closed. Hinge body to be aluminum with stainless steel hinge pin. Hinges to be of permanently lubricated design.

.3 Door Gaskets:

.1 The gasket shall be of one continuous piece per side (ex. four strips per opening) and shall be permanently bonded to the metal.

.2 The gasket shall be of an appropriate length so as not to have gaps at gasket joints or to shrink over time.

.3 The surface of the gasket shall be covered with a silicon lubricant to prevent sticking to the mating surface.

.4 The hinge shall be designed to prevent binding of the gasket

.10 Enclosure Finish

.1 General Requirements:

.1 The powder coating process shall be tested on at least one piece from a given batch of aluminum components to ensure a high quality coating for that type of component before the complete batch is powder coated. If there is uncertainty about the quality or appearance of the powder coating, the Contractor shall obtain the Owner's approval on the powder coating.

.2 Items to be powder coated shall be free of dents, scratches, weld burns, ripples, pits, and abrasion before powder coating.

.3 Removable components which may be damaged by the powder coating process shall be removed before powder coating and reassembled after powder coating.

.4 Mask all threaded hardware and tapped holes, as required.

.5 Generator to be shrink-wrapped with image approved by owner.

.6 Powder coat colour: RAL code to be provided by the Owner at the time of Shop Drawing review. Supplier shall provide RAL code on request for purposes of matching other equipment on site.

.7 Generator to be shrink-wrapped with image as approved by owner.

.11 Enclosure shall be vandal resistant

.1 Externally accessible fasteners shall preferably be blind head although Allen head will be permissible.

.2 Air inlet and outlet openings shall be designed such that objects of any size directed at the enclosure from vertically downward to horizontally flat cannot enter. Air inlet and outlet openings shall be sized such that inlet air velocity is below he level at which water penetration will occur.

.12 Engine coolant and oil drains to exterior of sound attenuated enclosure complete with manual shut off valve located inside enclosure.

3. EXECUTION

3.1 SOURCE QUALITY CONTROL

.1 Notify Contract Administrator 10 Business Days in advance of date of factory test. Contract Administrator may be present for testing outlined in this Technical Specification.

.2 Test procedure:

.1 Prepare blank forms and check sheet with spaces to record data and at top of first sheet record:

.1 Date.

.2 Generator set serial no.

.3 Engine, make, model, serial no.

.4 Alternator, make, model, serial no.

.5 Voltage regulator, make and model.

.6 Rating of generator set, kW, kV.A, V, A, r/min, Hz.

.2 Mark check sheet and record data on forms in duplicate as test proceeds.

.3 The engine generator set and the testing results shall meet current CSA standard C282 including the following tests:

.1 Generator to be tested at generator manufacturers facility for four (4) hours at full load and 0.8 power factor, taking readings at 15 minute intervals, and record the following:

.1 Time of reading.

.2 Running time.

.3 Ambient temp in degrees C.

.4 Lube oil pressure in kPa.

.5 Lube oil temp in degrees C.

.6 Alternator voltage: phase 1-2, 2-3, 1-3.

.7 Alternator current: phase 1, 2, 3.

.8 Power in kW.

.9 Frequency in Hz.

.10 Power Factor.

.11 Battery charger current in A.

.12 Battery voltage.

After completion of 4 hours run, demonstrate following shut down devices and alarms:

.13 Overcranking.

.14 Overspeed.

.15 High engine temp.

.16 Low lube oil pressure.

.17 Short circuit.

.18 Alternator over voltage.

.19 Low battery voltage, or no battery charge.

.20 Manual remote emergency stop.

.21 High alternator temperature.

.22 Tank leakage.

.4 Provide sound measurement results.

3.2 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

.2 After the genset is installed, temporary power shall be connected to the unit to energize the space heating.

3.3 INSTALLATION

.1 General

.1 The Contractor shall provide all necessary hoists, skids, temporary supports and beams to assist with installing the genset.

.2 The generating set shall be positioned on the seismic restraints neoprene pad type vibration isolators, supplied with the set, and carefully aligned and positioned as detailed on the Shop Drawings.

.3 The vibration isolator seismic restraints and anchor bolts shall be installed as per the manufacturer's instructions. The installation must be inspected and certified by the manufacturer's representative.

.4 Ensure that there are no rigid connections or incidental physical contacts between isolated equipment and the building structure or nearby systems.

.5 Select and locate vibration isolation equipment to give uniform loading and deflection, according to weight distribution of equipment.

.6 Complete wiring and interconnections as indicated.

.2 Fuel System

.1 Install sub-base tank and secure to the concrete slab with anchors as specified by the manufacturer.

.2 All unused surplus bungs in the fuel tank shall be plugged.

.3 Exhaust System

.4 Ship loose exhaust components to be installed on-site by contractor. Generator supplier to provide instructions/assistance via phone or email as required.

3.4 FIELD COMMISSIONING

.1 Notify the Contract Administrator 10 Business Days in advance of test date.

.2 Provide fuel for testing and leave full tanks on acceptance.

.3 Demonstrate:

.1 Unit start, transfer to load, retransfer to normal power, unit shut down, on "Automatic" control.

.2 Unit start and shut down on "Manual" control

.3 Unit start and transfer on "Test" control.

.4 Unit start on "Engine start" control.

.5 Operation of manual bypass switch.

.6 Operation of automatic alarms and shut down devices.

.7 Install continuous strip chart recorders to record frequency and voltage variations during load switching procedures. Each load change delayed until steady state conditions exist. Switching increments to include:

.1 No load to full load to no load.

.2 No load to 70% load to no load.

.3 No load to 20% load to no load.

.4 20% load to 40% load to no load.

.5 40% load to 60% load to no load.

.6 60% load to 80% load to no load.

.4 Run unit on 100% load for minimum period of 4h to show load carrying ability, stability of voltage and frequency, and satisfactory performance of dampers in ventilating system to provide adequate engine cooling. No adjusting of speed or voltage shall be made after the load tests have commenced.

.1 Generator supplier to be responsible for supplying all fuel and fluids for commissioning generator.

.5 At end of test run, check battery voltage to demonstrate battery charger has returned battery to fully charged state.

.6 After completion of 4 hours run, demonstrate following shut down devices and alarms:

.1 Overcranking.

.2 High engine temp.

.3 Low lube oil pressure.

.4 Low battery voltage, or no battery charge.

.5 Manual remote emergency stop.

.6 Tank leakage.

.7 Provide test reports from shop/factory that sensors were tested, in accordance with the Division 26 Technical Specifications and trip points documented. Provide certified documents.

END OF SECTION

Revision History

Rev. No.	Date	Description of Revisions	Prep. By	Rev. By
-	June 23, 2023	Issued for Tender	AW	MS

1.0 GENERAL

1.1 DOCUMENTS

.1 This Technical Specification forms a part of the Contract Documents and is to be read, coordinated and implemented in conjunction with all other parts.

1.2 RELATED TECHNICAL SPECIFICATIONS

.1 Technical Specification 26 05 00 Common Work Results – Electrical

.2 Technical Specification 26 27 16 Electrical Cabinets and Enclosures

.3 Technical Specification 26 32 13 01 Power Generation – Diesel

1.3 REGULATORY REQUIREMENTS

.1 American National Standards Institute (ANSI)

- .1 ANSI C78.374-2015 Light-Emitting Diode Package Specification Sheet for General Illumination Applications
- .2 ANSI C78.377-2015 American National Standard for Electric Lamps—Specifications for the Chromaticity of Solid State Lighting (SSL) Products

.2 Illuminating Engineering Society (IES)

- .1 IES LM-79-08: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products
- .2 IES LM-80-15: Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules
- .3 IES LM-82-12: LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature
- .4 IES LM-84-14: Approved Method for Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires
- .5 IES LM-85-14: Approved Method for Electrical & Photometric Measurements of High Power LEDs
- .6 IES TM-21-11: Projecting Long Term Lumen Maintenance of LED Light Sources
- .7 IES TM-28-14: Projecting Long-Term Luminous Flux Maintenance of LED Lamps and Luminaires

.8 IES TM-30-15: IES Method for Evaluating Light Source Color Rendition

.3 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41.1-2002 (R2008), IEEE Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits

.2 ANSI/IEEE C62.41.2-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits

.4 Canadian Standards Association (CSA International)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

.5 ICES-005-2016, Lighting Equipment

.6 National Electrical Manufacturers Association (NEMA)

.1 NEMA SSL 1-2010 Electronic Drivers for LED Devices, Arrays, or Systems

.7 Underwriters' Laboratories of Canada (ULC)

.1 UL 1449 (2014), Standard for Surge Protective Devices

1.4 SCOPE

.1 Materials and installation of lighting.

1.5 SHOP DRAWINGS AND SUBMITTALS

.1 Submit in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Technical Specification 26 05 00 Common Work Results – Electrical.

2.0 PRODUCTS

2.1 AREA LIGHT FIXTURE

.1 LED

.2 Tenon-mounted on Type 2 Pole, location as indicated in Contract Drawings.

.3 Power: 40W

.4 Lumen Output: 5500

.5 3000K colour temperature.

.6 Include all necessary connectors.

.7 Basis of design: Philips Lumec Roadfocus

2.2 LUMINAIRE POLE

.1 Steel poles: to CSA C22.2 No.206 and per BC MoTI specifications.

.2 Foundations to BC MoTI specifications.

.3 Pole shaft: BC MoTI Type 2

.4 Luminaire arm and antenna pole shaft extension:

.1 Flange: BC MoTI Type 1 flange (top and bottom)

.2 Arm: BC MoTI 2A Arm

.5 Finish: all materials and hardware shall be galvanized steel.

2.3 LUMINAIRE POLE BASE

.1 Pole Base: Type C2 concrete base.

3.0 EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated in Contract Drawings.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated in Contract Drawings.

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted individually parallel or perpendicular to building grid lines.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This specification refers to the location, protection, removal, relocation, and replacement of existing structures and utility works. The Contractor is advised that third party utilities are located in the Work area.

.2 Existing structures and utility works shall mean existing pipes, ducts, ditches, or other Works forming a part of sewerage, drainage, water, telephone, electrical, gas, or other utility system as well as trails, paths, sidewalks, curbs, poles, fences, buildings, retaining walls, rock walls, and other man-made objects that may be encountered during construction.

2.0 MATERIALS

2.1 SUPPLY

.1 The Contractor shall supply all materials required for the specified location, protection, removal, support, and replacement of existing structures.

.2 Unless specified otherwise, materials supplied for replacement of existing structures shall be at least equal to those being replaced.

3.0 EXECUTION

3.1 LOCATION OF UTILITIES AND STRUCTURES AND NOTIFICATION

.1 The Contractor shall be responsible for locating existing surface and underground utilities and structures that may affect the Work or may be damaged during construction.

.2 Drawings or descriptions, verbal or otherwise, of existing utilities or structures or their location that are given to the Contractor are intended only as an aid to his location of these existing utilities or structures. Measurements and location of the existing underground utilities or structures shown on the Drawings are not guaranteed to be accurate, and must be verified by the Contractor prior to proceeding with construction.

.3 On request by the Engineer, the Contractor shall excavate and uncover underground utilities or structures for the purpose of establishing line or grade for proposed installation of piping or other Work.

.4 The Contractor shall complete a BC 1 Call, and shall arrange for representatives of Telus (the telephone company), BC Hydro (power supply service company), Fortis (natural gas distribution company), Shaw Cablesystems (cablevision services), Regional District of Nanaimo (municipal utilities including watermains), and other utilities all to be on Site at the appropriate time, in advance of any excavation, to locate the existing utilities mains and services.

.5 Prior to excavation, the Contractor shall clearly mark the locations of existing utilities. Care shall be exercised during construction so as not to disturb these utilities.

3.2 PROTECTION OF UTILITIES AND STRUCTURES

.1 Unless authorization from the Engineer is received for their removal, underground and surface utilities and structures encountered during construction shall be protected from damage. In the event of damage resulting from the construction operation, they shall be repaired or replaced at the Contractor's sole expense to a condition which satisfies the appropriate utility company and is at least the equivalent of that which existed prior to construction.

3.3 EMERGENCY SITUATIONS

.1 In emergency situations resulting from the construction operation, where life or property are endangered, the Contractor shall immediately take whatever action is possible to eliminate the danger and shall also notify the appropriate authorities of the situation.

3.4 ACCESS TO UTILITIES MAINTAINED

.1 Access to existing utilities, hydrants, valve or control pit covers, valve boxes, and all other utility controls, warning systems, and appurtenances thereof, shall not be obstructed or made inaccessible at any time by the construction Work. Bridges, walks, or other temporary facilities shall be provided as may be necessary to ensure that these controls or warning systems are free for use in their normal manner at all times during construction.

3.5 CURTAILMENT OF UTILITY SERVICE

.1 Where existing utilities such as water, sewer, electricity, telephone, and gas are servicing the public, Work shall be planned and executed such that there is no curtailment of service provided by these utilities without prior receipt of approval of the authorities responsible for provision and maintenance of said utilities. The Contractor shall obtain the above approvals from the recognized authorities controlling these utilities. If approval for such disruption of utility service is not granted, the Contractor may be able to establish temporary facilities to provide continuous utility service throughout the course of construction. Such temporary facilities shall only be implemented after receiving the approval of the utility authority.

.2 If the Contractor, after receiving approval of the responsible authorities, is to temporarily close off an existing utility, they shall, unless otherwise authorized by the Engineer, notify individual users of the utility at least twenty-four (24) hours prior to the time of shut-off.

3.6 SUPPORT OF UTILITIES AND STRUCTURES

.1 Existing utilities and structures, including retaining walls shall be protected against damage from settlement by means of timber support or compaction of backfill as required. Where necessary, timber support shall remain in place following backfill of excavations.

.2 Backfill which is placed under or adjacent to existing utilities or structures that have been undermined during excavation shall be compacted in a manner that will prevent damage to the utility or structure by settlement. Such backfill shall be of approved granular material suitable for compaction.

3.7 DRAINAGE FACILITIES

.1 Existing culverts and headwalls, enclosed drains, flumes and ditches, and other drainage structures affected by the Work but left in place, shall be kept clear of excavated material at all times during construction. When it is necessary to temporarily remove an existing drainage structure, the Contractor shall provide suitable temporary ditches or other approved means of handling the drainage during construction. Culverts and drains shall be replaced on line and grade.

3.8 WORK IN VICINITY OF OVERHEAD POWER LINES

.1 Equipment shall not be operated where it is possible to bring such equipment or any part of the equipment within 3 m of any energized electrical conductor unless one (1) of the following safety precautions has been taken:

.1 The utility company has been notified, the line de-energized, or effectively guarded against contact, or displaced or re-routed from the Work area.

.2 WorkSafeBC, prior to construction, is notified in accordance with their required procedure.

.2 For high-voltage transmission lines, a greater clearance shall be provided as determined by the utility company.

3.9 SUPPORT OF EXISTING POWER POLES

.1 Poles located adjacent to an excavation shall be braced or supported if required, to prevent any damage or loss of service occurring to the utility lines.

3.10 RELOCATION OF EXISTING PIPING

.1 Where existing underground piping parallels the centreline of the trench, or crosses the trench centreline and intersects the pipe to be installed and must, in either case, be relocated, the Contractor shall make arrangements for the relocation of existing pipe or shall, having received the approval of the authority responsible for maintenance of the existing pipe, arrange to remove the existing pipe using the Contractor's own forces.

3.11 REMOVED OR SALVAGED MATERIALS

.1 For all materials removed by the Contractor during the Work, the Contractor shall ensure that these salvaged materials are not required by the Owner, and then appropriately dispose of these surplus materials. Should the Owner with to retain any such materials, they shall be removed with care, transported to the Nanoose Bay Pollution Control Centre, offloaded, and appropriately stockpiled where directed by the Owner, all by the Contractor at their own expense.

.2 Coordination of Existing Salvaged Work:

.1 Coordinate with the Owner for confirmation of materials, components and items of equipment identified for removal, and salvage from their present existing locations and as follows:

.1 Transport identified salvaged items to Owners' designated storage facility located at 3260 Schooner Cove Drive, Nanoose Bay, B.C. V9P 9H6.

.2 The Contractor is responsible for loading, unloading and hauling identified salvaged items using their own forces and equipment.

.2 Items salvaged by the Contractor and retained by the Owner include, but are not limited to:

.1 The entire kiosk and its components;

.2 The existing floats; and

.3 The hydrostatic level sensor.

.3 The Contractor shall remove and handle salvageable items from Site to minimize damage and to ensure that useability is maintained.

.4 Clean, decontaminate, or remediate hazardous substances (lead, asbestos dust, PCB residue, and similar substances) from salvaged materials so they are safe for reuse.

.5 Place materials on pallets or wrap in a protective film to ensure that loose pieces and projections do not cause injury to personnel, and that salvaged items remain as complete units.

.6 Clean items of construction of building debris, or materials that are not a part of the salvaged Work before delivering to the Owner.

3.12 RELICS AND ANTIQUES

.1 Relics and antique objects of historical significance found on Site remain the property of the Owner or as governed by any Federal or Provincial law. The Contractor shall protect such articles and request direction from the Engineer.

4.0 MEASUREMENT FOR PAYMENT

4.1 LOCATION OF EXISTING UTILITIES

.1 Payment for the location and verification of existing utilities will be made at the unit price for the applicable utility as shown in the Schedule of Quantities and Prices.

.2 This price shall include all materials, labour and equipment required to locate, expose, and verify the elevation of the top and bottom of the existing utility, including saw cutting, excavation, removal of the excavated material, shoring, dewatering, securing and maintenance of the exposed excavation. This price shall also include off-Site disposal of excavated materials, hauling, dumping fees, backfilling with import granular materials, compaction in lifts, and all Work incidental thereto.

4.2 REMOVAL OF EXISTING ITEMS

.1 Payment for removals and disposal will be made at the unit price shown in the Schedule of Quantities and Prices.

.2 This price shall include all materials, labour and equipment required for removal and disposal of all structures or items designated on the Drawings for removal including excavation, removal, transport for disposal, disposal fees, coordination with third party utilities, backfill of excavation

with suitable native material or import granular material as specified on the Drawings, or as directed by the Engineer, and all Work incidental thereto.

.3 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

4.3 SUPPORTING OF EXISTING UTILITY POLES

.1 Payment for supporting existing utility poles in accordance with BC Hydro requirements will be made at the unit price shown in the Schedule of Quantities and Prices.

.2 This price shall include all materials, labour and equipment required for supporting each utility pole including coordination with third party utilities, identification of conflict utility poles, supply of pole truck and lineman as required, and all Work incidental thereto.

.3 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This specification refers to all tree and vegetation removal and associated Work.

1.2 DEFINITIONS

.1 "Tree Removal" shall include the cutting of trees noted on the Drawings, snags, and brush to a maximum height of 0.3 m above the ground surface, decking of merchantable timber, and the removal and disposal of all other timber, fallen trees, logs, existing wood waste piles, branches, rotten wood, brush and all vegetative growth above the ground surface as directed by the Owner.

.2 "Vegetation Removal" shall include the excavation and disposal of all stumps, roots and embedded logs.

.3 "Merchantable Timber" shall be as defined by the Ministry of Forests Coast Timber Merchantability Specifications for the various species of trees in the areas to be cleared.

.4 "Wood Waste Material" shall include all biological material that exists within the work area that is not classified as merchantable timber.

2.0 MATERIALS

2.1 TREE & VEGETATION REMOVAL

.1 The Contractor shall supply all materials required for tree and vegetation removal.

3.0 EXECUTION

3.1 TREE REMOVAL

.1 Removal of trees and plants is to be kept to a minimum on this project. Only those trees that have been designated for removal by the Owner shall be cut down.

.2 Individual tree removals shall be conducted as indicated on the Drawings or as described in the Contract Documents. The Contractor shall verify the trees to be removed prior to the start of Work in each particular area. No falling of trees shall occur without specific approval from the Owner.

.3 If the Engineer requests the Contractor to preserve some trees, those trees or groups of trees that have been flagged "DO NOT CUT", shall be left standing. The Contractor shall take every precaution not to damage such trees and their roots when falling adjacent timber, or when conducting any other clearing operations.

.4 Trees shall be felled by experienced and qualified personnel. Merchantable timber shall be cut and processed to fully preserve its value. Trees shall be felled within the designated clearing areas, but in the event of any falling outside these areas, such trees shall be cut up and together with all debris and slash, returned to the clearing area for processing. The Contractor shall be responsible for any damages to utilities, private property, or preserved trees caused by the clearing operation.

.5 During all falling and heavy equipment work, spotters shall be in place to ensure the public does not wander into the area during these clearing operations. Signs shall also be erected warning the public to stay out of the area during clearing operations.

.6 All merchantable timber removed from property shall be decked in a suitable location that is accessible by a self-loading logging truck.

.7 On instructions from the Engineer, individual trees adjacent to but outside the designated clearing areas shall be cut, processed, and decked.

.8 The Contractor shall have a spill containment kit on-site during all equipment work on this project. Fuelling and lubricating of equipment shall take place away from existing drainage courses.

.9 The Contractor shall co-ordinate all falling around hydro poles and overhead hydro wires with BC Hydro.

3.2 VEGETATION REMOVAL

.1 Vegetation removal shall be conducted within the main working areas indicated on the Drawings or as described in the Contract Documents.

.2 Excavations resulting from removal of stumps, roots, or other material in fill areas shall be filled by the Contractor as a part of their operation.

.3 Care shall be taken when working near preserved trees or trees remaining so as not to damage or disturb the living roots. In general, no grubbing should take place below the canopy or drip line of remaining trees. Dangerous stumps that must be left in these areas shall be cut low with sharp edges rounded.

.4 Prior to commencing with Work, the Contractor shall provide sediment and erosion control.

3.3 DISPOSAL OF WOOD WASTE MATERIAL

.1 All wood waste material resulting from the main working areas (whether standing or already on the ground or in piles) shall be removed from Site and disposed of at an approved disposal facility obtained by the Contractor. Wood waste materials shall be loaded into bin trucks or regular trucks and removed from Site. Wood waste materials that are ground up or chipped into piles must also be removed from Site and disposed of at an approved disposal facility obtained by the Contractor. No wood waste materials are to be left on Site.

3.4 MERCHANTABLE TIMBER

.1 Merchantable timber shall be topped, trimmed of all branches (limbed), and stockpiled (decked) in a designated storage area approved by the Engineer. Log decks shall not be piled higher than 3.0 metres. All merchantable timber will remain the property of the Owner but shall be the responsibility of the Contractor until the completion of the Contract, or until removed.

.2 Merchantable timber shall be moved using due care, and with suitable approved equipment and methods to fully preserve its value. The Contractor shall take all reasonable precautions to protect merchantable timber during and after cutting, to ensure no loss or damage occurs as a result of theft or vandalism.

.3 All merchantable timber (commercial species greater than 8" diameter at breast height) must be felled, bucked, and moved to the stockpile area and placed so it can be retrieved by a self-loading logging truck. The Contractor shall review bucking lengths with the Owner prior to proceeding.

3.5 CONSTRUCTION ACCESS

.1 The Contractor shall construct all temporary construction accesses that are required to conduct their operations on this project.

4.0 MEASUREMENT AND PAYMENT

4.1 TREE & VEGETATION REMOVAL

.1 Payment for tree and vegetation removal will be made at the lump sum price shown in the Schedule of Quantities and Prices.

.2 This price shall include all labour, materials and equipment necessary to remove the trees and vegetation, cutting of tagged trees, snags, stumps and brush to a maximum height of 0.3m above the ground surface (unless noted otherwise in the Owner's Arborist's report or Owner's Environmental Consultant's report), limbing, topping, and bucking of all merchantable timber and moving the merchantable timber to the specified decking location (so that it is accessible by a self-loading logging truck), protection of the decked timber, and protection of the existing trees and plants that have been identified by the Owner, and in accordance with the Contract Documents.

.3 The price shall also include all materials, labour and equipment required to clear and remove the existing vegetation and wood waste material (all biological material that is not classified as merchantable timber) from the Work area as required to install the proposed Work in accordance with the Contract requirements and as directed by the Owner. This price shall include the removal and disposal of any bushes, shrubs, tree limbs, branches and any other organic matter that conflicts with the installation of any of the proposed utilities or road works, and all Work incidental thereto.

.4 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This specification refers to trench excavation and backfill. Bedding and backfill within the pipe zone is specified in applicable pipe installation sections.

.2 The pipe zone is the area enclosed by the earth trench walls and the distance from the bottom of the trench to 300 mm above the top of the pipe.

.3 This specification also refers to excavation and backfill for structures.

1.2 DEFINITIONS

.1 Trench excavation shall be classified as common, or rock excavation described as follows:

.1 Common excavation is defined as the removal of all material encountered which is not classified as rock excavation.

.2 Rock excavation is the removal of solid ledge rock which requires breaking with a hydraulic rock breaker for its removal. Removal of soft or disintegrated rock which can be removed with a hand pick or power-operated excavator or shovel with ripper, or previously blasted or broken rock in rock fills or elsewhere; or boulders or pieces of fractured rock which do not occur naturally within the excavated volume but fall into the excavation from the adjacent area, shall not be classified as rock excavation. Hard pan (glacial till) shall not be classified as rock. Large boulders which cannot be removed from the trench using the normal trenching or excavation equipment will be considered as solid ledge rock.

1.3 REFERENCES

.1 ASTM C117, Test Method for Material Finer Than: 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D1557-02, Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures using modified effort (2700kNm/m3).

.4 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.

.5 CAN/CGSB-8.2-M, Sieves, Testing, Woven Wire, Metric.

2.0 MATERIALS

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

.2 Flat and elongated particles of coarse aggregate: to ASTM D4791.

.3 Greatest dimension to exceed five times least dimension.

.4 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Natural sand.

.2 Manufactured sand.

.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.5 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

.1 Crushed rock.

.2 Gravel and crushed gravel composed of naturally formed particles of stone.

.3 Light weight aggregate, including slag and expanded shale.

2.2 SOURCE QUALITY CONTROL

.1 Notify the Engineer of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.

.2 Submit gradations and test results for the specified materials to the Engineer for approval.

.3 If, in opinion of Engineer, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.4 Notify the Engineer 4 weeks in advance of proposed change of material source.

.5 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

2.3 TRENCH BOTTOM STABILIZATION

.1 Material for stabilization of trench bottom shall be 25mm minus crushed gravel, crushed rock, oversize screenings, drain rock, or fine crushed rock, as approved by the Engineer.

2.4 TRENCH NATIVE BACKFILL MATERIAL

.1 Where approved by the Engineer for use, native backfill material above the bedding zone shall be material excavated from the trench from which all boulders larger than 150 mm in maximum dimension, large roots, stumps, organics or other debris that would prevent consolidation of the backfill have been removed. Native Backfill must be free draining and approved by the Engineer.

2.5 TRENCH IMPORTED BACKFILL MATERIAL

.1 Where specified, the trench excavation shall be backfilled with import backfill material. In general, import trench backfill shall be used under asphalt or gravel areas and within shallow trenches that are excavated in solid rock.

.2 Import backfill material shall be the same material as specified for road subbase material.

2.6 GRANULAR SUBBASE MATERIAL (75mm MINUS)

.1 The granular subbase material under roads shall be a free draining, well graded, pit-run gravel conforming to the following gradation limits when tested in accordance with ASTM C136:

US Standard Sieve Size	(% Passing by Weight)
75 mm	100
19 mm	15-100
0.600 mm	0-100
0.300 mm	0-15
0.075 mm	0-5

2.7 GRANULAR BASE AND SHOULDER GRAVEL (19mm MINUS)

.1 Road base and shoulder granular shall be composed of inert, clean, durable and well graded crushed aggregate, uniform in quality and free from soft or disintegrated pieces. At least 60 % of the aggregate particles shall have one face crushed. The aggregate gradation shall fall within the following limits when tested in accordance with ASTM C136:

US Standard Sieve Size	(% Passing by Weight)
25 mm	100
19 mm	80-100
9.5 mm	50-85
4.75 mm	35-70
2.36 mm	25-50
1.18 mm	15-35
0.300 mm	5-20
0.075 mm	0-5

2.8 DRAIN ROCK

.1 Drain rock shall be washed, shall have a maximum size of 25 mm, and no more than 5 % by weight of the rock shall pass a 9.5 mm sieve.

2.9 CONCRETE MIX

.1 Concrete for pipe encasement and for filling sandbags on culvert headwalls, expansion/contraction anchors and trench dams shall be made with normal Portland cement (type 10) and shall have a 28-day minimum compressive strength of 25 MPa, or as specified on the Drawings.

3.0 EXECUTION

3.1 TRENCH ALIGNMENT AND DEPTH

.1 The trench shall be excavated so that pipe(s) can be laid to the established alignment and depth with allowance made for specified trench wall clearances and bedding as required.

.2 Where existing asbestos cement watermain is encountered within the trench line and is disturbed during the installation of the new watermain, the asbestos cement pipe shall be handled in accordance with WorkSafeBC regulations and disposed of in an environmentally approved landfill site.

3.2 TRENCHING AND BACKFILLING EQUIPMENT

.1 Mechanical trenching and backfilling equipment may be used except where by so doing damage to trees, buildings, sidewalks, curbs, piping, or other existing structures or man-made obstacles above or below ground cannot be avoided.

.2 Trenches shall be hand excavated and backfilled where such obstacles prevent the use of mechanical equipment.

3.3 CAUTION IN EXCAVATION

.1 Trenches shall be excavated only as far in advance of the pipe laying operation as safety, traffic, and weather conditions permit. Caution shall be exercised with respect to structures, piping, or other man-made obstacles that may exist within the working area and due consideration given to the protection and support of such properties and structures.

.2 During trench excavation, existing ditches shall be kept free of excavated material in order to prevent sediment from being picked up by drainage flows within the ditches.

3.4 TRENCH ROCK EXCAVATION

.1 If encountered, trenching through solid ledge rock shall be accomplished using an excavator mounted hydraulic rock breaker or a power-operated hand tool. Drilling and blasting of trench rock will not be permitted due to the presence of nearby residential homes.

3.5 EXCAVATED TRENCH MATERIAL

.1 Unless otherwise approved by the Engineer for use on Site, excavated trench material shall be removed and disposed of at a location to be provided by the Contractor. The RDN will not provide a disposal location and stockpiling on Site will not be permitted. Waste material shall not be dumped on private property without the written permission of the owner of the property.

.2 On completion of the Work the Contractor shall obtain signed release forms from any owners of property upon which waste material has been dumped, and present copies of these forms to the Engineer.

.3 Where material is approved for use as backfill by the Engineer, it may be piled alongside the trench in accordance with WorkSafeBC regulations provided the working space is adequate for this purpose, and provided that by so doing the backfill material does not obstruct traffic, does not contravene environmental regulations, or spill onto private properties adjacent to the line of the trench thereby disturbing fences, buildings, shrubs, lawns, or other items of value.

.4 Where it is not possible to pile material alongside the trench in compliance with the above restrictions, the excavated material shall be hauled out, stockpiled, and returned for backfill, or alternatively, hauled to disposal sites obtained by the Contractor and replaced with approved material provided by the Contractor.

3.6 TRENCH SHORING

.1 Trench excavation, stability and safety procedures shall conform to WorkSafeBC Industrial Health and Safety Regulations, as may be necessary to protect life, property, and structures adjacent to the Work, the Work itself, or to maintain trench widths within the specified limits. Trenches shall be shored with WorkSafeBC approved cages or with sheeting and bracing in accordance with the requirements of the WorkSafeBC. Trench shoring shall be located no closer than 150 mm to the widest section of any installed pipe.

.2 Whenever possible, shoring shall be placed so that it does not extend below the springline of the pipe being installed. When it is necessary to place shoring below the pipe springline, as in the case of over excavation for trench bottom stabilization, shoring shall be raised in 600mm lifts, and all backfill placed below the level of the pipe springline shall be thoroughly compacted on each lift to fill the void left by the raised sheeting.

.3 When shoring is moved along or removed from a trench in which backfill is to be compacted, it shall be planned and executed in a manner which permits compaction of the backfill in the manner specified.

3.7 TRENCH WIDTHS AND PIPE ZONE

.1 Trenches shall be excavated such that there is no less than 150 mm clearance between the outside of the outermost pipe at its largest section and the trench sheeting or earth wall, and no more than 300 mm clearance between the pipe and the earth wall regardless of the existence of trench support works, unless otherwise shown on the Drawings.

.2 The above condition shall govern from the bottom of the trench to a distance 300 mm above the top of the pipe at its largest section. Trench widths above this level shall be maintained within the allowable limits shown on the Drawings, or as dictated by WorkSafeBC requirements.

.3 The pipe zone is defined as that portion of the trench between the bottom level of the pipe bedding and a level 300 mm above the top of the installed pipe.

3.8 DEWATERING

.1 Ground and surface water shall be controlled to the extent that excavation and pipe installation can proceed in the specified manner and such that the trench bottom is not disturbed to the detriment of the pipe installation. Trench water shall not be permitted to enter the pipe being installed unless approval is received from the Engineer.

.2 The necessary pumps, well points, or other equipment shall be employed to keep excavations free of water. Caution shall be exercised to make sure that foundation problems with existing structures and works under construction do not result from the selected method of dewatering excavations. Discharge from pumps, well points, or other dewatering equipment shall be located and controlled such that loss, damage, nuisance, or injury to the public does not result. Dewatering discharges shall not be allowed to enter any drainage course.

.3 Well pointing shall only be used upon approval by the Engineer and after it has been demonstrated that trench dewatering by sump pumps is not effective.

.4 Keep excavations free of water while Work is in progress.

.5 Protect open excavations against flooding and damage due to surface run-off or groundwater seepage.

.6 Dispose of water in a manner not detrimental to public and private property, in accordance with the Environmental Mitigation Plan, or any portion of Work completed or under construction.

3.9 TRENCH BOTTOM CONDITIONS

.1 Trenches shall be maintained such that pipe can be installed without getting water, muck, silt, gravel, or other foreign material into the pipe. Material remaining in the trench bottom on completion of machine excavating which has been disturbed or softened by workers shall be removed before bedding material is placed.

.2 The trench bottom shall be firm and capable of supporting the pipe to be installed, otherwise the bottom shall be stabilized by means of overexcavation or special foundation designed to support the pipe as hereinafter described.

.3 When the material in the trench bottom is found to be unstable or otherwise unsuitable for pipe support or the support of appurtenant structures, the trench shall be overexcavated to the level at which stable material is encountered and the excavation backfilled to the level of normal bedding with base gravel material approved by the Engineer. This material shall be compacted to 95% Modified Proctor Density. Bedding material, as specified for normal pipe bedding, may be used for this purpose to a maximum depth of 300 mm below the normal depth of bedding.

3.10 PLACING BACKFILL

.1 In order that consolidation of backfill is not hampered, trench water, if present, shall be removed prior to commencement of backfilling.

.2 To prevent damage to the installed pipe, backfill shall be placed in the trench by rolling down a slope and not by pushing it over the edge of the trench and allowing it to drop vertically.

.3 Every effort shall be made to plan the backfilling operation such that exposure of backfill material to wet weather is kept to a minimum.

.4 The trench shall be backfilled as close to the pipe laying operation as conditions permit and trench excavations shall not be left open overnight without the written permission of the Engineer. In such conditions the Contractor shall provide and install snow fencing around any open trenches or hazardous areas left overnight or unattended.

3.11 BEDDING AND BACKFILL WITHIN THE PIPE ZONE

.1 The pipe zone is defined as that portion of the trench between the bottom level of the pipe bedding and a level 300 mm above the top of the installed pipe.

.2 Bedding and backfill within the pipe zone is covered in the applicable pipe installation sections.

.3 Contractor shall use appropriate compaction equipment to ensure the HDPE, PVC and SS pipes are not damaged during compaction activities. Refer to the Drawings for details.

3.12 BACKFILL ABOVE PIPE ZONE

.1 In trench sections, backfill shall be compacted, using trench compaction equipment. In wider excavations, backfill shall be compacted using area compaction methods. Backfill above the pipe zone and surface restoration of trenches shall be carried out in accordance with the following paragraphs:

.2 Trench backfill above the pipe zone shall be imported road subbase backfill material to subgrade level, compacted to 95% of Modified Proctor Density (ASTM D1557). The remainder of the trench shall be backfilled with the design depth of granular base, as shown on the Drawings.

3.13 SITE PREPARATION FOR STRUCTURES

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated shown on the Drawings.

3.14 STOCKPILING FOR STRUCTURES

.1 Stockpile fill materials in areas as indicated. The area available on Site for stockpiling is limited, and stockpiling off-site may be required. Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination and from excessive moisture change.

3.15 EXCAVATION FOR STRUCTURES

.1 Excavate to lines, grades, elevations and dimensions as indicated on the Drawings.

.2 Dispose of surplus and unsuitable excavated material off Site.

.3 Protect excavated slopes from seepage and erosion.

.4 Earth bottoms of excavations to be to grades shown on the Drawings, free from loose, soft or organic matter.

.5 Notify Engineer when design subgrade elevation is reached.

.6 Geotechnical Engineer to inspect and approve proposed bearing surfaces.

.7 Remove unsuitable material from excavation bottom to extent and depth as directed by Engineer and backfill with compacted granular base to 95% Modified Proctor Density.

.8 Where required, due to unauthorized over-excavation, backfill with compacted granular base to 95% Modified Proctor Density at the Contractor's own cost.

3.16 BACKFILLING FOR STRUCTURES

.1 Do not proceed with backfilling operations until Engineer has inspected and approved installations and hydrostatic testing of the reservoir has been successfully completed.

.2 Use fill types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D1557 corrected maximum dry density.

.3 Under the Pump Station slab, place granular base fill in maximum 150 mm lifts. Compact to 95% Modified Proctor Density.

.4 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.5 Do not use backfill material, which is frozen or contains, ice, snow or debris.

.6 Unless otherwise noted herein, place backfill material in uniform horizontal layers of no more than 300 mm loose thickness, up to grades indicated. Compact each layer as specified before placing succeeding layer.

.7 Backfilling Around Structures:

.8 Use light compaction equipment within 1.0 m of walls.

.9 Compaction densities are percentages of maximum densities obtained from ASTM D1557.

.10 Do not backfill around or over cast in place concrete within 24 hours after placing of concrete.

.11 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 1.0 m where sides are being filled to the same level.

.12 Moisten fill prior to placing concrete.

.13 Tolerance: Finished base surface under Pump Station slab to be within plus or minus 13 mm of established grade and cross section but not uniformly high or low.

3.17 INSPECTION AND TESTING

.1 Testing and materials and compaction will be carried out by an independent testing laboratory retained by the Owner.

.2 The following minimum tests will be conducted:

- .1 Regular sieve analysis of proposed granular base, granular subbase, and drain rock.
- .2 Determination of optimum moisture content and Modified Proctor Density (ASTM D1557).
- .3 Repeat sieve analysis and optimum moisture content if source or gradation of materials changes during the project.

.3 Determination of moisture content and field densities (ASTM O2922) of in-place materials:

- .1 Minimum of 3 field density tests per lift, for granular base fill.
- .2 Minimum of 3 field density tests per lift for the granular subbase fill.

.4 Submit sieve analysis results to Engineer for review at least two weeks prior to proceeding with Work.

.5 Submit compaction results to Engineer for review prior to casting base slab.

3.18 COMPACTION OF BACKFILL

.1 Subject to the provisions contained elsewhere herein, compaction of backfill above the pipe zone shall be obtained by using approved, mechanical, power-driven compactors. Compaction shall be carried out with the soil at optimum moisture content such that compaction to 95% of Modified Proctor Density (ASTM D1557) is obtained. Backfill shall be compacted in lifts of not greater than 300 mm compacted depth, or 600 mm uncompacted depth where a hoe-pack or other approved

compaction equipment is used. Granular base shall be compacted in lifts of not greater than 150mm compacted depth.

.2 Compaction testing will be carried out by a testing consultant selected by the Engineer. Initial materials testing, compaction density testing and one set of compaction retests where required will be paid for by the Owner. Any additional testing required due to unsatisfactory results or proposed alternative materials will be billed to the Contractor.

.3 Obtain Engineer's approval of compaction.

3.19 DISPOSAL OF EXCAVATED MATERIAL

.1 Surplus or waste excavated material shall be removed from the trench area during the excavation or at the time of backfilling and shall not be left along the trench following completion of the backfilling operation.

.2 Surplus material, which is not required for the Work, shall be loaded and hauled to a disposal site to be found by the Contractor.

.3 The Contractor shall exercise particular care to avoid spillage on paved roadways over which excavated material is hauled. Any such spillage shall be cleaned up promptly by sweeping or hosing with water.

.4 The Contractor shall remove the existing asphalt from the locations indicated on the Drawings and dispose of this material at an approved offsite facility.

3.20 RESTORATION OF WORKING AREAS

.1 Working areas are those areas which are affected by the construction operation, but which lie outside the specified limits of trench excavation. Working areas shall be restored to their original condition in the following manner.

.2 Untravelled Surfaces:

.1 Working areas in untravelled surfaces shall be restored to their original condition. Where directed by the Engineer, the Contractor shall perform hydraulic seeding on any working areas that may become a source of sediment runoff.

.3 Travelled Surfaces:

.1 Working areas in travelled surfaces shall be restored to their original condition. This shall include replacing the granular base on gravel surfaces to a condition acceptable to the Engineer.

3.21 SURFACE MAINTENANCE DURING CONSTRUCTION

.1 The Contractor shall maintain all trench surfaces and working surfaces affected by his operation throughout the construction period and until such time as the project is accepted by the Owner.

3.22 TRENCH SETTLEMENT DURING GUARANTEE PERIOD

.1 The Contractor shall replace materials and rectify all failures that occur as a result of settlement of trench backfill or collapse of trench walls during the guarantee period.

.2 Trenches in which backfill settles shall be refilled with suitable backfill material, and surfaces that are adjacent to trenches or on trench backfill, which settle or fail during this period, shall be replaced or repaired in an approved manner.

3.23 TRAFFIC AND PEDESTRIAN CONTROL

.1 The Contractor shall be responsible for traffic control during all operations and shall not unduly disrupt normal traffic and pedestrian movement. Refer to Section 01 11 00 – General Requirements, for further details.

4.0 MEASUREMENT AND PAYMENT

4.1 TRENCH EXCAVATION WITH IMPORT BACKFILL

.1 No measurement will be made for trench excavation with imported backfill. Payment for all Work under this section is to be included in the applicable unit price per lineal metre or price per lump sum for installation of the sanitary sewer pipe(s) that it most closely relates to in the Schedule of Quantities and Prices.

.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

4.2 AUTHORIZED OVEREXCAVATION (PROVISIONAL*)

.1 When the Contractor has obtained prior approval from the Engineer, authorized overexcavation will be accepted as an additional item of Work and paid as follows. Payment for authorized overexcavation will be made at the unit price per cubic metre of placed imported backfill material as shown on the Schedule of Quantities and Prices. Measurement will be made based on the volume of material placed, based on field measurements of the trench. This price shall include the additional excavation of the unsuitable materials, disposal of unsuitable materials, loading, hauling and dumping (including applicable fees), the supply, placing, and compaction of imported backfill material, and all Work incidental thereto.

.2 Payment for overexcavation will only be made when, in the opinion of the Engineer, it is necessitated by the natural existence of unsatisfactory soil conditions. No payment will be made from acts, neglects, or delays of the Contractor.

.3 Payment for overexcavation will only be considered below the pipe zone or nominal 100 mm depth underneath the design pipe invert.

4.3 ROCK EXCAVATION (PROVISIONAL*)

.1 Rock excavation will be accepted as an additional item of Work and paid as follows. Payment for rock excavation will be made at the unit price per cubic metre of excavated rock material as shown on the Schedule of Quantities and Prices. Measurement will be made based on the in place volume of solid ledge rock removed, based on field measurements of the excavated trench. This price shall include excavation of the solid ledge rock, disposal of the excavated rock materials, loading, hauling and dumping (including applicable fees), and all Work incidental thereto.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This specification governs the production, placing and compaction of hot mix, hot laid asphalt concrete for asphalt pavement surrounds for nelson boxes and other structures.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Refer to Section 31 23 33.01 – Excavation & Backfill, for specifications relating to installation of base materials below asphalt surrounds.

1.3 REFERENCE STANDARDS

.1 Asphalt pavement shall be in accordance with the British Columbia Ministry of Transportation and Infrastructure Engineering Standards and Specifications.

2.0 MATERIALS

2.1 AGGREGATE

.1 Aggregate for asphaltic concrete shall be composed of hard, durable, angular crushed gravel free from silt or clay lumps, cementation, organic material, frozen material and other deleterious materials.

.2 The aggregate gradation shall fall within the following limits when tested in accordance with ASTM C136 and ASTM C117:

Gradation Limits (% Passing by Weight)			
US Standard	**Medium Mix**		**Fine Mix**
Sieve Size	**19 mm**	**12 mm**	**12.5 mm**
25 mm	-	-	-
19 mm	100	-	-
16 mm	-	100	-
12.5 mm	84-95	90-100	100
9.5 mm	73-90	73-90	90-100
4.75 mm	50-75	50-75	55-80
2.36 mm	35-57	35-57	32-64
1.18 mm	26-45	26-45	24-51
0.600 mm	18-34	18-34	17-40
0.300 mm	10-26	10-26	13-29
0.150 mm	6-17	6-17	8-18
0.075 mm	3-7	3-7	4-10

.3 All sample gradations shall fall within the gradation limits, and any deviations between the samples and the project curve, based on the mix design, shall not exceed the following limits:

US Standard Sieve Size	Maximum Permissible Variation of Crushed Agg. Gradation (% Passing)
4.75mm and larger	± 5.0
1.18 to 4.75 mm	± 3.5
0.300 to 1.18 mm	± 2.0
0.075 to 0.300 mm	± 1.0

.4 A minimum 85% of the material retained on a 4.75 sieve shall have at least 2 fractured faces. Percentages shall be determined by particle count.

.5 Shale content by weight shall not exceed 3% in the lower course nor 1-1/2% in the surface course.

.6 Aggregate short of material passing the 0.075 mm sieve shall have approved mineral filler added. Mineral filler shall be only material passing the 0.075 mm sieve and shall be finely ground particles of limestone, hydrated lime, Portland Cement or other approved non-plastic materials when tested in accordance with ASTM D4318.

.7 The moisture content of the aggregate after leaving the drier and before mixing shall not be more than 0.05% by weight.

.8 Standard tests may be required to confirm the aggregate source is suitable for use in the production of aggregate for asphaltic concrete, including soundness of aggregate, LA Abrasion, sand equivalent, absorption of aggregate, and petrographic examination.

2.2 ASPHALT CEMENT

.1 Asphalt cement shall be in accordance with CAN/CGSB - 16.3, be prepared from the refining of petroleum oils and be homogenous, free from water and shall not foam when heated to 175°C.

.2 Asphalt cement shall conform to the following specifications:

Test Designation	Characteristics	Min	Max	Units
ASTM D5	Penetration @ 25°C (100g for 5 seconds)	80	100	(0.1 mm)
ASTM D2171	Absolute Viscosity @ 60° C	550	750	poise
ASTM D2042	Solubility in Trichloroethylene	90	-	%
ASTM D92	Flash Point by Cleveland Open Cup	230	-	°C
ASTM D1754	Loss on Heating, Max 0.85%	-	0.85	%
ASTM D5	Penetration @ 25°C (after loss on heating 100g for 5 seconds)	55	-	% of Original

.3 The Contractor shall inform the Owner of the name of his asphalt supplier and shall ensure that each load of asphalt is accompanied with a flow sheet showing compliance with the preceding requirements. Such flow sheets shall be submitted to the Owner.

2.3 JOB MIX AND PLANT CALIBRATION

.1 If requested by the Owner, a job mix formula shall be provided by the Contractor and shall contain the following information:

- .1 Sieve analysis of combined aggregate in mix.
- .2 Aggregate size range in each bin separation to be used.
- .3 Weight of aggregate to be used from each bin for one batch of mix.
- .4 Weight of asphalt cement to be used for one batch of mix.
- .5 Optimum mixing and compacting temperatures.

.2 If requested by the Owner, a plant calibration for continuous mix plants shall be provided by the Contractor.

2.4 ASPHALTIC CONCRETE ACCEPTANCE REQUIREMENTS

.1 The finished grade surface shall be free from bumps, depressions or other irregularities and shall be within 6 mm of the design grade and cross section, but not uniformly high or low, when measured with a three (3) metre straight-edge in any direction.

.2 The finished elevation of the compacted asphaltic concrete shall be 0-6 mm above the finish elevation of structures, including but not limited to curbs, gutters, manhole lids, catchbasins, valve boxes and survey monuments.

.3 The finished surface of the asphaltic concrete shall be homogenous, free from segregation and consistently uniform in surface texture.

.4 Asphaltic concrete shall be compacted to **98% mean compacted density**. Maximum acceptable standard deviation of test data shall be 1.5%, with no individual test results less than 95% compacted density.

.5 Asphaltic concrete thickness, as measured in accordance with ASTM D3549, shall not be less than the specified thickness for all test cores.

3.0 EXECUTION

3.1 RESPONSIBILITY FOR BASE

.1 The base compaction and grading shall be approved by the Owner prior to commencement of asphalt placement.

.2 In areas of road or trench restoration, where after the excavation for the specified 150 mm depth of base, the subgrade is found to be deficient and unsuitable for road construction, the area shall be overexcavated to the level at which stable material is encountered and the excavation

backfilled to the level of the base gravel material with approved subbase material as approved by the Owner. This material shall be compacted to 95% Modified Proctor Density

.3 The Contractor shall examine the approved base prior to commencing asphalt placement and satisfy themselves that it is properly prepared for the placement of asphaltic concrete, and shall notify the Owner of any observed deficiencies prior to paving. The Contractor's responsibility for pavement failures shall include those caused by base failure.

3.2 TRAFFIC

.1 The Contractor shall be responsible for traffic control during all operations and shall not unduly disrupt normal traffic movement.

.2 Traffic shall not be permitted on the finished pavement until it has cooled to atmospheric temperature.

3.3 ADJUSTMENT OF SERVICES

.1 The Contractor shall adjust manholes, catchbasins, valves, etc. to the proper finished grade at the time of paving. The adjusted items shall be inspected and approved by the Owner prior to backfilling and paving. The Contractor shall ensure that disturbed gravels are reinstated and compacted to the required standard.

3.4 CLEANING

.1 Items or structures within the paved area shall be covered and protected from asphalt intrusion during the paving operation. The Contractor shall thoroughly remove from all culverts, catchbasins, curbs, gutters and other structures such contamination by asphaltic or other materials as may have occurred during the performance of the Work.

3.5 TESTING

.1 The Owner may arrange for a testing firm to carry out tests to determine whether the applicable standards and specifications have been met. Where initial testing indicates non-compliance with the specifications, additional testing shall be required at the Contractor's expense.

.2 The Contractor, as directed by the Owner, shall supply specimens or samples for testing.

.3 Inspection and testing by the Owner shall not relieve the Contractor of his responsibility for quality control.

.4 Asphaltic concrete found to be in non-compliance with the specifications shall be repaired or replaced by the Contractor at no additional cost to the Owner. The Contractor shall submit to the Owner for approval, his proposed method to correct the noted deficiencies, prior to commencing the Work.

.5 The test programs outlined below are minimum requirements and may be modified by the Owner. Full testing may be required during the first few days of paving to determine quality control and construction procedures. As paving progresses sufficient tests to maintain uniformity will be required.

3.6 TACK COAT

.1 The existing asphaltic concrete surface shall be thoroughly cleaned by a power-driven sweeper immediately prior to applying the tack coat.

.2 Tack coat shall be applied to the edge of existing asphaltic concrete, curbs and structures where these surfaces will be in contact with the new asphaltic concrete pavement.

.3 Tack coat shall be applied only when the surface is dry and clean, and the air temperature is over 10 degrees C.

.4 Tack coat shall be uniformly applied with an approved pressure distributor at a rate of 0.25 litres per square metre. The temperature of the material shall be maintained between 32 degrees C. and 38 degrees C.

.5 Work shall be planned so that no more tack coat than is necessary for the days operation is placed on the surface.

3.7 TRANSPORTATION OF HMA

.1 Trucks used for the transport of hot mix shall be equipped with tarpaulins and with insulated boxes where required. Trucks shall not leak fuel or lubrication oils.

.2 Inside surfaces of truck boxes shall be free of all deleterious materials and lubricated with suitable thin oil or soap, but excessive use of lubricant will not be permitted.

.3 The mixture shall be transported from the paving plant to the job Site utilizing designated truck routes where possible, and shall use local streets only to obtain local access.

.4 Loads shall be delivered continuously in covered trucks to provide a uniform, non-stop paving operation. Delivery of the mix shall be scheduled to permit completion of the paving operation in daylight hours unless otherwise approved by the Owner.

3.8 PLACEMENT

.1 Surfaces onto which asphaltic concrete pavement is placed shall be dry, above 5 degrees C, and cleaned of all loose and foreign materials. Mixtures shall normally not be laid when the atmospheric temperature is less than 5 degrees C and falling.

.2 The mixture at time of placing shall be not less than 120 degrees C or greater than 140 degrees C or as required by the mix design.

.3 The Contractor may use such methods as approved by the Owner in narrow areas, irregular sections, intersections, turnouts or driveways, where it is impractical to spread by hand.

.4 Minor inequalities in spreading and shaping the paved surface adjacent to existing structures such as manholes, catchbasins or valves shall be performed to a condition satisfactory to the Owner.

3.9 COMPACTION

.1 Compaction shall commence immediately after the bearing capacity of the course is adequate to support compaction equipment without undesirable displacement or cracking.

.2 During the compaction operations, the plate tamper surface shall be kept moist with only enough water to avoid picking up material. Fuel oil, lubricating oil, or kerosene shall not be permitted as lubricants for the surface of the tamper.

.3 Where compaction causes displacement of material, affected areas shall be loosened immediately with lutes or shovels and restored to original grade of loose material before re-compacting.

3.10 JOINTS

.1 Joints are not permitted for asphalt surround aprons. Placement shall be continuous until completion of the apron, to the satisfaction of the Engineer.

4.0 MEASUREMENT AND PAYMENT

4.1 ASPHALT PAVEMENT

.1 No payment will be made for Work specified in this section. Payment for all Work under this section is to be included in the lump sum price that is most closely relates to the for installation of Sanitary Sewer, Manholes and Miscellaneous Structures, and Construction of the Pump Station.

.2 Payment shall include all manpower, equipment, and materials required for the asphalt surround installations, including traffic control, placement and compaction of 150 mm of base granulars, any regrading and re-compaction of existing road gravels that may be necessary, cleaning and tack coating of interface areas of the previously paved surface, mixing, transporting, placing, compacting, finishing, and all other Work and materials incidental thereto.

.3 Payment shall also include adjustment of all manholes, catch basins, valve boxes and any other features within the area to be paved.

.4 All new asphalt pavement shall have a minimum compacted thickness of 50 mm.

.5 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This section refers to manholes, and miscellaneous structures.

1.2 SHOP DRAWINGS

.1 The Contractor shall submit Shop Drawings for manholes, frames and covers, and for the bases if they are to be pre-cast, as shown on the Drawings.

1.3 SURVEY LAYOUT FOR STRUCTURES

.1 The Contractor will be responsible for establishing survey layout for all manholes and miscellaneous structures.

1.4 RELATED WORK SPECIFIED ELSEWHERE

.1 Refer to Section 33 31 11 – Sanitary Sewer Piping, for additional information regarding the sanitary sewer.

.2 Refer to Section 33 32 13.13 – Sanitary Pump Station, for additional information regarding the Pump Station, kiosk and mechanical equipment.

2.0 MATERIALS

2.1 SUPPLY

.1 The Contractor shall supply all materials required for the specified structure.

2.2 PRECAST MANHOLE BASE AND RISER SECTIONS

.1 Except as otherwise specified herein, manholes shall be of precast reinforced-concrete manhole bases, riser sections and appurtenances, for each size and type noted on the Drawings.

.2 Pre-cast manhole bases and riser sections shall be watertight and as noted on the Drawings, conforming to ASTM C478, with watertight formed joints using rubber 'O' ring seals.

.3 The top manhole riser section shall be 300 mm long, to allow for future grade adjustment.

2.3 PRECAST 600mm DIA. CHAMBERS

.1 Unless otherwise specified herein, catch basins, barrel extensions, lids and riser rings shall be of precast reinforced-concrete, conforming to ASTM C478-82 or latest revision.

.2 Brick for the filler ring below the cast frame shall only be used after specific approval by the Engineer in writing, and shall be concrete brick, conforming to ASTM C55, Type I, Grade U-1.

2.4 MANHOLE TOPS

.1 Manhole tops shall be flat slab, precast concrete. Tops shall be reinforced to withstand CS 600 loading conditions. Precast tops shall conform to ASTM C478, with approved offset opening for frame and cover.

2.5 MANHOLE FRAMES AND COVERS

.1 Frames and covers shall be cast iron of an approved pattern to withstand CS 600 loading requirements. The clear opening of the frame shall be 500mm in diameter. Frame and cover dimensions and details are shown on RDN Bylaw No. 500 Standard Detail Drawing S-13, found in Appendix A. The cover shall have a weight of 66 kg. The frame shall be of the round base pattern with three (3) 22mm diameter levelling holes with pocket for square nut, and having a weight of 84 kg. Bearing faces of the cover to frame shall be machined for a non-rocking fit. Covers shall each have two (2) 22mm diameter lifting holes, with the associated carriage bolt assemblies.

.2 Covers shall have the following wording shown on the Drawings permanently embossed thereon “Sanitary Sewer”. The manhole covers and frames shall be model C18 or C20, or approved equivalent, as supplied by Alf’s Casting, Dobney Foundry, TR Castings, or Terminal City.

2.6 RISER RINGS

.1 Riser rings shall be precast reinforced concrete to conform to ASTM C-478-82 or latest revision.

.2 Brick for the filler ring below the cast frame shall only be used after specific approval by the Engineer, and shall be concrete brick conforming to ASTM C55, Type I, Grade U-1.

2.7 MANHOLE STEPS

.1 Steps or shall conform to ASTM C478-82 or latest revision, for manhole steps and ladders and shall be 20mm diameter aluminum alloy #6351-T6 to CSA S157 and NBC 1977, safety type, designed to withstand a minimum design live load of 1,334 Newtons (300 ft.lb). The minimum length of rungs or cleats shall be 250 mm in conformance with WorkSafeBC requirements.

.2 Steps shall be cast in place by the manufacturer, c/w polyethylene anchor insulating sleeves, and imbedded a minimum distance of 76 mm. The rung or cleat shall project a minimum clear distance of 100 mm from the wall of the riser.

3.0 EXECUTION

3.1 MANHOLE CONCRETE BASES

.1 All water shall be removed from the excavation prior to placing base concrete. The base shall be constructed such that the first section of a precast section can be set plumb with uniform bearing throughout its full circumference.

.2 If material in the bottom of the trench is unsuitable for support, the bottom shall be overexcavated to firm base as determined by the Engineer and backfilled to the required grade with thoroughly compacted base gravel as specified for trench bottom stabilization under the applicable item included in Section 31 23 33.01 – Excavation & Backfill.

.3 Where overexcavation and backfill with base gravel is not practical, special structural support shall be provided as specified for trench bottom stabilization under the applicable item included in Section 31 23 33.01 – Excavation & Backfill.

.4 Concrete manhole bases shall be constructed only as directed by the Engineer when pre-cast manhole bases are not available or appropriate. Pipes and fittings through the manhole shall be temporarily supported on concrete blocks. Concrete for manhole bases shall develop a minimum compressive strength of 20 MPa at 28 days.

.5 Precast manhole bases should be used. Due to the variability of existing conditions, pipe inverts and angles may need to be adjusted in the field.

3.2 PRECAST MANHOLE RISER SECTIONS

.1 Precast manhole riser sections shall be placed plumb and conform to ASTM C478. During placement of precast sections, care shall be taken to ensure that manhole steps are in alignment and that they are oriented to suit the proposed location of the entrance cover.

.2 Joints between pre-cast manhole bases and risers, and between the top of risers and the cover slab shall be made using "O" rings. The interior of the manhole joints shall be cement mortared to provide a smooth finish.

3.3 FRAMES AND COVERS

.1 Frames shall be set on a base as shown on the Drawings. Grade rings shall be mortared in an approved manner and the inside and outside face of the grade rings shall be "buttered" with mortar such that a neat, even finish results. Frames shall be firmly embedded in mortar and shall be set to provide a cover surface which is even with and true to the contour of the road or adjacent finished grade.

3.4 MANHOLE STEPS

.1 Manhole steps shall be placed as shown on the Drawings or as directed by the Engineer. Steps in riser sections shall be aligned in each section so as to form a continuous ladder with rungs equally spaced vertically in the assembled manhole and design distance of 300 mm apart.

.2 The maximum distance down from the entry level (top of the manhole cover) to the centreline of the top rung shall be 500 mm. The maximum distance up from the manhole bottom (top of benching) to centerline of the bottom rung shall be 450mm.

3.5 DEWATERING

.1 Ground and surface water shall be controlled to the extent that the Work can proceed in the specified manner and such that the excavation is not disturbed to the detriment of the concrete structure installation. Water shall not be permitted to enter the manhole or sewer piping.

.2 The necessary pumps, vacuum trucks, well points, or other equipment shall be employed to keep excavations free of water. Caution shall be exercised to make sure that foundation problems with existing structures and works under construction do not result from the selected method of dewatering excavations. Discharge from pumps, well points, or other dewatering equipment shall

be located and controlled such that loss, damage, nuisance, or injury to the public does not result. Dewatering discharges shall not be allowed to enter any drainage course.

4.0 MEASUREMENT AND PAYMENT

4.1 MANHOLES

.1 Payment for manholes will be made at the unit price per manhole shown in the Schedule of Quantities and Prices. This unit price shall include all labour, materials and equipment necessary to install structures for each type and size, and in accordance with the Contact Documents.

.2 This unit price shall include supply and installation of all materials including the frame and cover, carriage bolts, precast manhole lid, precast manhole riser sections complete with O-ring seals and aluminum ladder rungs, precast and pre-benched or cast-in-place manhole base, paved asphalt surround where required, excavation, channelling & benching, grouting, brickwork, concrete and mortar, backfilling with import backfill material, compaction, temporary restoration as required, temporary bypass pumping as required, and all Work and materials incidental thereto.

.3 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

4.2 600mm DIA. CHAMBER

.1 Payment for the 600mm dia. precast concrete chamber will be made at the unit price for the types shown in the Schedule of Quantities and Prices. This unit price shall include all materials, labour and equipment required to supply and install the chamber barrel, extension if required, grade rings, concrete surround, drain rock, frame and cover, carriage bolts, and asphalt surround as required, in accordance with the Contract Documents.

.2 This unit price shall include excavation and backfilling with import backfill, compaction, adjustment to final grade, concrete and grouting cleaning out sump prior to acceptance again one month before expiry of warranty period, temporary restoration as required, and all work and materials incidental thereto.

.3 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

4.3 MISCELLANEOUS STRUCTURES

.1 Payment for concrete expansion/contraction anchors will be made at the lump sum price shown in the Schedule of Quantities and Prices. This price shall include all materials, labour and equipment required to supply and install the anchors as specified, including excavation, concrete, rebar, associated HDPE anchor fittings fused to pipe, and all other items incidental thereto.

.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This specification refers to pipe, fittings, and miscellaneous appurtenances for pressure piping.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Refer to Section 01 57 10 – Site Treatment, for additional information regarding restoration work.

.2 Refer to Section 01 57 20 – Sequencing and Tie-in Requirements, for additional information regarding sequencing.

.3 Refer to Section 31 23 33.01 – Excavation & Backfill, for additional information regarding excavating and backfilling.

.4 Refer to Section 33 05 16 – Manholes and Miscellaneous Structures, for additional information regarding structures.

.5 Refer to Section 33 32 13.00 – Welding, for additional information regarding the welding of stainless steel pipe and fittings.

.6 Refer to Section 33 32 13.13 – Sanitary Pump Station, for additional information regarding the Pump Station, kiosk, and mechanical equipment.

1.3 SHOP DRAWINGS

.1 Provide Shop Drawings in accordance with Section 01 33 00 – Submittals.

.2 Provide Shop Drawings for all high density polyethylene (HDPE) & Polyvinyl Chloride (PVC) pipe, fittings, bends, fusion couplings, stainless steel pipe & fittings, stainless steel flanges, flange gaskets, nut & bolts, hardware lubrication, and appurtenances and all pipe specials.

2.0 MATERIALS

2.1 MATERIALS TESTING

.1 The Owner may retain the services of an independent testing company to provide test reports on pipe and fittings in accordance with the applicable standard specifications.

.2 Test specimens may be selected by the Engineer either at the place of manufacture or at the job Site and shall be delivered to the testing laboratory by the Contractor. The number of pipe specimens to be tested shall not normally exceed 0.5% of the number of pieces to be installed on the job. However, where initial testing indicates inadequacies in the pipe, additional testing may be required.

.3 The entire costs of initial testing, including materials and transportation costs, will be paid by the Owner. Any costs incurred for extra testing requested by the Contractor, or resulting from unsatisfactory initial test results, shall be charged to the Contractor.

2.2 PIPE AND JOINTS

.1 Piping shall be sized as shown on the Drawings, and shall be AWWA and CSA approved. The supplier shall, if requested by the Engineer, submit an affidavit of compliance with the standard specifications and supplementary date. All piping shall bear the underwriter's label.

.1 Polyvinyl Chloride Pipe (PVC)

.1 The PVC required on this project shall conform to AWWA C900, be certified to CSA B137.3 and be Class 150 (DR 18) for sizes 100 to 300 mm. Joints shall have an integrally thickened bell and spigot type conforming to ASTM D3139 with a single elastomeric gasket to ASTM F477.

.1 PVC DR 35 pipe shall have a minimum pipe stiffness (F/Y) of 320 kPa at 5.0% deflection to ASTM D2412. PVC pipe shall conform to the requirements of ASTM D3034, and to CSA B182.2 for sizes 100 to 300 mm.

.2 High Density Polyethylene Pipe (HDPE)

.1 The HDPE required on this project shall be made from the HDPE resin PE 4710 and shall conform to AWWA C906. HDPE pipe shall be certified by the Canadian Standard Association CSA B137.1. HDPE pipe shall be DR 17 as noted on the Drawings for the different sections of sanitary forcemain.

.1 The minimum working pressure rating shall be 125 psi, the minimum allowable total pressure during recurring surge shall be 175 psi, and the minimum allowable total pressure during occasional surge shall be 225 psi.

.2 In cases where it is too difficult to co-ordinate fusion of a joint with a standard fusion machine, electro-fusion couplings that are endorsed by the pipe manufacturer will be permitted.

.3 Stainless Steel Pipe (SS)

.1 Unless otherwise noted on the Drawings, stainless steel pipe shall be Schedule 40 (Type 316L). Stainless steel pipe shall have a minimum yield of 205 MPa (30,000 psi) and shall conform to AWWA C220, ASTM A312, ASTM A409, and ASTM A778.

2.3 FITTINGS

.1 Stainless steel pipe specials and fittings shall be designed to have the same strength as the piping they connect to. Reinforcing collars, or wrappers, shall be provided where required. The minimum wall thickness of fittings shall equal the wall thickness of pipe, unless otherwise noted on the Drawings. Design standard shall be to ATSM A774 and ANSI B16.9 – B16.28. Prior to fabrication, the Contractor shall submit Shop Drawings of all fabricated stainless steel fittings to the Engineer.

.2 Joints between fittings and pipes shall be as shown on the Drawings.

.3 All HDPE fittings shall be resin PE 4710 and conform to AWWA C906 and ASTM F2206 and be manufactured to have the same minimum pressure ratings as the pipe to which the fitting is connected or fused to (see above). HDPE pipe fittings shall not be fabricated in the field.

.4 All PVC fittings shall include integral bell and spigot ends with stiffened wall section and formed groove for a rubber gasket. Fittings shall conform to ASTM D3212 and gaskets to ASTM F477, and must withstand a minimum hydrostatic pressure of 345 kPa (50 psi) without leakage. PVC fittings shall be factory manufactured fittings.

.5 Prior to fabrication, the Contractor shall submit Shop Drawings of all fabricated HDPE and PVC fittings to the Engineer. The Shop Drawings shall indicate the minimum pressure ratings and be sealed by an Engineer registered in British Columbia.

.6 HDPE fittings shall be connected by heat butt fusion in accordance with ASTM D2657 and manufacturer's recommended standards. All HDPE fittings shall have a minimum pressure rating equal to or greater than the pipe it is fused to.

.7 HDPE Electrofusion Branch Saddles shall conform to ASTM D2513 and ASTM D3261. Electrofusion Branch Saddles shall be manufactured with resin material having a material designation code of PE4710.

.8 Moulded HDPE fittings shall conform to ASTM 3261 and be manufactured to have the same minimum working pressure rating as the pipe to which the fitting is connected or fused to. Fitting shall be suitable for fusion to main and dimensions specified on the Drawings. The Shop Drawings shall indicate the minimum pressure rating and be sealed by an Engineer registered in British Columbia.

.9 Flanged joints shall conform to AWWA C906 flat faced stub end (flange adapter) and loose stainless steel back-up ring unless specified otherwise. Stub ends (flange adapters) and flange assemblies shall be manufactured to have the same minimum working pressure rating as the pipe to which the fitting is connected or fused to. The Shop Drawings shall indicate the minimum pressure rating on the fittings being supplied as provided by the manufacturer.

2.4 FLANGES, GASKETS, BOLTS, AND TIE-RODS

.1 Flanges

.1 Stainless steel slip-on flanges for HDPE stub-end (flange adapter) pipe connections shall be constructed from Type 316L stainless steel to ASTM A182/A182M, unless otherwise specified on the Drawings. Stub ends (flange adapters) and flange assemblies shall be manufactured to have the same minimum working pressure rating as the pipe to which the fitting is connected or fused to.

.2 Stainless Steel Flanges shall be type 316L to ASTM A182/A182M, unless otherwise specified on the Drawings. Flanges shall conform in dimensions and drilling to ANSI B16.5 or ANSI B16.47 Class 150, unless otherwise specified. Flanges shall be machined true and square for the connection to valves or other piece of equipment. Stainless steel flanges connecting to ductile iron flanges shall be flat faced.

.2 Gaskets

.1 Flange gaskets for flat face flanges shall be full face type, manufactured from natural rubber. Flange gaskets shall be to AWWA C207 and shall be rated for a minimum pressure of 150 psi. Gaskets shall be 1.59 mm (1/16 inch) thick for flanges to 250 mm diameter and 3.18 mm (1/8 inch) thick for flanges over 250 mm diameter.

.2 Contractor shall submit gasket specifications to engineer, a minimum of 5 working days prior to installation.

.3 Bolts and Nuts

.1 Flange assembly bolts and nuts for connecting non stainless steel components shall be carbon steel, with bolts to ASTM A449 or A325 Type 1 heavy hex finish, and nuts to ASTM A563. Bolt sizes shall be to AWWA C110. Bolt length shall be such that, after the joints are made up, bolts shall protrude through the nut, but not more than 12mm. Bolts and nuts for buried service shall be cadmium-plated in accordance with ASTM B766 or zinc plated in accordance with ASTM B633.

.2 Flange assembly bolts and nuts for connecting to stainless steel components shall be stainless steel. Stainless steel bolts shall be in accordance with ASTM F593 with a minimum yield of 75,000 psi (515 MPa) and have hexagonal heads in accordance with ASME B18.2.1. Stainless steel nuts shall be in accordance with ASTM F594 and have hexagonal heads in accordance with ASME B18.2.2. Stainless steel washers shall be used on all stainless steel bolt heads and nuts that are buried. Bolt sizes shall be to AWWA C110. Bolt length shall be such that, after the joints are made up, bolts shall protrude through the nut, but not more than 12mm.

.3 Contractor shall submit nuts and bolts specifications to engineer, a minimum of 5 working days prior to installation.

.4 All stainless steel nuts shall be tightened using a lubricant to prevent galling. Approved products are Copper Coat NV-21, Never Seez NSBT-16, and Anti Seez NSBT-8.

.5 Contractor shall submit lubrication specifications to engineer, a minimum of 5 working days prior to installation.

.6 On review and submission of acceptable gaskets, nuts & bolts, and lubrication specifications, the Engineer will review torque requirements.

.7 Contractor shall submit flange bolt tightening sequence or procedure to Engineer for approval.

.4 Tie Rods

.1 Tie rods shall be continuously threaded, quenched and tempered alloyed steel to ASTM A354, with a minimum yield strength of 752 MPa (109,000 psi) and be fabricated in accordance with ASME B1.1 for screws threads, coarse thread series. All tie rods shall be zinc plated in accordance with ASTM B633.

.5 Tie rods shall be either carbon steel or stainless steel. Carbon steel rods and stainless steel rods shall be strain hardened to ASTM F593, Group 1 and shall be continuously threaded, quenched and tempered alloyed steel to ASTM A354, with a minimum yield strength of 752 MPa (109,000 psi) and be fabricated in accordance with ASME B1.1 for screw threads, coarse thread series. All tie rods shall be cadmium plated in accordance with ASTM B766.

2.5 WATER SERVICE PIPE

.1 All pipe for underground water services shall be 25mm dia. polyethylene (PE4710) pressure tubing conforming to AWWA C901-17, with a minimum pressure rating of 160 psi.

2.6 PETROLATUM PROTECTIVE TAPE COATINGS

.1 Petrolatum protective tape coatings for covering buried flanges, nuts & bolts, tie-rods, MJ fittings, and MJ restraints shall be manufactured by Denso and shall be Densyl Tape, Denso LT Tape, or Denso ColorTape. These products shall be covered by Denso Utility Tape or Denso Fiber-Wrap Tape.

.2 All buried stainless steel piping, stainless steel flanges, and any other flanges connected by stainless steel bolts shall be wrapped in a petrolatum protective tape coating.

2.7 TRACER WIRE

.1 Blue RW90 copper tracer wire shall be taped to the water supply main as shown on the Drawings.

2.8 CONCRETE MIX

.1 Concrete for pipe support or encasement shall be made with Portland cement (type 50) and shall have a 28-day minimum compressive strength of 35 MPa, an exposure class rating of C-1 and 5-8% air entrainment. Calcium admixtures shall be added, as approved, to reduce the initial setting time.

2.9 PIPE BEDDING AND SURROUND MATERIAL

.1 Bedding sand shall be granular in nature, free of organic material, silt, or clay, and shall conform to the following gradation limits when tested in accordance with ASTM C136:

US Standard Sieve Size	(% Passing by Weight)
19 mm	100
9.5 mm	85-100
4.75 mm	70-100
1.18 mm	20-65
0.600 mm	0-45
0.150 mm	0-10
0.075 mm	0-5

.2 Other acceptable bedding materials for use only when approved by the Engineer, are drain rock, or pea gravel.

.3 Pea gravel bedding material, shall be approximately 6 mm dia., evenly graded, clean material.

3.0 EXECUTION

3.1 BEDDING

.1 Bedding material shall be placed within the pipe zone which is defined as the area enclosed by the excavated trench earth walls and from the bottom of the trench to a level of 300 mm above the top of the pipe, as shown on the Drawings.

.2 Prior to installing pipe, a cushion of bedding material shall be placed in the trench bottom and compacted to grade by approved hand tampers or mechanical means to form a firm pipe base. The cushion shall cover the full width of the trench bottom and have a minimum depth of bedding below the pipe of 100 mm. Bell or coupling holes shall be dug such that the full barrel of the pipe is supported throughout its length by the bedding material. After the pipe is in position, bedding material shall be placed around the pipe to the limits shown on the Drawings. This material shall be compacted in lifts, each having a maximum compacted depth of 150 mm.

.3 Alternatively, the pipe being laid may be temporarily supported on grade with sandbag pedestals. Bedding material shall then be placed and thoroughly tamped around the pipe to the limits shown on the Drawings. This material shall be compacted in lifts, each having a maximum compacted depth of 150 mm. As the bedding material is placed, sandbags shall be removed or cut to release the sand contained therein.

.4 In areas of excessive groundwater seepage within the trench, and where trench rock blasting has occurred, drain rock bedding material shall be placed up to 300 mm above pipe and separated from fines by using geotextile. If sandbags have been used for pipe support, they shall be cut prior to further backfill to eliminate point loading of the pipe. Granular material shall be used for the remainder of the pipe zone material, to obtain the required sidewall compaction for the pipe.

.5 After the pipe has been installed and bedded, additional bedding material shall be placed by hand to a minimum depth of 300 mm over the pipe. The bedding material shall be compacted in lifts, each having a maximum compacted depth of 150 mm.

3.2 PIPE ALIGNMENT AND DEPTH OF COVER

.1 The pipe shall be laid on line in accordance with the Engineer's stakes.

.2 The minimum depth of cover on main pipes measured from the top of the installed pipe to ground surface adjacent to the trench shall be 1.2 metres unless otherwise noted or shown on the drawing profile or as directed by the Engineer. No claims shall be made for increases in cover to avoid existing utilities.

.3 In situations when 450 mm vertical clearance cannot be achieved at sanitary or storm sewer crossings, watermain pipe joints shall be staggered evenly each side of the crossing. Any watermain joints within 3 metres of a sanitary or storm sewer shall be wrapped in Denso tape and Denso-mastic. Where the watermain is installed below a sanitary sewer, storm sewer, or a drainage ditch, pipe joints shall be wrapped in Denso tape and Denso-mastic.

3.3 PIPE CUTTING

.1 Pipe cutting shall be done in the manner recommended by the pipe manufacturer employing tools designed for this purpose.

3.4 PIPE INSTALLATION

.1 Pipe installation shall be in accordance with AWWA C605 for PVC pipe, except where otherwise varied by this specification. Pipe installation of HDPE pipe shall be in accordance with the manufacturer's recommendations.

.2 Pipe shall be checked before being lowered into the trench to ensure that no foreign material, manufacturer's defects, or cracks exist that might prevent the proper jointing of the pipe or its operation. Pipe and fittings shall be carefully lowered into the trench by means of derricks, ropes, or other approved tools or equipment in a manner that will prevent damage to the pipe and injury of workmen.

.3 Pipe shall be jointed in strict accordance with the manufacturer's recommended practice. The open end of the pipe in the trench shall be suitably covered to prevent entrance of trench water and other material during periods when pipe is not being installed.

.4 Precaution shall be taken to ensure that displacement of the pipe in the trench does not occur through soil displacement or flotation due to the presence of trench water. Pipe that has been displaced shall be removed from the trench and relaid.

.5 Fittings shall be supported adequately on bedding material so as to reduce the transmission of any undesirable load or stress on the adjoining pipe. Where ductile iron fittings or gate valves are connected to PE pipe, the area around the fittings shall be backfilled with well compacted imported granular backfill material after the bedding material has been placed.

.6 Fusion welding shall be performed by a qualified and certified contractor with at least five years experience with joining HDPE pipe. The Contractor shall provide a list of previous projects and references to the engineer for review at least one week prior to mobilizing equipment to Site.

3.5 HORIZONTAL AND VERTICAL CURVES

.1 Pipe on horizontal and vertical curves shall be laid true to the curve of the radius shown on the Drawings and in accordance with field lines and grades for each curve supplied by the Engineer. Variations in vertical curves and grades within the allowable joint deflection may be allowed where deemed expedient or economical by the Engineer.

.2 Unless otherwise specified, the amount of pipe deflection at joints and couplings or within the pipe barrel shall not exceed one-half that recommended by the manufacturer. The Contractor shall provide short sections of pipe if required to provide the number of joint deflections required to meet the radius shown on the Drawings. Bending of the pipe will not be allowed.

3.6 CONCRETE THRUST BLOCKS

.1 Concrete thrust blocking and approved joint restraint shall be provided at fittings as shown on the Drawings, in accordance with normal practice. Concrete shall be placed between undisturbed ground and the fitting to be anchored. The area of thrust block bearing on pipe and on ground shall be as shown on the Drawings or as directed by the Engineer in consideration of the soil conditions present.

.2 Concrete shall be placed so that pipe and fitting joints are accessible for repair after the concrete has set. Bolts on flanged fittings shall be left free. A polyethylene plastic barrier shall be provided between all fittings and concrete for thrust blocking.

.3 Where thrust blocks are required at final tie-ins, full size concrete lock blocks shall be used so the water system can be re-pressurized soon after the tie-ins are completed.

3.7 FITTINGS

.1 Fittings shall be installed at the locations shown on the Drawings or as directed by the Engineer. Fittings shall be checked before being lowered into the trench to ensure that no foreign material, manufacturer's defects or cracks exist that might prevent the proper operation or jointing of the fitting to the pipe.

.2 The fittings shall be properly joined to the water pipe, and adequately supported on bedding material, so as to reduce the transmission of any undesirable load or stress on the adjoining pipe.

3.8 PETROLATUM PROTECTIVE TAPE COATINGS

.1 Petrolatum protective tape coatings for covering buried flanges, nuts & bolts, tie-rods, MJ fittings, and MJ restraints shall be manufactured by Denso and shall be Densyl Tape, Denso LT Tape, or Denso ColorTape. These products shall be covered by Denso Utility Tape or Denso Fiber-Wrap Tape.

.1 All buried stainless steel piping, stainless steel flanges, and any other flanges connected by stainless steel bolts shall be wrapped in a petrolatum protective tape coating.

3.9 DEFLECTION

.1 Unless otherwise authorized by the Engineer, the amount of pipe deflection at joints and couplings shall not exceed 50% of the maximum recommended by the manufacturer.

3.10 CONCRETE FILL

.1 Concrete shall be used for pipe base, encasement, capping, sandbag headwalls or backfill as shown on the Drawings or as directed by the Engineer. Concrete shall have adequate time to set before backfill material is placed.

3.11 CONNECTION TO EXISTING PIPING

.1 Connection shall be made to existing piping at the location shown on the Drawings. Caution shall be exercised in uncovering existing pipe to ensure that no damage occurs.

.2 The Contractor shall notify the Regional District of Nanaimo at least 1-week prior to undertaking the sanitary tie-in to existing manhole from the proposed transition manhole, and shall fully co-ordinate all activities.

.3 Unless otherwise specified, connection to existing piping shall not take place until the new sanitary forcemain has been installed, flushed, pressure tested and accepted by the Engineer.

3.12 BACKFILL ABOVE THE PIPE ZONE

.1 Backfill above the pipe zone shall be as specified in Section 31 23 33.01 – Excavation & Backfill.

3.13 FLUSHING

.1 The pipes shall be cleaned of dirt and other foreign materials. When non-chlorinated water is used to flush new piping, flushing water shall be discharged to water courses or ditches that have sufficient capacity to carry the flow. When chlorinated water is used to flush new piping, the Contractor shall contain the flushing water and neutralize its chlorine residual prior to release or if approved by Owner, discharged into the sanitary system. The pipes shall be flushed at water velocities of 1 m/sec or as high a velocity as can be obtained from the available water sources.

.2 The contractor shall obtain approval from the Owner before taking water from the distribution system. As a minimum, the Owner will require a double check valve be installed at any point of water withdrawal.

3.14 LEAKAGE TEST FOR PIPING

.1 Following trench backfilling, flushing, and Engineer's approval, leakage tests shall be performed on all installed piping. Tests shall be conducted in the presence of the Engineer.

.2 Testing shall be in accordance with pipe manufacturer's recommended testing procedures.

.3 The Contractor is responsible for conducting and documenting the leakage testing in accordance with the manufacturers recommend procedures. The Engineer shall witness the test.

.4 The Contractor shall submit the testing procedures to the Engineer for approval 7-days prior to testing.

.5 Leakage tests shall be carried out between valved sections of the main such that every significant line valve in the system is tested for leakage in the shut-off position and the total variation in pipe invert elevation is kept to a minimum along each section to be tested.

.6 As a minimum, leakage tests shall be performed in the following manner. The section to be tested shall be filled with water and all air expelled from the piping. It is recommended that the test section be filled with water for at least 24 hours prior to testing. By pumping water into the test section, the pressure within the pipe shall be increased to the required test pressure, which shall be 1.5 times the system working pressure (as measured at the lowest point of the test section). All test pressures and procedures must be approved by the pipe manufacturer. The pipe shall be re-pressurized by the addition of make-up water at hourly intervals. This re-pressurization shall be repeated 3 times after the original pressurization. After this period, a measured amount of make-up water shall be added to return the pipe to test pressure. This measured amount of make-up water shall not exceed the pipe manufacturer's make-up water allowance.

.7 Piping will not be accepted until the make-up water volume is less than the HDPE pipe manufacturer's make-up water allowance for each test section.

.8 Should any test disclose leakage, the Contractor shall locate and repair the defect and retest the section to ensure the volume of make-up water is within the allowable limits.

4.0 MEASUREMENT AND PAYMENT

4.1 SANITARY GRAVITY AND FORCEMAIN SEWER PIPING

.1 Payment for the sanitary gravity main and forcemain installations will be made at the unit prices per linear metre or price per lump sum shown in the Schedule of Quantities and Prices. Measurement will be made horizontally along the centreline of the pipe.

.2 The prices shall include all materials, labour, and equipment required to supply and install the pipes in accordance with the Contract Documents.

.3 The prices shall include the supply and installation of the sanitary gravity or forcemain piping, excavation within the bedding zone, pipe fusing, pipe gluing, pipe insertion, installation of the tracer wire, pipe deflections, supply and installation and compaction of pipe bedding material, temporary trench restoration, traffic/pedestrian control, disposal of excess excavated materials, construction of asphalt surrounds as required, supply and installation of Densomastic and Denso tape, and all Work incidental thereto.

.4 The prices shall include all necessary efforts required to shut down and isolate the affected portions of the existing system, providing advance written notice to those affected by service interruption, system pressure testing, flushing, temporary test points as required to test the system prior to final tie-ins, and all Work incidental thereto except those items for which payment is specified elsewhere.

.5 The prices shall also include trench excavation and backfill above the pipe zone (as specified in Section 31 23 33.01 – Excavation & Backfill) to the original ground elevation, and to the satisfaction of the Engineer.

.6 The prices shall also include the careful excavation of existing pipes and the removal and disposal of existing appurtenances and piping.

.7 The prices shall also include all efforts required to meet WorkSafeBC regulations.

.8 Surface restoration will be paid separately under the applicable items for surface restoration. Refer to Section 01 57 10 – Site Treatment for additional information.

.9 Rock Excavation is a Provisional* item, and will be paid separately under the applicable items in the Schedule of Quantities and Prices.

4.2 SANITARY GRAVITY AND FORCEMAIN SEWER TIE-INS

.1 Payment for tie-ins will be made at the lump sum prices shown in the Schedule of Quantities and Prices.

.2 The prices shall include all materials, labour and equipment required to complete each tie-in in accordance with the Contract requirements.

.3 The prices shall include the supply and installation of all materials required for the tie-in as shown on the Drawings including bends, reducers, fittings, concrete, thrust blocks, rebar, gaskets, nuts, bolts, traffic control, cutting and re-benching existing manhole, connection to piping, pipe bedding, backfilling with import material, compaction, traffic control, visual pressure testing, disposal of excess excavated materials, and all Work incidental thereto.

.4 The prices shall include excavation and imported backfill as specified in Section 31 23 33.01 – Excavation & Backfill.

.5 The prices shall also include any additional fittings or restraints that the Contractor feels are needed to facilitate their tie-in method and testing procedures.

.6 The prices shall also include the careful excavation of existing pipes and the removal and disposal of existing appurtenances and watermain piping located within the tie-in area.

.7 The prices shall also include all efforts required to meet WorkSafeBC regulations.

.8 Surface restoration will be paid separately under the applicable items for surface restoration.

.9 Rock Excavation is a Provisional* item, and will be paid separately under the applicable items in the Schedule of Quantities and Prices.

4.3 SANITARY GRAVITY AND FORCEMAIN FITTINGS, OTHER THAN AT TIE-INS

.1 Payment for individual fittings, other than those included in the lump sum tie-in items, will be made at the unit price per fitting shown in the Schedule of Quantities and Prices. This unit price shall include all materials, labour and equipment required to supply and install each fitting in accordance with the Contract requirements.

.2 The prices shall include the supply and installation of each fitting, including concrete thrust blocks, gaskets, nuts, bolts, traffic control, and all Work and materials incidental thereto.

.3 The prices shall include excavation and imported backfill as specified in Section 31 23 33.01 – Excavation & Backfill.

.4 Rock Excavation is a Provisional* item, and will be paid separately under the applicable items in the Schedule of Quantities and Prices.

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This section refers to shop and field welding of stainless steel pipe.

1.2 CODES

.1 All Work associated with the welding process, such as procedure qualification, welder qualification, lineup, welding, and weld testing, in accordance with the latest edition of American Society of Mechanical Engineers (ASME) B31.3 and AWWA C220 for shop welding applications, and AWWA C231 and CSA Z662 for field welding applications.

.2 ASTM A380, Practice for Cleaning, Descaling and Passivation of Stainless Steel Parts, Equipment and Systems.

.3 ASTM A967, Chemical Passivation Treatments for Stainless Steel Parts.

.4 Welding procedure (PQR) and welder qualification shall be done as per ASME Sec IX, B31.3.

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1 Refer to Section 33 31 11 – Sanitary Sewer Piping, for additional information regarding the sanitary sewer piping.

.2 Refer to Section 33 32 13.13 – Sanitary Pump Station, for additional information regarding the Pump Station, kiosk, and mechanical equipment.

1.4 SUBMITTALS

.1 The Contractor shall submit their proposed welding procedures to the Engineer for review and approval not later than thirty (30) working days prior to commencing any welding Work.

.2 The Engineer's review of the Contractor's proposed welding procedures shall not relieve the Contractor of their duties and responsibilities under the Contract.

1.5 PIPE

.1 Stainless steel pipe: per Section 33 31 11 – Sanitary Sewer Piping.

1.6 FILLER METAL AND SHIELDING GAS

.1 Appropriate for approved welding procedure(s). Electrodes are to conform to CSA W48-18. Grade is to be of tensile strength equivalent to or greater than the ultimate tensile strength of the parent metal and is to be suitable for the electric current characteristics, position of welding, and other conditions of intended use.

1.7 PIPE ENDS

.1 Provide pipe ends with a bell and plain end. Bell ends shall be a minimum of 150mm (6") deep unless specified otherwise.

1.8 END BEVELS

.1 Pipe ends to be provided with mill bevels. Bevels are to be 30° to 40° with a vertical lip of 1.5 mm ±0.75 mm unless specified otherwise. Field bevels are to be reasonably smooth and uniform and in conformance with mill bevels.

1.9 EQUIPMENT

.1 Welding equipment is to be 300 A or larger DC machines and be designed and maintained in an acceptable condition to obtain the specified results. A record of the machine calibration is to be submitted for review prior to commencing welding.

2.0 EXECUTION

2.1 GENERAL

.1 Surfaces to be welded shall be smooth, uniform; free of fins, lamination, tears, slag, grease, paint, and other deleterious conditions, which might adversely affect welding.

.2 Submit proposed welding procedure to Engineer using the forms provided at the end of this Section. Procedure is to be used to prepare the test joints required for qualification.

.3 Fabricate the majority of stainless-steel welding in an approved fabrication shop that is set up to handle, fabricate and weld stainless steel pipe using handling procedures that are designed to eliminate carbon contamination of the stainless steel. Stainless steel pipe fabrication tools for preparing welds including wire brushes, chisels, files and hammers, welding gloves and grinding wheels used during the fabrication of stainless-steel piping must not have been previously used on carbon steel Work. Use only 300 series stainless steel brushes or wheels for austenitic and nickel alloys. Separate areas used for fabrication of austenitic and nickel alloys from areas used for carbon steel fabrication by methods suitable to prevent contamination by carbon steel shavings, grinding dust and zinc dust from painting operations. Use adhesive-backed tape for backing purge gas such that when no longer required, it can be completely removed by a suitable solvent or abrasive.

.4 Mechanical power cleaning of all exterior welds is required. Use stainless steel wire brushes only. Identify and control brushes.

.5 Groove stainless steel pipe in accordance with grooving machine manufacturer's instructions.

2.2 WELDING PROCEDURES

.1 Gas Metal Arc Welding, GMAW (aka MIG) is preferred for austenitic stainless-steel pipe welding applications. Follow applicable codes for GMAW welding procedure.

.2 Large bore piping may be internally back welded and is to be identified in the submitted procedure.

.3 Where required and approved by the Engineer, use a manual welding procedure Gas Tungsten Arc Welding (GTAW aka TIG).

.4 Shielded Metal Arc Welding, (SMAW) is not an approved welding procedure.

.5 Fabrication code shall be in accordance with ASME B31.3 and Inspection code shall be Normal Fluid Service (NFS).

2.3 WELDER QUALIFICATION

.1 Welders engaged on the Work are to possess a valid Class 'A' license from the appropriate governing authority and provide a logbook showing continuity.

.2 Qualify individual welders for the particular weld procedures to be used in the Work. Provide copies of WPQs to Engineer when qualification test results are submitted.

.3 Welders are to qualify under ASME B31.3 Chapter V and CSA Z662, Clause 7.8.

.4 Make a record of the test given to each welder and of the detailed results of each test. Record is to be maintained by Contractor and a list of qualified welders and procedures in which they are qualified are to be provided to the Engineer. Welders may be required to requalify if there is a question about their ability.

2.4 QUALIFICATION OF THE WELDING PROCEDURE

.1 Prior to any shop welding, permit the Engineer and/or designated inspection company to conduct a visual inspection of the fabricator's shop and facilities. Owner will pay for this inspection.

.2 Prepare fillet and butt weld test joints in accordance with the proposed welding procedure submitted to the Engineer. Give Engineer written notice of when and where the welding of the test joints will take place so that the Engineer or designated welding inspection company can be present. Clearly identify the welder on any weld test coupon.

.3 Test joints are to be tested in accordance with ASME B31.3 Chapter V for shop welding and CSA Standard Z662, Clause 7.7 for field welding at Owner's expense. Any re-test required by the Engineer due to defect in original test specimens is at Contractor's cost.

.4 Welding procedure may be qualified with two different welding processes i.e. (GTAW/GMAW)

.5 Welding procedure should be of an uphill progression only (down hand progression will not be accepted for stainless steel welding).

.6 Upon qualification, no change in the procedure will be permitted without the written approval of the Engineer.

2.5 FIELD WELDING

.1 Minimize field welding and perform only with the prior consent of the Engineer. Do not undertake field welding when the quality of the completed weld would be impaired by prevailing weather conditions. If, in the Engineer's opinion, protection from weather conditions is necessary, then postpone welding until this protection has been erected. The Contractor must be prepared for such events and will not be compensated for downtime associated with delays of this nature.

.2 Welding of Stainless Steel in the field shall be protected from the elements as GMAW and GTAW uses shielding gas and is prone to porosity if the shielding gas is blown away while in process.

.3 When the ambient temperature is below 0C cease all welding operations unless an appropriate welding procedure has been qualified. Minimum Preheat requirement should be of 10 C or 50 F as per ASME B31.3

.4 Metal surfaces in and adjacent to the welding groove are to be dry before welding commences and kept dry and free from dirt, loose scale, slag, grease or any other foreign contaminant.

.5 Clearance is to be in accordance with CSA Z662, Clause 7.9.8. When the pipe is welded in a trench, bell hole is to be of sufficient size to provide the welder or welders ready access to the joint so that their skill is not impaired. When pipe is welded above ground, the working clearance around the pipe at the weld shall be not less than 400 mm.

.6 Clean stainless pipe with alcohol or acetone to a pre-weld zone extending 50mm on either side of the weld.

.7 Conform to Clause 7.9 of CSA Z662 for all field welding.

.8 Protect the pipe from damage during the welding operation. All welding equipment for internal welding should be on a non-marking rubber wheel cart.

2.6 PRODUCTION (SHOP) WELDING

.1 Production welding is to conform to ASME Code B31.3, Chapter V and the following requirements.

.2 No pup shorter than 1 m or three (3) pipe diameters, whichever dimension is greater to be installed in the line. There shall be at least one (1) full joint of pipe installed between pups, which are shorter than 5 m. All pups must be moved ahead on a current basis and installed in the line.

.3 No two (2) weld beads shall be started or stopped in the same location. Visually examine each weld pass and repair any defects (i.e., pin holes, slag inclusions, gas pockets, and undercutting, etc.) prior to welding the next pass.

.4 Do not strike the arc on the pipe at any point other than the welding groove. Any section of pipe, which has been arc burned may, at the discretion of the Owner's Representative, be cut out and replaced by the Contractor.

.5 No weld is to be subjected to sudden variations in temperature and no welded sections are to be subjected to stresses, due to movement of pipe, loading on pipe, etc., until the welds have cooled below 38C. Damage caused by the welded pipe being subjected to stresses before complete cooling of welds is to be corrected by the Contractor.

.6 All temperatures are to be measured by pyrometric crayons or other suitable devices approved by the Owner's Representative.

.7 All passes to have no more than five (5) minutes elapse between the previous pass termination and the commencement of the next pass.

.8 Use inert gas backing for stainless steel welding. Solar flux prohibited for liquid commodity piping.

2.7 POST-WELD CLEANING

.1 Passivate all stainless steel welds in accordance with ASTM A380 and ASTM A967. Coat stainless piping welds with the appropriate pickling paste or immersed in a liquid bath of pickling solution. Any pickling product for use on piping for a potable system shall be NSF certified. Any noticeable discolouration found on the stainless pipe shall also be removed by pickling.

.2 Once sufficient pickling time has elapsed the passivated surface shall be cleaned of all acids by thoroughly rinsing the pipe. Observe regulatory requirements for disposal of acid.

.3 Burnish exterior of pipe and fittings where residual tapes, markings, fabrication or transportation blemishes are evident to Engineer to produce a clean, even appearance. Do not use carbon steel tools or materials for burnishing.

2.8 LINEUP CLAMPS

.1 Use of lineup clamps are to conform to CSA Z662, Clause 7.9.4. Internal lineup clamps are to be used whenever practicable and when used shall not be removed until root bead is complete. External lineup clamps may be used only when use of internal lineup clamps is not practicable. Root bead segments used in connection with external lineup clamps are to be uniformly spaced around the circumference of the pipe, and to have an accumulative length of not less than fifty percent (50%) of the pipe circumference before the clamp may be removed. Pipe is to remain supported and stationary until root bead is completed.

.2 Stainless Steel lineup clamps are to be protected to minimize contamination with Carbon Steel. All affected areas are to be cleaned and passivated.

2.9 PIPE HANDLING

.1 Extreme care is to be exercised to prevent damage to pipe. Damage is to be repaired as directed by the Owner's Representative by the Contractor. Bevel ends are to be repaired if damaged.

.2 Contractor is to minimize introduction of sand and dirt to the inside of the pipe to minimize scratching and damage to the pipe.

.3 All dents in the pipe deeper than 3.20 mm are to be removed by cutting dented portion of the pipe out, re-bevelling the cut ends, welding and recoating.

2.10 INSPECTION

.1 Inspection will be conducted in accordance with ASME B31.3 Chapter VI. Owner will pay for weld inspections and examinations except as noted herein.

.2 Owner will conduct In-Process Examination at Contractor's fabrication shop in accordance with ASME B31.3 Paragraph 344.7.

.3 After completion of any welding operation, permit Engineer and/or Owner's Inspector to inspect the welds.

.4 Work performed will be rigidly inspected. Such inspection shall not relieve Contractor of responsibility for performing Work in conformance with the Specifications. Notify Engineer in advance of performing any Work in order that inspection may be arranged. Engineer may reject any Work that does not comply with the specified requirements. Furnish the Engineer and/or Owner's Inspector reasonable facilities and space for inspection, testing, and obtaining any information Owner's Inspector desires respecting the character of material used and progress and condition of the Work.

.5 Ten percent (10%) of butt welds are subject to radiographic inspection. Radiographic inspection is to be carried out by operators certified in conformance with CSA W178.1 and W178.2. .6 Examine all double welded joints by liquid penetrant method in conformance to ASME B31.3 prior to back welding.

.6 Examine ten (10%) percent of all fillet welds, such as pocket welds, seal welds, and welds for slip-on flanges by the liquid penetrant method in conformance to ASME B31.3.

.7 Owner's Inspector may use any method of additional inspection necessary to establish quality control and ensure adherence to welding procedures. Engineer has the right to accept or reject any weld not meeting the approved procedures and/or specified requirements.

2.11 REPAIR OR REMOVAL OF WELD DEFECTS

.1 Repair or removal of weld defects to be in accordance with ASME B31.3 Chapter VI and CSA Z662, Clause 7.12. Back welding is not allowed without qualification of the welding procedure used.

.2 In case of defective welds, the re-examination of the welds is to conform to Paragraph 341.3.4 of ASME B31.3.

2.12 STORAGE OF ELECTRODES

.1 Protect the welding electrodes from any deterioration prior to use and any portion of carton or box found to be damaged or damp will be cause for rejection of entire box or carton.

.2 Closely follow manufacturer's recommendations for the care and storage of electrodes.

.3 Store welding electrodes which are susceptible to adverse effects of atmospheric moisture, such as the low hydrogen type electrodes and lime-coated stainless steel electrodes, in heated ovens when not in use. These ovens are to have an internal temperature of at least 150°C. Electrodes of this type, which have been exposed to the atmosphere more than 4 hours, shall be discarded or returned to the heated oven for a minimum of 8 hours before they may be used.

3.0 MEASUREMENT AND PAYMENT

.1 No measurement will be made for Work specified in this section. Payment for all Work under this section is to be included in the lump sum price that it most closely relates to in the Schedule of Quantities and Prices.

.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the Item which it most closely relates to.

PROPOSED WELDING PROCEDURE (SAMPLE)

DATE: _____

JOB TITLE: _____

KOERS & ASSOCIATES ENGINEERING PROJECT NO: _____

CLASSIFICATION OF PIPE: _____

MAXIMUM TENSILE STRENGTH: _____

MAXIMUM YIELD STRENGTH: _____

PERCENTAGE ELONGATION IN 50mm _____

MILL TEST REPORT FORWARDED TO KOERS & ASSOCIATES ENGINEERING (YES/NO) _____

LADLE ANALYSIS FORWARDED TO KOERS & ASSOCIATES ENGINEERING (YES/NO) _____

CARBON CONTENT: _____

CARBON EQUIVALENT: _____

PROCESS: _____

DIAMETER AND WALL THICKNESS: _____

JOINT DESIGN: _____

FILLER METAL

Pass	Size	AWS Classification	Voltage	Amperage	Polarity	Brand
1						
2						
3						
4						
5						

POSTION: _____

DIRECTION OF WELDING: _____

NUMBER OF WELDERS: _____

TIME LAPSE BETWEEN PASSES: _____

INTER-PASS HEATING (IF REQUIRED): _____

METHOD OF HEATING: _____

CLEANING BETWEEN PASSES: _____

PREHEAT: _____

MINIUM AMBIENT TEMPERATURE: _____

END OF SECTION

1.0 GENERAL

1.1 SCOPE OF WORK

.1 This specification refers to the supply and installation of the sanitary sewer Pump Station, pig loader and all associated Work as detailed on the Drawings.

1.2 SAFETY

.1 The Contractor is responsible for Site safety.

.2 The Contractor shall follow WorkSafeBC regulations for Work in confined spaces and sanitary sewer wet wells.

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1 Safety shall be specified under Section 01 11 00 – General Requirements.

.2 Trench excavation and backfill above the pipe zone shall be as specified under Section 31 23 33.01 – Excavation & Backfill.

.3 Site excavation and backfilling for structures shall be as specified under Section 31 23 33.01 – Excavation & Backfill.

.4 Sewer piping shall be as specified under Section 33 31 11 – Sanitary Sewer Piping.

.5 Operation and maintenance manual shall be as specified under Section 01 33 00 – Submittals.

.6 Electrical, instrumentation and control works shall be as specified under Division 26 specifications. Refer to Section 26 05 00 – Common Work Results – Electrical, for more additional information.

.7 Concrete Work is specified on the Sorenson Trilogy Structural Engineering Drawings.

.8 Manholes and other structures shall be as specified under Section 33 05 16 – Manholes and Miscellaneous Structures.

1.4 SHOP DRAWINGS

.1 Provide Shop Drawings in accordance with Section 01 33 00 – Submittals.

.2 Contractor shall provide sealed design drawings showing how the pump are going to be mounted inside the wet well. These drawings shall be sealed by a Professional Engineer licenced to practise in the province of British Columbia.

.3 Provide Shop Drawings for all dismantling joints, stainless steel pipe & fittings, stainless steel flanges, flange gaskets, nut & bolts, hardware lubrication, Victaulic couplings, air release valve, odor control valve, check valves, root valve, backflow preventor (owner supplied), knife gate valves, process gauge, pressurization fan, flow meter, level transmitter, kiosk, ladder, fall arrest anchor, davit lift, pump, ball valves, manhole frame and cover and appurtenances and all pipe specials.

1.5 SERVICES

.1 The Contractor shall coordinate with BC Hydro for delivery of services and provision of connecting hardware, permits and similar.

.2 The Contractor shall make themself fully acquainted with all codes and bylaws relating to the installation of equipment. He shall obtain and pay for all permits required for the execution and inspection of his Work and pay all charges relating to such permits.

.3 All Works are to be in accordance with BC Hydro requirements, including coordination of the pre-job meeting prior to construction.

2.0 MATERIALS

2.1 PUMP AND MOTOR

.1 The two (2) pumps are Owner supplied and are currently installed in the wet well.

.2 Motor: 5hp/3.73kw 600volt 3phase 60hz 4pole:

- .1 Impeller: MH impeller code 464.
- .2 4” volute;
- .3 20m cable;
- .4 Flush valve ready, ;
- .5 CSA approved;
- .6 Hard iron impeller.

.3 Contact:

Edward Zhou, B.ASc. EIT.

Technical Sales Representative

Xylem Canada Company

74 Glacier Street,

Coquitlam, BC V3K 5Y9

Office: +1.604.942.6664 Direct: +1.778.284.4265

Mobile: +1.604.505.2777

edward.zhou@xyleminc.com

2.2 PUMP STATION ACCESSORIES

.1 The Pump Station shall be equipped with the following accessories:

- .1 Discharge Connections:
  - .1 To suit pump.
  - .2 Epoxy Coated.

.2 Guide bars:

.1 50mm dia. 304L Stainless Steel;

.2 Two (2) required for each pump, six (6) total;

.3 Length to suit.

.3 Guide Bar Bracket and Bar Holders:

.1 304L Stainless Steel.

.4 Horizontal Level Regulator Hanger:

.1 304L Stainless Steel.

.5 Level Regulators:

.1 Cable length to suit.

.6 Lifting Chains, Chain Connectors, Master Links, and Chain Hooks:

.1 316L Stainless Steel;

.2 Length to suit.

2.3 LEVEL TRANSMITTER

.1 AMETEK 675 Shark Cage Level Transmitter.

.2 Model: 675PB0015MLS.

.1 K515072 Cable Length to suit;

.2 K234436 In-line Desiccant.

2.4 LADDER

.1 Steps shall conform to ASTM C478 for manhole steps and ladders and shall be hot-dip galvanized, 20-mm diameter steel, safety type, designed to withstand a minimum design liveload of 1,334 Newtons (300 ft.lb). The minimum length of rungs or cleats shall be 250 mm.

.2 Steps shall be cast in place by the manufacturer, imbedded a minimum distance of 76 mm. The rung or cleat shall project a minimum clear distance of 100 mm from the wall of the riser.

2.5 ACCESS HATCH

.1 Chamber access hatch shall be double leaf aluminum access hatch with a flush lifting handle, recessed padlock box, vertical compression springs, slamlock, safety grating and stainless steel safety chains with s-hooks at each end. Hatch to handle 300 lbs/sf loading and have a minimum clear opening of 2150mm x 1375mm.

.2 All hardware shall be type 316 stainless steel.

2.6 DISMANTLING JOINTS

.1 Dismantling Joints shall have AWWA C207 Class D Flanges, and shall be a ROBAR 7906, Smith Blair 975, ROMAC DJ400, or Approved Equal. The internal lining and exterior coating shall be fusion bonded epoxy in accordance with AWWA C213. Bolts and nuts shall be stainless steel.

2.7 AIR RELEASE VALVE

.1 The 50mm Air Release Valve shall be an APCO series 440 (model 400.1), or Approved Equal for Wastewater applications, complete with the following:

- .1 Stainless Steel trim and Buna N seal;
- .2 316L backflushing attachments;
- .3 316L Stainless Steel blow off valves;
- .4 316L Stainless Steel orifice drain connections back into the wet well;
- .5 Minimum pressure rating of 150 psi.

2.8 BALL VALVES

.1 Ball valves shall be stainless steel, UL approved. Approved ball valve manufacturers are MA Stewart & Sons Ltd (MAS).

2.9 REDUCED PRESSURE ZONE ASSEMBLY

.1 Owner Supplied.

2.10 FLOW METERS

.1 Endress+Hauser Flowmeter

- .1 Promag W 400.
- .2 Model: 5W4C1F.
- .3 Diameter: 150mm.
- .4 Design: Fixed flange, 0 x DN inlet (upstream) and outlet (downstream) runs required.
  - .1 CSA C/US NI Cl.I Div.2 Gr. ABCD;
  - .2 Power Supply: 100-240 VAC/24 VAC/DC;
  - .3 Output; Input: 4-20mA HART, 2x pulse/freq./ switch output; status input;
  - .4 Housing: Remote, alu, coated;
  - .5 Cable, Remote Version: 10m/30ft coil + signal cable;
  - .6 Electrical Connection: Thread 1/2" NPT;
  - .7 Liner: Polyurethane;
  - .8 Process Connection: CL150, carbon steel, flange ASME B16.5;

.9 Electrodes: 316SS, bullet nose;

.10 Calibration Flow: 0.5%;

.11 Operation Language Display: English;

.12 Display; Operation: WLAN;

.13 Application Package: Heartbeat Verification + Monitoring.

.2 Sensus Meter – Owner Supplied.

2.11 KNIFE GATE VALVES

.1 PMP Precision Valve, Mono-T 316 Stainless Steel Bonneted Valve, or Approved Equal.

.1 Length: Non-rising Stem.

.2 Flange: ANSI B16.5 Class 150.

.3 Size: as noted on the Drawings.

.4 Design: B16.34, AWWA C520-14.

.5 Manual Hand Wheel (in kiosk), AWWA Square Nut (buried).

.6 Valves to be lockable for compliance with LOTO protocols.

2.12 CHECK VALVES

.1 Check valves shall be APCO CVS SERIES 250 Swing-Check, equivalent products will not be considered.

.1 Valve to include air cushion cylinder, lever, counter weight and for vertical flow up installation.

.2 For wastewater applications.

.3 Ductile iron body.

.4 AWWA C508-09.

.5 250 psi minimum pressure rating.

.6 Stainless Steel shaft and Seat.

2.13 KIOSK (OWNER SUPPLIED)

.1 All internal control wiring, device installation, and conduit Work shall be completed prior to shipping to Site. See Electrical Drawings and Division 26 Specifications for details.

.2 Refer to Structural Drawings and Specifications for kiosk concrete base details.

2.14 VICTAULIC COUPLERS

.1 Victaulic couplings shall be Style 489, or Approved Equal.

.1 Coupling to be type 316L stainless steel, rigid type, conforming to ASTM A351, A743 and A744.

.2 Ends shall be grooved for connection to Schedule 40 stainless steel pipe.

.3 Pipe ends to be installed at maximum separation allowed by manufacturer.

.4 Gasketing suitable for wastewater applications.

.5 250 psi minimum pressure rating.

.6 Stainless steel hardware.

2.15 PRESSURE GAUGE

.1 Pressure Gauge:

.1 4.5” (114mm) Fluid-Filled Process Gauge, Dial/Analog Type.

.2 Wetted material to be type 316L Stainless Steel.

.3 0.5” (13mm) NPT male process connection.

.4 Pressure Range:

.1 Primary Reading (-)13 to 125 psi;

.2 Secondary Reading (-)100 to 800 kPa;

.3 Maximum 2 lb increments.

.2 Gauge/Root Valve:

.1 ASHCROFT Gauge Valve – V01 Series, or approved equal.

.1 Stainless steel valve construction;

.2 Wetted material to be type 316L stainless steel;

.3 0.5” (13mm) NPT male x female process connection;

.4 250 psi minimum pressure rating.

.2 Process connection shall installed at 3 or 9 o’clock to pipe. Contractor to supply necessary stainless steel fittings to allow vertical orientation of process gauge.

2.16 WET WELL PRESSURIZATION FAN

.1 Dexon Canada Air Systems Inc. SMVOD Series Vent Fan. Equivalent products will not be considered.

.1 Vent fan model: SMDV2

.2 Internal Wiring: 120V AC x 24V DC

.3 Blower: Papst 6224N

.4 Capacity: 240 CFM at full speed, 40 CFM at idle speed.

.5 Transformer: Hammond 166K25

2.17 ODOR CONTROL VALVE

.1 Odor control valve shall be Wager Company Model 4-1800, or Approved Equal.

.1 Aluminum body with epoxy powder coated finish.

.2 Media suitable for wastewater applications

.3 Flange: ANSI B16.5 Class 150

.4 Tamper proof lockable latches.

2.18 FALL RESTRAINT ANCHOR

.1 3M™ DBI SALA Advanced Floor Mount Sleeve Davit Base, equivalent products will not be considered.

.1 Model 8518347

.2 Stainless steel body.

.3 Stainless steel fasters, installed in accordance with manufacturer recommendations.

2.19 DAVIT LIFT CRANE

.1 Thern COMMANDER 2000 Portable Davit Crane.

.1 Davit Crane – Owner Supplied:

.1 (Separate from this Contract).

.2 Davit Base:

.1 Flush Mount Model 5BF20S316

.2 Type 316L stainless steel body

.3 Stainless steel fasteners, installed in accordance with manufacturer recommendations.

.4 Watertight cap.

2.20 PIPE SUPPORTS

.1 All metal pipe supports, bolts, washers, and nuts shall be stainless steel Type 304.

.2 Pipe supports shall be Standon Model C92 or Approved Equal, pipe clamp style.

.3 Pipe supports shall be fastened to concrete with Hilti KBII stud type fasteners.

2.21 WET WELL COATING

.1 Wet well inside shall be coated with CEM-KOTE FLEX CR, or approved equivalent following construction of well benching.

3.0 EXECUTION

3.1 INSTALLATION

.1 The pumps and associated equipment shall be installed in accordance with manufacturer recommendations, approved submittals and Shop Drawings. Any damage resulting from either failure to observe the installation instructions or as a result of proceeding with the Work without complete knowledge of how it is to be done, shall be the Contractor's responsibility.

.2 Equipment installation and required connections shall be made by skilled tradesmen to the best standards. The Work shall be accurately carried out to produce a neat, secure, functional installation. Where piping connections are made to equipment, unions and thread lubricants or other couplings allowing ease of disconnection shall be provided. Stress or pull to any equipment or pump flanges shall not be permitted.

3.2 FIELD TESTING

.1 All pumps and related equipment shall be run on completion of installation, in the presence of the Engineer, and a representative of the pump manufacturer. The Contractor shall remedy any deficiencies and re-run the equipment.

.2 Contractor to provide Pump Station start-up report completed by the Commissioning Manager.

3.3 TEMPORARY BYPASS SYSTEM

.1 The Contractor shall provide a temporary bypass system, including the supply, installation, operation and subsequent removal of the temporary pumping system required to bypass the wastewater flow around the Pump Station during construction of the new Works. Refer to Section 01 57 00 – Temporary Pumping for additional information.

3.4 PUMP STATION START UP AND COMMISSIONING

.1 Start Up:

.1 Conduct workshop with the Owners' Representatives and the Engineer to identify and integrate activities of all parties in start-up of Work. Prepare Start-up Plan which includes the following:

.1 Plan objectives;

.2 Facilities to be started;

.3 Sequence of events and start-up schedule;

.4 Responsibilities of each party;

.5 List of individuals involved complete with contact telephone numbers;

.6 English language description of each systems' intended means of operation;

.7 Initial operating conditions and parameters;

.8 Intended final operating conditions and parameters;

.9 Laboratory requirements and arrangements for outside testing services;

.10 Sampling and monitoring requirements;

.11 Contingency plans to respond to potential emergencies;

.12 Safety and environmental considerations.

.2 Develop Training plan and implement.

.3 Provide Operating and Maintenance Manuals as required by individual Sections.

.4 Conduct Dry Run Tests for all equipment, witnessed by Engineer.

.5 Conduct Wet Run Tests for all equipment, witnessed by Engineer.

.6 Correct any deficiencies uncovered during testing.

.7 Provide Pre-Commissioning Certification Form.

.2 Commissioning

.1 Assemble the Contractor's commissioning team to respond to requests for assistance by the Engineer or Owner. Team to consist of representatives of Contractor and Contractor's mechanical, electrical and instrumentation crews or subcontractors, as appropriate.

.2 Contractor's representative to be at Site during normal working hours for entire commissioning period. Contractor's commissioning team to be at Site during normal working hours for the first 5 days of commissioning of each identified commissioning package and available with a 4-hour notice during remainder of each commissioning period. Contractor's representative and the commissioning team may be required to be at Site outside of normal working hours during the commissioning period, at the discretion of the Owner or the Engineer and shall be available with a 4-hour notice.

.3 Remove and clean or replace as required all permanent and temporary filters and strainers in pipeline systems; dewater and clean sumps and leave process systems clean and filled with clean water, unless otherwise directed by Engineer.

.4 Commission Work in stages based on commissioning packages. Each commissioning package to consist of fully functional portions or groups of operationally tested systems capable of operating in concert to provide a complete service or function that is of value to Owner.

.5 Commissioning to be generally conducted in manual mode first, followed by automatic operation.

.6 Period of time for continuous automatic operation for acceptance of commissioning is 80 hours with all systems operating continuously without fault and all process, mechanical, control and electrical equipment free of vibration, overloading or overheating and functioning in accordance with specified rates, methods and performance.

.7 Failure of any part of Work during the period of continuous automatic operation will require restart of that portion or system of Work, following rectification of the fault or failure.

.8 If it is necessary to suspend start-up, commissioning or continuous operation during the commissioning period due to deficiencies or failure in any system, the full cost of

interruption, call-back, testing and resumption of start-up, commissioning, or continuous operation shall be paid by Contractor.

3.5 KIOSK

.1 Install kiosk in accordance with MoTI Standard Specifications for Highway Construction. Attach kiosk to concrete base with ½"Hilti-style hot-dipped galvanized concrete inserts, bolts and washers, placed at no more than 1000mm centres. Bolts shall penetrate a minimum of 100mm into concrete base. Seal around the interior base of kiosk with latex caulking or non-acidic silicone sealant.

.2 All internal control wiring, device installation, and conduit Work shall be completed prior to shipping to Site. See Electrical Specifications.

4.0 MEASUREMENT AND PAYMENT

4.1 NANOOSE BAY PUMP STATION No. 6

.1 No measurement will be made for Work specified in this section. Payment for all Work under this section is to be included in applicable the lump sum price shown in the Schedule of Quantities and Prices for Nanoose Bay Pump Station No. 6.

.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the item which it most closely relates to.

.3 Payment will be pro-rated and paid out as a percentage of the overall Work completed.

4.2 ELECTRICAL, INSTRUMENTATION & CONTROLS

.1 No measurement will be made for Work specified in this section. Payment for all Work under this section is to be included in the lump sum price shown in the Schedule of Quantities and Prices for Electrical, Instrumentation and Controls.

.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the item which it most closely relates to.

.3 Payment will be pro-rated and paid out as a percentage of the overall Work completed.

4.3 KIOSK CONCRETE PAD STRUCTURE

.1 No measurement will be made for Work specified in this section. Payment for all Work under this section is to be included in applicable the lump sum price shown in the Schedule of Quantities and Prices for Kiosk Concrete Pad Structure.

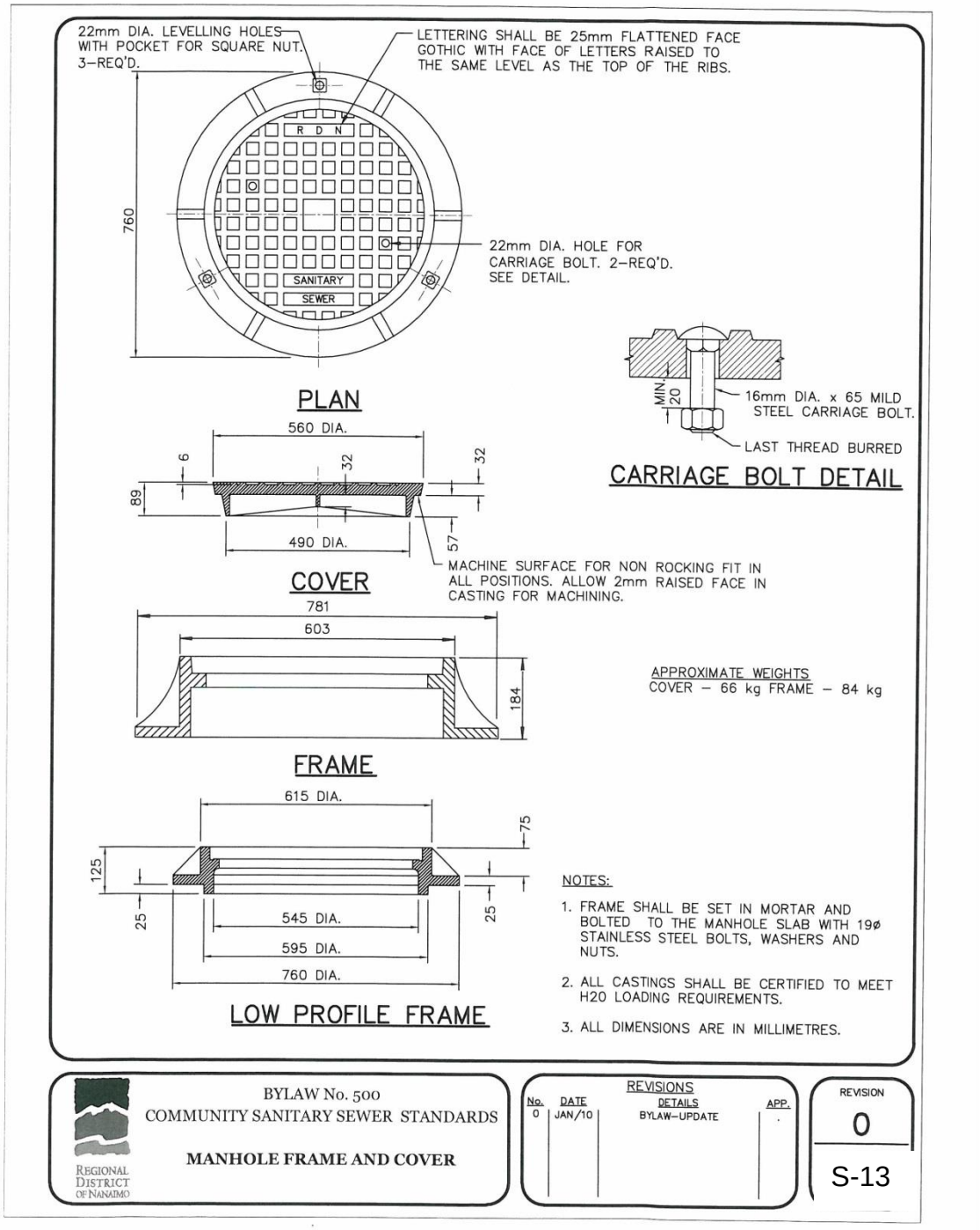
.2 Any Work not specifically set out under the Schedule of Quantities and Prices shall be included in the Contractor's price under the item which it most closely relates to.

.3 Payment will be pro-rated and paid out as a percentage of the overall Work completed.

END OF SECTION

Ministry of Transportation & Infrastructure
Construction Permit

Regional District of Nanaimo Bylaw No. 500
Standard Detail Drawing No. S-13
(2014)


22mm DIA. LEVELLING HOLES WITH POCKET FOR SQUARE NUT. 3–REQ'D.
LETTERING SHALL BE 25mm FLATTENED FACE GOTHIC WITH FACE OF LETTERS RAISED TO THE SAME LEVEL AS THE TOP OF THE RIBS.
R D N
SANITARY
SEWER
760
22mm DIA. HOLE FOR CARRIAGE BOLT. 2–REQ'D. SEE DETAIL.
PLAN
MIN. 20
16mm DIA. x 65 MILD STEEL CARRIAGE BOLT.
LAST THREAD BURRED
CARRIAGE BOLT DETAIL
560 DIA.
6
32
32
89
490 DIA.
57
MACHINE SURFACE FOR NON ROCKING FIT IN ALL POSITIONS. ALLOW 2mm RAISED FACE IN CASTING FOR MACHINING.
COVER
781
603
184
APPROXIMATE WEIGHTS
COVER – 66 kg FRAME – 84 kg
FRAME
615 DIA.
75
125
25
25
545 DIA.
595 DIA.
760 DIA.
LOW PROFILE FRAME
NOTES:
1. FRAME SHALL BE SET IN MORTAR AND BOLTED TO THE MANHOLE SLAB WITH 19ø STAINLESS STEEL BOLTS, WASHERS AND NUTS.
2. ALL CASTINGS SHALL BE CERTIFIED TO MEET H20 LOADING REQUIREMENTS.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
REGIONAL DISTRICT OF NANAIMO
BYLAW No. 500
COMMUNITY SANITARY SEWER STANDARDS
MANHOLE FRAME AND COVER
REVISIONS
No. 0
DATE JAN/10
DETAILS BYLAW–UPDATE
APP. .
REVISION 0
S-13