



New Westminster

CORPORATION OF THE CITY OF NEW WESTMINSTER

CONTRACT No. NWIT-26-02

SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades

Updated Instructions to Tenderers

Updated Supplementary General Conditions

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INVITATION TO TENDER

**CORPORATION OF THE CITY OF NEW WESTMINSTER
(THE OWNER)**

Contract: SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades

Reference No: NWIT-26-02

The Owner invites tenders for:

SA-11 Sanitary Pump Station Upgrade located at 833 Salter Street, New Westminister, BC

SA-12 Sanitary Pump Station Upgrade located at 911 Crane Place, New Westminister, BC

SA-16 Sanitary Pump Station Upgrade located at 425 Brunette, New Westminister, BC

Copies of the Contract Documents are available for download from the City of New Westminister Purchasing site at:

<https://www.newwestcity.ca/business-and-economy/doing-business-with-the-city/request-for-bids-and-proposals-open>

Tenderers are responsible to check for all subsequent addendums/amendments on the City's Purchasing web page and/or BC Bid and respond according to the Invitation to Tender documents.

Tenders are scheduled to close at:

Tender Closing Date: Tuesday, April 21, 2026

Tender Closing Time: 3:00 pm (Local Time)

Tenders to be submitted by email to nwpurchasing@newwestcity.ca with Subject "**NWIT-26-02 SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades**". The City reserves the right to ask any Tenderer to forward a hard copy of the tender and bond after Tender Closing.

A tender shall be accompanied by Bid Security in the amount of ten percent (10%) of the Tender Price payable to the Corporation of the City of New Westminister. The successful tenderer will be required to provide a Performance and Labour and Material Payment Bond each in the amount of fifty percent (50%) of the Tender Price. An Agreement of Surety to bond shall accompany the tender submitted.

Enquiries regarding this tender may be directed to:

Heather Rossi, Procurement Specialist

City of New Westminister

nwpurchasing@newwestcity.ca

The lowest or any Tender may not necessarily be accepted and the City will not be responsible for any cost incurred by the Tenderer in preparing the Tender. Tender award will be contingent on budget approval from the City of New Westminister Council.

INSTRUCTIONS TO TENDERERS

Instructions to Tenderers, Part I

INSTRUCTIONS TO TENDERERS – PART 1

(TO BE READ WITH “INSTRUCTIONS TO TENDERERS - PART II” CONTAINED IN THE EDITION OF THE PUBLICATION “MASTER MUNICIPAL CONSTRUCTION DOCUMENTS” SPECIFIED IN ARTICLE 2.2 BELOW)

CORPORATION OF THE CITY OF NEW WESTMINSTER (THE OWNER)

Contract: SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades

Reference No: NWIT-26-02

1.0 Introduction 1.1 These Instructions apply to and govern the preparation of tenders for this *Contract*. The *Contract* is generally for the following work:

Upgrades to the existing **SA-11 Sanitary Pump Station**, which will generally include:

- Replacement of pumps, discharge pipes, and accessories within the wet well.
- FRP repairs to the existing FRP wet well.
- Installation of a new below-grade valve chamber.
- Connection to an existing sanitary forcemain.
- Installation of a new electrical controls kiosk and SCADA communications pole.
- Removal and disposal of existing equipment.
- Refacing of existing generator enclosure.

Upgrades to the existing **SA-12 Sanitary Pump Station**, which will generally include:

- Replacement of pumps and accessories within the wet well.
- Replacement of the existing ductile iron access hatch.
- Installation of a new cast-in-place concrete roof slab.
- Installation of a new electrical controls kiosk and SCADA communications pole.
- Removal and disposal of existing equipment.
- General site works including reinstatement of asphalt.

Upgrades to the existing **SA-16 Sanitary Pump Station**, which will generally include:

- Replacement of pumps and accessories within the wet well.
- Installation of concrete walls and flooring in the valve chamber/wet well
- Installation of a new cast-in-place concrete roof slab.
- Rebenching of overflow tank sump to direct flow.
- Installation of a new electrical controls kiosk and SCADA communications pole.
- Installation of new standby generator and concrete slab.
- Removal and disposal of existing equipment.
- General site works including reinstatement of asphalt.

- 1.2 Direct all inquiries regarding the *Contract*, to:
Heather Rossi, Procurement Specialist
City of New Westminster
511 Royal Ave, New Westminster, BC, V3L 1H9
email: nwpurchasing@newwestcity.ca

1.3 **Deadline for Inquiries**

The deadline for submitting inquiries is **seven (7) days** before the Tender Closing Date. Any inquiries received after this time may not be answered

2.0 Tender Documents

- 2.1 The tender documents, which a tenderer should review to prepare a tender, consist of all of the *Contract Documents* listed in Schedule 1 entitled "Schedule of Contract Documents". Schedule 1 is attached to the Agreement which is included as part of the tender package. The *Contract Documents* include the drawings listed in Schedule 2 to the Agreement, entitled "List of *Contract Drawings*", and Schedule 3 "Prime Contractor Designation".
- 2.2 Portions of the Contract Documents are included by reference. Copies of these documents have not been included with the tender package. These documents are the Instructions to Tenderers - Part II, General Conditions, Specifications, and Standard Detail Drawings. They are those contained in the publication entitled "Master Municipal Construction Documents - General Conditions, Specifications, and Standard Detail Drawings". Refer to Schedule 1 to the Agreement or, if not specified in Schedule 1, then the applicable edition shall be the most recent edition as of the date of the *Tender Closing Date*. All sections of this publication are by reference included in the *Contract Documents*.

Copies of the Master Municipal Construction Document (Platinum Edition) can be obtained at:

Support Services Unlimited
#102 – 211 Columbia Street
Vancouver, BC, V6A 2R5
604-681-0295

- 2.3 Any additional information made available to tenderers prior to the *Tender Closing Time* by the *Owner* or representative of the *Owner*, such as geotechnical reports or as-built plans, which is not expressly included in Schedule 1 or Schedule 2 to the Agreement, is not included in the *Contract Documents*. Such additional information is made available only for the assistance of tenderers who must make their own judgment about its reliability, accuracy, completeness and relevance to the *Contract*, and neither the *Owner* nor any representative of the *Owner* gives any guarantee or representation that the additional information is reliable, accurate, complete or relevant.

Addenda

- 2.4 Should addenda to the tender documents be required for any reason, it is the City's intention not to issue addenda during a period three (3) days prior to the Tender Closing date and time.

- 2.5 All Addenda become part of the Contract Documents.
- 2.6 Failure to acknowledge any Addendum may result in the disqualification of the Tenderer.
- 3.0 Submission of Tenders**
- 3.1 Tenders must be submitted in electronic format, to the email address below and must be received on or before:
- Tender Closing Time: 3:00 pm (Local Time)**
- Tender Closing Date: Tuesday, April 21, 2026**
- Address: **Email to:** nwpurchasing@newwestcity.ca with Subject **"NWIT-26-02 SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades"**.
- Attention: **Purchasing Manager**
- 3.2 Late tenders will not be accepted or considered, and will be returned unopened.
- 3.3 The City will not open this Tender in public. The City will make the Tender results available to Tenderers within a reasonable period following the Tender Closing Date and Time.
- 4.0 Additional Instructions to Tenderers Items 5 to 16**
- 5.0 Tender Requirements**
- 5.1 **IT 5.3.4 (amend clause 5.3.4 as follows)**
Add "The Comparable Work Experience listed in Appendix 4 must be comparable in scope and magnitude to the Work of this Tender."
- 5.2 **IT 5.3 (amend clause 5.3 as follows)**
Add "5.3.6 Appendix 6 – Force Account Labour and Equipment Rates. Insert the hourly rates for Labour and Equipment including allowances for taxes, assessments, benefits, tools, overhead, and profit."

Add "5.3.7 Appendix 7 – Declaration – Living Wage Employer"
- 6.0 Amendment of Tenders**
- 6.1 **IT 12.1 (amend clause 12.1 as follows)**
Delete "or fax," from the first sentence.
- 7.0 Award**
- 7.1 **IT 15.1 (delete clause 15.1.1 and replace with):**
15.1.1 Reject any or all Tenders if the City determines, in its sole discretion and after appropriate investigation and evaluation, that:
- a) the comparable work references are, in the opinion of the City, unsatisfactory; **OR**
 - b) information becomes available after Closing Time which significantly changes the scope or extent of the project; **OR**
 - c) the Tender, or all of the Tenders, exceeds the available budget funds; **OR**
 - d) less than three (3) Tenders are received.

7.2 IT 15.5 (add clause 15.5 as follows)

In exercising its discretion, the *Owner* will have regard to the information provided by the Tenderer in the Appendices to the Form of Tender as described under IT 5, and may also have regard to any information obtained by the *Owner* in evaluating such tender information, as well as the *Owner's* previous experience, if any, with the Tenderer. In exercising its discretion the *Owner* may consider, but is not limited to, the following criteria in addition to the Tender Price:

- a) the proven experience of the Tenderer, and any listed subcontractors to do the Work;
- b) the Tenderer's ability to complete the Work within the Preliminary Construction Schedule;
- c) the Tenderer's ability to work effectively with the *Owner*, its consultants and representatives;
- d) the Tenderer's ability to manage and do the work effectively using the named superintendent and submitted contractors and subcontractors;
- e) the Tenderer's history on other projects including with respect to quality of work, changes in the work, force account work, and the contract administration costs of the *Owner*;
- f) the nature of any legal proceedings undertaken by the Tenderer, or any officer or director of the Tenderer or affiliate of the Tenderer, directly (or indirectly through another corporation) against the *Owner* within the previous five years of the Invitation to Tenders;
- g) litigation and on-going unresolved claims;
 - a. in addition to any other provision of this tender document, and without limiting the City's discretion under any other provision of this tender document, the City may, in its absolute discretion, reject a tender if:
 - i. the Tenderer, or any officer or director of the Tenderer, is or has been engaged directly or indirectly in a legal action against the City in relation to any matter; or,
 - ii. the Tenderer has current unresolved extra work claims totalling in excess of \$100,000.00 beyond 90 days of contract substantial completion for any construction project with the City.
 - b. in determining whether or not to reject a tender under this section, the City will consider whether the litigation or unresolved extra work claim is likely to affect the Tenderer's ability to work with the City, its employees, consultants and representatives and whether the City's experience with the Tenderer indicates an unusual risk the City will incur increased staff and legal costs in the administration of the contract if awarded to the Tenderer.

The *Owner* will, following receipt of an acceptable tender, issue in writing a *Notice of 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 Tender Closing Date.

7.3 IT 15.6 (add clause 15.6 as follows)

The *Owner* may, prior to and after Contract Award, negotiate changes to the scope of the Work, the type of materials, the specifications or any conditions with the low tenderer without having any duty or obligation to advise any other tenderer or to allow them to vary their Tender Prices as a result of such changes and the *Owner* shall have no liability to any other tenderer as a result of such negotiations or modifications.

The award of this *Contract* is subject to approval of the *Owner* and to the availability of sufficient funds to complete the Work. The City may delete certain portions of the Work if Tender Prices exceed the available budget.

8.0 Prime Contractor Designation

8.1 IT 18.0 (add clause 18.0 as follows)

Schedule 3 Prime Contractor Designation forms part of the Agreement.

9.0 Freedom of Information

9.1 IT 19.0 (add clause 19.0 as follows)

The City of New Westminster is subject to the Province of British Columbia *Freedom of Information and Protection of Privacy Act*. All documents will be received and held in confidence by the City of New Westminster and the information will not be disclosed, except to the extent necessary for carrying out the City's purposes or as required by law.

10.0 Living Wage Information

10.1 IT 20.0 (add clause 20.0 as follows)

Effective January 1, 2011, the City of New Westminster became a "Living Wage Employer" (see Form of Tender - Appendix 7). As such, the City has established a Living Wage Policy that requires all firms that are contracted by the City to provide services on City premises, to pay their employees, who perform said service on City property, a Living Wage as calculated by the Living Wage for Families Campaign. The current living wage rate for Metro Vancouver can be found on the Living Wage BC website <https://www.livingwagebc.ca/>.

In order to determine an employee's hourly rate with benefits the Living Wage for Families has created a Living Wage Calculator to assist with this determination. Please access the following website to determine your compatibility.

https://www.livingwagebc.ca/living_wage_calculator

The City includes in all its competitive bid documents a Declaration referencing the City's expectations with regards to compliance of the Policy. **Completion and submission of the Declaration is required prior to Contract award** (see Form of Tender - Appendix 7).

In evaluating submissions, the City intends to rely on the Declaration provided by a Respondent and shall have no obligation or duty to investigate the truthfulness of the Declaration.

Please review the City's [Living Wage Page](#) for further information.

11.0 Good Neighbour Protocol

11.1 IT 21.0 (add clause 21.0 as follows)

This policy is for City-led construction projects and works. The [Good Neighbour Protocol](#) (GNP) provides guidelines to minimize construction related impacts to residents and businesses.

The successful contractor will be required to adhere to the Good Neighbour Protocol. Please review the City's Good Neighbour Protocol for further information.

12.0 Non-Road Diesel Engine Emissions Regulation

12.1 IT 22.0 (add clause 22.0 as follows)

All non-road diesel powered equipment that is 25 hp (19 kw) or greater must comply with Metro Vancouver's Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021 (the Bylaw). The Bylaw requires owners or operators of Tier 0 and Tier 1 non-road diesel engines to register, label, and pay fees in order to operate within Metro Vancouver. Please advise what Engine Tier your proposed equipment meets and if it complies with Metro Vancouver's Bylaw. Provide the engine registration number issued by Metro Vancouver if applicable. The City, at its discretion, may give preference to equipment that meets higher emission standards. To register your equipment call Metro Vancouver for assistance at 604-451-6655 or visit www.metrovancouver.org/nonroaddiesel

13.0 Tree Protection

13.1 IT 23.0 (add clause 23.0 as follows)

The contractor must protect all trees in accordance with City policy. Requirements for tree protection are available on the City's website. The contractor is required to make application and obtain a tree protection permit prior to the start of the work. Final location of the tree protection is to be reviewed with, and approved by the City Arborist.

For tree removals and pruning, refer to City of New Westminster Pruning Standards included in the project specifications. All arborist services must be performed by the following approved arborists:

1. Norm Hol, Arbortech Consulting
2. Adela Parlesak, Bartlet Tree Experts
3. Lesley Gifford, Urban Grove

- | | |
|---|---|
| <p>14.0 Sanctuary City</p> | <p>14.1 IT 24.0 (add clause 24.0 as follows)
 The City is a Sanctuary City; the contractor shall comply with the Sanctuary City Policy, which can be found on the City's website.
 https://www.newwestcity.ca/sanctuary-city-policy</p> |
| <p>15.0 Modifications to Existing Wet Well</p> | <p>15.1 IT 25.0 (add clause 25.0 as follows)
 All modifications to the existing wet well, including removal of the intermediate platform, levelling of the wet well base, patching of existing wall penetrations, and installation of new wall penetrations, must be performed by the pump supplier's (Xylem) FRP representative, Barski Industries.</p> |
| <p>16.0 Coordination with Schoolboard and Contractor</p> | <p>16.1 IT 26.0 (add clause 26.0 as follows)
 The Schoolboard has ongoing construction activities scheduled at the Queensborough Middle School anticipated to extend into 2027. All coordination with the Schoolboard and the Schoolboard's contractor, including access to site, is the sole responsibility of the successful contractor.</p> |

FORM OF TENDER WITH APPENDICES

- Form of Tender
- Appendix 1: Schedule of Quantities and Prices
- Appendix 2: Preliminary Construction Schedule
- Appendix 3: Experience of Superintendent
- Appendix 4: Comparable Work Experience
- Appendix 5: List of Sub-Contractors
- Appendix 6: Force Account Labour and Equipment Rates
- Appendix 7: Declaration – Living Wage Employer

FORM OF TENDER

CORPORATION OF THE CITY OF NEW WESTMINSTER
(THE OWNER)

Contract: SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades

Reference No: NWIT-26-02

To Owner:

1 WE, THE UNDERSIGNED:

- 1.1 have received and carefully reviewed all of the *Contract Documents*, including the Instructions to Tenderers, the specified edition of the "Master Municipal Construction Documents - General Conditions, Specifications and Standard Detail Drawings" and the following Addenda:

(Addenda, if any)

- 1.2 have full knowledge of the *Place of the Work*, and the *Work* required; and
- 1.3 have complied with the Instructions to Tenderers; and

2 ACCORDINGLY WE HEREBY OFFER

- 2.1 to perform and complete all of the *Work* and to provide all the labour, equipment and material all as set out in the *Contract Documents*, in strict compliance with the *Contract Documents*; and
- 2.2 to achieve Substantial Performance of the *Work* on or before **fifty-two (52) weeks** from the *Notice to Proceed*; and
- 2.3 to do the *Work* for the price, which is the sum of the products of the actual quantities incorporated into the *Work* and the appropriate unit prices set out in Appendix 1, the "*Schedule of Quantities and Prices*", plus any lump sums or specific prices and adjustment amounts as provided by the *Contract Documents*. For the purposes of tender comparison, our offer is to complete the *Work* for the "*Tender Price*" as set out on Appendix 1 of this Form of Tender. Our *Tender Price* is based on the estimated quantities listed in the *Schedule of Quantities and Prices*, and excludes GST.

3 WE CONFIRM:

- 3.1 that we understand and agree that the quantities as listed in the *Schedule of Quantities and Prices* are estimated, and that the actual quantities will vary.

4 WE CONFIRM:

- 4.1 that the following appendices are attached to and form a part of this tender:
- 4.1.1 the appendices as required by paragraph 5.3 of the Instructions to Tenderers – Part II; and
- 4.1.2 the *Bid Security* as required by paragraph 5.2 of the Instructions to Tenderers – Part II.

Tenderer's Initials _____

5**WE AGREE:**

5.1 that this tender will be irrevocable and open for acceptance by the *Owner* for a period of sixty (60) calendar days from the day following the *Tender Closing Date and Time*, even if the tender of another tenderer is accepted by the *Owner*. If within this period the *Owner* delivers a written notice ("*Notice of Award*") by which the *Owner* accepts our tender we will:

5.1.1 within 15 *Days* of receipt of the written *Notice of Award* deliver to the *Owner*:

- a) a Performance Bond in the amount of 50% of the Contract Price, issued by a surety licensed to carry on the business of surety ship in the Province of British Columbia, and in a form acceptable to the *Owner*;
- b) a Labour and Material Payment Bond in the amount of 50% of the Contract price, the Labour and Material Payment Bond must be a **Broad Form bond**, protecting all companies with a direct contract with the Principal or any sub-contractor of the Principal;
- c) a *Baseline Construction Schedule*, as provided by GC 4.6.1;
- d) a "clearance letter" indicating that the tenderer is in WorkSafeBC compliance;
- e) a copy of the insurance policies as specified in GC 24 indicating that all such insurance coverage is in place; and,
- f) proof of a valid City of New Westminster or MetroWest Inter-Municipal Business License

5.1.2 sign the *Contract Documents* as required by GC 2.1.2.

5.1.3 within 2 *Days* of receipt of written "*Notice to Proceed*", or such longer time as may be otherwise specified in the *Notice to Proceed*, commence the *Work*; and

6**WE AGREE:**

6.1 that, if we receive written *Notice of Award* of this *Contract* and, contrary to paragraph 5 of this Form of Tender, we:

a) fail or refuse to deliver the documents as specified by paragraph 5.1.1 of this Form of Tender; or

b) fail or refuse to commence the *Work* as required by the *Notice to Proceed*,

then such failure or refusal will be deemed to be a refusal by us to enter into the *Contract* and the *Owner* upon written notice to us, may award the *Contract* to another party. We further agree that, as full compensation on account of damages suffered by the *Owner* because of such failure or refusal, the *Bid Security* shall be forfeited to the *Owner*, in an amount equal to the lesser of:

a) the face value of the *Bid Security*; and

b) the amount by which our *Tender Price* is less than the amount for which the *Owner* contracts with another party to perform the *Work*.

Tenderer's Initials _____

7

OUR ADDRESS is as follows:

Phone:

Fax:

E-mail:

Attention:

This Tender is executed this

 day of

, 2026

Contractor:

(full legal name of corporation, partnership or individual)

(Authorized Signatory)

(Authorized Signatory)

Tenderer's Initials

FORM OF TENDER – Appendix 1**SCHEDULE OF QUANTITIES AND PRICES
SA-11 Pump Station Upgrades**

(See paragraph 5.3.1 of the Instructions to Tenderers - Part II)

(All prices and *Quotations* including the *Contract Price* shall include all *Taxes*, but shall not include *GST*. *GST* shall be shown separately.)

Item	Description	Unit	Quantity	Unit Price (\$)	Amount (\$)
SA-11 - 1	General Requirements				
1.01	Mobilization and Demobilization	L.S.	1	\$	\$
1.02	Traffic Control	L.S.	1	\$	\$
1.03	Erosion & Sediment Control	L.S.	1	\$	\$
1.04	Quality Control/ Testing/ Start up/ Commissioning	L.S.	1	\$	\$
1.05	O&M Manuals & Redline Drawings	L.S.	1	\$	\$
1.06	Contractor Design Temporary Bypass System	L.S.	1	\$	\$
1.07	Temporary Facilities	L.S.	1	\$	\$
1.08	Project Identification	INCIDENTAL			
1.09	Groundwater Control, Treatment, and Disposal	INCIDENTAL			
Subtotal Section 1 – to be carried over to summary page				\$	

SA-11 - 2	Demolition and Removals				
2.01	Salvage and Disposal of Existing Electrical Kiosk and Concrete Slab	L.S.	1	\$	\$
2.02	Preparation of Existing Wet Well for Upgrades	L.S.	1	\$	\$
Subtotal Section 2 – to be carried over to summary page				\$	

SA-11 - 3	Civil and Geotechnical				
3.01	Site Topsoil Reinstatement	cu.m	4	\$	\$
3.02	Excavation and Disposal Offsite	cu.m	25	\$	\$
3.03	New Sanitary Forcemain	Lin.m	5	\$	\$
3.04	Connection to Existing Forcemain	L.S.	1	\$	\$

Tenderer's Initials _____

Item	Description	Unit	Quantity	Unit Price (\$)	Amount (\$)
3.05	Pre-Locate Existing Utilities	INCIDENTAL			
3.06	CCTV Inspection of Pipelines (Initial)	L.S.	1	\$	\$
3.07	CCTV Inspection of Pipelines (1 Year)	L.S.	1	\$	\$
3.08	Cap and Abandon Existing Forcemain	L.S.	1	\$	\$
3.09	Relocate Existing Hydrant-Controlled Water Valve	L.S.	1	\$	\$
Subtotal Section 3 – to be carried over to summary page				\$	

SA-11 - 4	Pump Station Mechanical				
4.01	Flygt NP 3102 SH 6.43HP Submersible Pumps	Each	2	\$	\$
4.02	SS Piping & Valves within Valve Chamber	L.S.	1	\$	\$
4.03	FRP Wet Well Modifications Including New Ladder and Exhaust Fan	L.S.	1	\$	\$
4.04	FRP Piping within Wet Well	L.S.	1	\$	\$
Subtotal Section 4 – to be carried over to summary page				\$	

SA-11 - 5	Pump Station Structural				
5.01	Pre-Cast Reinforced Concrete Valve Chamber, Including Custom Hatch	L.S.	1	\$	\$
5.02	Cast-In-Place Concrete Slab	Each	1	\$	\$
Subtotal Section 5 – to be carried over to summary page				\$	

SA-11 - 6	Pump Station Electrical				
6.01	Instrumentation, Wiring, Conduits, and Communications System	L.S.	1	\$	\$
6.02	Generator Enclosure Restoration	L.S.	1	\$	\$
6.03	Electrical Kiosk and Controls	L.S.	1	\$	\$
6.04	SCADA Communications Including Antenna, Assembly and Pole	L.S.	1	\$	\$
Subtotal Section 6 – to be carried over to summary page				\$	

SA-11 - 7	Provisional				
7.01	Over Excavation and Disposal Offsite	cu.m	10	\$	\$
Subtotal Section 7 – to be carried over to summary page				\$	

Tenderer's Initials _____

SA-12 Pump Station Upgrades

(See paragraph 5.3.1 of the Instructions to Tenderers - Part II)

(All prices and *Quotations* including the *Contract Price* shall include all *Taxes*, but shall not include *GST*. *GST* shall be shown separately.)

Item	Description	Unit	Quantity	Unit Price (\$)	Amount (\$)
SA-12 - 1	General Requirements				
1.01	Mobilization and Demobilization	L.S.	1	\$	\$
1.02	Traffic Control	L.S.	1	\$	\$
1.03	Erosion & Sediment Control	L.S.	1	\$	\$
1.04	Quality Control/ Testing/ Start up/ Commissioning	L.S.	1	\$	\$
1.05	O&M Manuals & Redline Drawings	L.S.	1	\$	\$
1.06	Contractor Design Temporary Bypass System	L.S.	1	\$	\$
1.07	Temporary Facilities	L.S.	1	\$	\$
1.08	Project Identification	INCIDENTAL			
1.09	Groundwater Control, Treatment, and Disposal	INCIDENTAL			
Subtotal Section 1 – to be carried over to summary page				\$	

SA-12 - 2	Demolition and Removals				
2.01	Salvage and Disposal of Existing Electrical Kiosk and Concrete Slab	L.S.	1	\$	\$
2.02	Preparation of Existing Wet Well for Upgrades	L.S.	1	\$	\$
Subtotal Section 2 – to be carried over to summary page				\$	

SA-12 - 3	Civil and Geotechnical				
3.01	50mm Thick of Asphalt Reinstatement	cu.m	7	\$	\$
3.02	75mm Thick of 19mm Minus Crushed Material	cu.m	5	\$	\$
3.03	Excavation and Disposal Offsite	cu.m	25	\$	\$
3.04	Pre-Locate Existing Utilities	INCIDENTAL			
Subtotal Section 3 – to be carried over to summary page				\$	

Tenderer's Initials _____

Item	Description	Unit	Quantity	Unit Price (\$)	Amount (\$)
SA-12 - 4	Pump Station Mechanical				
4.01	Flygt NP 3085 MT 3HP Submersible Pumps	Each	2	\$	\$
4.02	Wet Well Modifications Including New Ladder and SS Guiderails	L.S.	1	\$	\$
Subtotal Section 4 – to be carried over to summary page				\$	

SA-12 - 5	Pump Station Structural				
5.01	Cast-In-Place Wet Well Concrete Slab, Including Custom Hatch	L.S.	1	\$	\$
5.02	Cast-In-Place Concrete Slab	Each	1	\$	\$
Subtotal Section 5 – to be carried over to summary page				\$	

SA-12 - 6	Pump Station Electrical				
6.01	Instrumentation, Wiring, Conduits, and Communications System	L.S.	1	\$	\$
6.02	Electrical Kiosk and Controls	L.S.	1	\$	\$
6.03	SCADA Communications Including Antenna, Assembly and Pole	L.S.	1	\$	\$
Subtotal Section 6 – to be carried over to summary page				\$	

SA-12 - 7	Provisional				
7.01	Over Excavation and Disposal Offsite	cu.m	10	\$	\$
Subtotal Section 7 – to be carried over to summary page				\$	

Tenderer's Initials _____

SA-16 Pump Station Upgrades

(See paragraph 5.3.1 of the Instructions to Tenderers - Part II)

(All prices and *Quotations* including the *Contract Price* shall include all *Taxes*, but shall not include *GST*. *GST* shall be shown separately.)

Item	Description	Unit	Quantity	Unit Price (\$)	Amount (\$)
SA-16-1	General Requirements				
1.01	Mobilization and Demobilization	L.S.	1	\$	\$
1.02	Traffic Control	L.S.	1	\$	\$
1.03	Erosion & Sediment Control	L.S.	1	\$	\$
1.04	Start-Up & Commissioning	L.S.	1	\$	\$
1.05	O&M Manuals & Redline Drawings	L.S.	1	\$	\$
1.06	Contractor Design Temporary Bypass System	L.S.	1	\$	\$
1.07	Temporary Facilities	L.S.	1	\$	\$
1.08	Project Identification	INCIDENTAL			
1.09	Groundwater Control, Treatment, and Disposal	INCIDENTAL			
Subtotal Section 1 – to be carried over to summary page				\$	

SA-16-2	Demolition and Removals				
2.01	Removal and Disposal of Existing Pump Station Building	L.S.	1	\$	\$
2.02	Removal and Disposal of Existing Concrete	L.S.	1	\$	\$
Subtotal Section 2 – to be carried over to summary page				\$	

SA-16-3	Civil and Geotechnical				
3.01	Pre-Locate Existing Utilities	L.S.	1	\$	\$
3.02	Site Grading and Restoration	L.S.	1	\$	\$
3.03	CCTV Inspection of Pipelines (Initial)	L.S.	1	\$	\$
3.04	CCTV Inspection of Pipelines (One Year)	L.S.	1	\$	\$
3.05	Supply and Install Sanitary Forcemain	Lin.m	85	\$	\$
3.06	Water Service and Associated Works	L.S.	1	\$	\$

Tenderer's Initials _____

Item	Description	Unit	Quantity	Unit Price (\$)	Amount (\$)
3.07	Asphalt Parking Pad	cu.m	1	\$	\$
3.08	Rollover Curb and Sidewalk	L.S.	1	\$	\$
3.09	Supply and Install Perimeter Security Fence c/w Roller Gate	L.S.	1	\$	\$
3.10	Supply and Install Bollards	L.S.	1	\$	\$
Subtotal Section 3 – to be carried over to summary page				\$	

SA-16-4	Pump Station Mechanical				
4.01	Flygt NP 3127 LT 3 Phase 425 Submersible Pumps	Each	2	\$	\$
4.02	Piping & Valves	L.S.	1	\$	\$
4.03	Metal Works	L.S.	1	\$	\$
Subtotal Section 4 – to be carried over to summary page				\$	

SA-16-5	Pump Station Structural				
5.01	Polyurethane Liner for Wet Well and Valve Chamber	L.S.	1	\$	\$
5.02	Cast-In-Place Wet Well and Valve Chamber Cover	L.S.	1	\$	\$
5.03	Cast-In-Place Concrete Slab	L.S.	1	\$	\$
5.04	Cast-In-Place Wet Well and Valve Chamber Walls, Floors and Benching	L.S.	1	\$	\$
Subtotal Section 5 – to be carried over to summary page				\$	

SA-16-6	Pump Station Electrical				
6.01	Electrical Service	L.S.	1	\$	\$
6.02	Generator Set	L.S.	1	\$	\$
6.03	Electrical Kiosk	L.S.	1	\$	\$
6.04	Instrumentation	L.S.	1	\$	\$
6.05	SCADA Antenna and Assembly	L.S.	1	\$	\$
6.06	Electrical Systems	L.S.	1	\$	\$
6.07	4" Communication Conduit	L.S.	1	\$	\$
Subtotal Section 6 – to be carried over to summary page				\$	

Tenderer's Initials _____

Item	Description	Unit	Quantity	Unit Price (\$)	Amount (\$)
SA-16-7	Provisional				
7.01	Alternate Forcemain Profile and Blow-Down Assembly	L.S.	1	\$	\$
7.02	Rock Removal	L.S.	1	\$	\$
7.03	Over Excavation	L.S.	1	\$	\$
7.04	Allow City Structural Engineer to Conduct Inspection of Existing Infrastructure During Bypassing	Per Day	2	\$	\$
Subtotal Section 7 – to be carried over to summary page				\$	

Tenderer's Initials _____

FORM OF TENDER – Appendix 1**SCHEDULE OF QUANTITIES AND PRICES**

(See paragraph 5.3.1 of the Instructions to Tenderers - Part II)

(All prices and *Quotations* including the *Contract Price* shall include all *Taxes*, but shall not include *GST*. *GST* shall be shown separately.)

TENDER SUMMARY

ITEM	DESCRIPTION	TOTAL AMOUNT
SA-11 Pump Station Upgrades		
SA-11-1.0	General Items	\$
SA-11-2.0	Demolition and Removals	\$
SA-11-3.0	Civil and Geotechnical	\$
SA-11-4.0	Pump Station Mechanical	\$
SA-11-5.0	Pump Station Structural	\$
SA-11-6.0	Pump Station Electrical	\$
SA-11-7.0	Provisional	\$
SA-11 SUBTOTAL		\$

SA-12 Pump Station Upgrades		
SA-12-1.0	General Items	\$
SA-12-2.0	Demolition and Removals	\$
SA-12-3.0	Civil and Geotechnical	\$
SA-12-4.0	Pump Station Mechanical	\$
SA-12-5.0	Pump Station Structural	\$
SA-12-6.0	Pump Station Electrical	\$
SA-12-7.0	Provisional	\$
SA-12 SUBTOTAL		\$

Tenderer's Initials _____

SA-16 Pump Station Upgrades		
SA-16-1.0	General Items	\$
SA-16-2.0	Demolition and Removals	\$
SA-16-3.0	Civil and Geotechnical	\$
SA-16-4.0	Pump Station Mechanical	\$
SA-16-5.0	Pump Station Structural	\$
SA-16-6.0	Pump Station Electrical	\$
SA-16-7.0	Provisional	\$
SA-16 SUBTOTAL		

SA-11, SA-12, SA-16 TENDERED PRICE

\$

5% GST

\$

TOTAL TENDERED PRICE

\$

Tenderer's Initials _____

FORM OF TENDER – Appendix 2**PRELIMINARY CONSTRUCTION SCHEDULE**

(See paragraph 5.3.2 of the Instructions to Tenderers - Part II)

Indicate schedule with bar chart with major item descriptions and time

ACTIVITY	CONSTRUCTION SCHEDULE (MONTHS)											
	1	2	3	4	5	6	7	8	9	10	11	12

Tenderer's Initials _____

FORM OF TENDER – Appendix 3

EXPERIENCE OF SUPERINTENDENT

(See paragraph 5.3.3 of the Instructions to Tenderers - Part II)
Include name and contact information for references

Name: _____ Years' Experience: _____

Experience:

Date: _____

Project Name: _____

Responsibilities: _____

References: _____

Date: _____

Project Name: _____

Responsibilities: _____

References: _____

Date: _____

Project Name: _____

Responsibilities: _____

References: _____

Tenderer's Initials _____

FORM OF TENDER – Appendix 4**COMPARABLE WORK EXPERIENCE**

(See paragraph 5.3.4 of the Instructions to Tenderers - Part II and paragraph 54.1 of the Instructions to Tenderer – Part I – add additional pages as necessary)

Company / Owner's Name: _____

Contact Person: _____ Phone: _____

Email Address _____

Description of Work: _____

Project Date: _____ Approximate Value: _____

Company / Owner's Name: _____

Contact Person: _____ Phone: _____

Email Address _____

Description of Work: _____

Project Date: _____ Approximate Value: _____

Company / Owner's Name: _____

Contact Person: _____ Phone: _____

Email Address _____

Description of Work: _____

Project Date: _____ Approximate Value: _____

Tenderer's Initials _____

FORM OF TENDER – Appendix 5**LIST OF SUBCONTRACTORS**

(See paragraph 5.3.5 of the Instructions to Tenderers - Part II)

TENDER ITEM	TRADE	SUBCONTRACTOR NAME	PHONE NUMBER

Tenderer's Initials _____

FORM OF TENDER – Appendix 6

FORCE ACCOUNT LABOUR AND EQUIPMENT RATES

(See paragraph 5.2 – 5.3.6 of the Instructions to Tenderers - Part I)

[illegible]

Tenderer's Initials

FORM OF TENDER – Appendix 7**DECLARATION – LIVING WAGE EMPLOYER**

(See paragraph 5.2 - 5.3.7 and paragraph 10.1 of the Instructions to Tenderers – Part I)

**DECLARATION – LIVING WAGE EMPLOYER**

I, _____ as a duly authorized signing officer of

Company: _____

Address _____

_____, confirm that all employees and sub-contractors under our contract with the City as outlined below, are paid not less than the “Living Wage” as calculated by the Living Wage for Families Campaign.

I understand that this requirement extends only to those employees and sub-contractors’ employees that perform work while on City premises and property for durations in excess of one continuous hour per occasion.

I understand that the City will conduct audits if and when notification of breach of this compliance is received by the City. I understand that in the event any breach of this declaration is found to be true, the City reserves the right to cancel its contract without penalty at any time once said authentication of the breach is made.

Contract Name: _____

Authorized Signatory:

Dated:

Tenderer's Initials _____

AGREEMENT

- Agreement
 - Schedule 1 – Schedule of Contract Documents
 - Schedule 2 – List of Drawings
 - Schedule 3 – Prime Contractor Designation

AGREEMENT

BETWEEN OWNER AND CONTRACTOR

(FOR USE WHEN UNIT PRICES FORM THE BASIS OF PAYMENT - TO BE USED ONLY WITH THE GENERAL CONDITIONS AND OTHER STANDARD DOCUMENTS OF THE UNIT PRICE MASTER MUNICIPAL CONSTRUCTION DOCUMENTS.)

BETWEEN OWNER AND CONTRACTOR

This agreement made in duplicate this

_____ day of _____ 2026

Contract: SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades

Reference No. NWIT-26-02

BETWEEN:

The Corporation of the City of New Westminster
511 Royal Avenue
New Westminster, BC, V3L 1H9
(the "Owner")

AND:

(the "Contractor")

The Owner and the Contractor agree as follows:

Article 1 The Work Start / Completion Dates

- 1.1 The *Contractor* will perform all *Work*, provide all labour, equipment, and material, and do all things strictly as required by the *Contract Documents*.
- 1.2 The *Contractor* will commence the *Work* in accordance with the *Notice to Proceed*. The *Contractor* will proceed with the *Work* diligently, will perform the *Work* generally in accordance with the construction schedules as required by the *Contract Documents* and will achieve *Substantial Performance* of the *Work* on or before **fifty-two (52) weeks** from the *Notice to Proceed*, subject to the provisions of the *Contract Documents* for adjustments to the *Contract Time*.
- 1.3 Time shall be of the essence of the *Contract*.

Article 2 Contract Documents

- 2.1 The "*Contract Documents*" consist of the documents listed or referred to in Schedule 1, entitled "Schedule of Contract Documents", which is attached and forms a part of this Agreement, and includes any and all additional and amending documents issued in accordance with the provisions of the *Contract Documents*. All of the *Contract Documents* shall constitute the entire *Contract* between the *Owner* and the *Contractor*.

- 2.2 The *Contract* supersedes all prior negotiations, representations, or agreements, whether written or oral, and the *Contract* may be amended only in strict accordance with the provisions of the *Contract Documents*.

Article 3 Contract Price

- 3.1 The price for the *Work* ("*Contract Price*") shall be the sum in Canadian dollars of the following
- 3.1.1 the product of the actual quantities of the items of Work listed in the Schedule of Quantities and Prices which are incorporated into or made necessary by the Work and the unit prices listed in the Schedule of Quantities and Prices; plus
 - 3.1.2 all lump sums, if any, as listed in the Schedule of Quantities and Prices, for items relating to or incorporated into the Work; plus
 - 3.1.3 any adjustments, including any payments owing on account of Changes and agreed to Extra Work, approved in accordance with the provisions of the *Contract Documents*
- 3.2 The *Contract Price* shall be the entire compensation owing to the *Contractor* for the *Work* and this compensation shall cover and include all profit and all costs of supervision, labour, material, equipment, overhead, financing, and all other costs and expenses whatsoever incurred in performing the *Work*.

Article 4 Payment

- 4.1 Subject to applicable legislation and the provisions of the *Contract Documents*, the *Owner* shall make payments to the *Contractor*.
- 4.2 If the *Owner* fails to make payments to the *Contractor* as they become due in accordance with the terms of the *Contract Documents* then interest calculated at 0% per annum over the prime commercial lending rate of the Royal Bank of Canada on such unpaid amounts shall also become due and payable until payment. Such interest shall be calculated and added to any unpaid amounts monthly.

Article 5 Rights and Remedies

- 5.1 The duties and obligations imposed by the *Contract Documents* and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.
- 5.2 Except as specifically set out in the *Contract Documents*, no action or failure to act by the *Owner*, *Contract Administrator* or *Contractor* shall constitute a waiver of any of the parties' rights or duties afforded under the *Contract*, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach under the *Contract*.

Article 6 Notices

- 6.1 Communications among the *Owner*, the *Contract Administrator* and the *Contractor*, including all written notices required by the *Contract Documents*, may be delivered by hand, or by fax, or by pre-paid registered mail to the addresses as set out below:

The *Owner*:

**Corporation of the City of New Westminster
511 Royal Avenue
New Westminster, BC V3L 1H9**

Email:

Attention:

The *Contractor*:

Email:

Attention:

The *Contract Administrator*:

**Aplin Martin
800-1177 West Hastings Street,
Vancouver, BC, V6E 2K3**

Email:

Attention

- 6.2 A communication or notice that is addressed as above shall be considered to have been received
- 6.2.1 immediately upon delivery, if delivered by hand; or
 - 6.2.2 immediately upon transmission if sent by any form of electronic communication, provided that if such day is not a Working Day or if it is received after the end of normal business hours on the date of its transmission at the place of receipt, then it will be deemed to have been received at the opening of business at the place of receipt on the first Working Day following the transmission; or
 - 6.2.3 after five (5) Days from date of posting if sent by registered mail
- 6.3 The *Owner* or the *Contractor*, at any time, may change its address for notice by giving written notice to the other at the address then applicable. Similarly, if the *Contract Administrator* changes its address for notice then the *Owner* will give or cause to be given written notice to the *Contractor*.
- 6.4 The sender of a notice by fax assumes all risk that the fax is received in hard copy.

Article 7 General

- 7.1 This *Contract* shall be construed according to the laws of British Columbia.
- 7.2 The *Contractor*, without the express written consent of the *Owner*, shall not, assign this *Contract*, or any portion of this *Contract*.
- 7.3 The headings included in the *Contract Documents* are for convenience only and do not form part of this *Contract* and will not be used to interpret, define, or limit the scope or intent of this *Contract* or any of the provisions of the *Contract Documents*.
- 7.4 A word in the *Contract Documents* in the singular includes the plural and, in each case, vice versa.

7.5 This agreement shall enure to the benefit of and be binding upon the parties and their successors, executors, administrators and assigns.

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

Contractor:

Contractor Name

(FULL LEGAL NAME OF CORPORATION, PARTNERSHIP OR INDIVIDUAL)

(AUTHORIZED SIGNATORY)

(WITNESSED BY SIGNATURE)

(AUTHORIZED SIGNATORY NAME)

(WITNESS NAME)

Owner:

Corporation of the City of New Westminster

(FULL LEGAL NAME OF CORPORATION, PARTNERSHIP OR INDIVIDUAL)

(AUTHORIZED SIGNATORY)

(WITNESSED BY SIGNATURE)

Patrick Shannon, MCIPS/NISCL-CSCL
Purchasing Manager and
Manager of Insurance and Risk

Heather M. Rossi
Procurement Specialist

(AUTHORIZED SIGNATORY NAME)

(WITNESS NAME)

**Schedule 1
Schedule of Contract
Documents**

The following is an exact and complete list of the *Contract Documents*, as referred to in Article 2.1 of the Agreement.

NOTE: The documents noted with “*” are contained in the “Master Municipal Construction Documents - General Conditions, Specifications and Standard Detail Drawings” edition dated 2009 Platinum. All sections of this publication are included in the *Contract Documents*.

Agreement, including all Schedules;

Schedule 3 – Prime Contractor Designation;

Supplementary General Conditions (included in this document);

General Conditions* (updated to 2016-11-18);

Supplementary Specifications (included in this document);

Specifications*;

Supplementary Standard Detail Drawings (included in this document);

Standard Detail Drawings*;

Executed Form of Tender, including all Appendices;

Contract Drawings listed in Schedule 2 to the Agreement –“List of *Contract Drawings*”;

SA-11 Sanitary Pump Station As built Drawing (1995);

SA-12 Sanitary Pump Station As built Drawing (1990);

SA-16 Sanitary Pump Station As built Drawing

Instructions To Tenderers - Part I;

Instructions to Tenderers - Part II*;

The following Addenda:

The following Enquiries and Responses:

Schedule 2
List of Contract
Drawings

TITLE	DRAWING NO.	REVISION NO.	REVISION DATE
SA- 11 Sanitary Pump Station Upgrades			
Cover Sheet	00	-	22/01/2026
Civil Site Plan	C01	3	22/01/2026
Section Views & BOM	P01	3	22/01/2026
Wet Well Section Views	P02	3	22/01/2026
Standard Details	P03	3	22/01/2026
Site Plan & Single Line Diagram	E01	1	28/01/2026
Kiosk Layout	E02	1	28/01/2026
Block Diagrams & Details	E03	1	28/01/2026
Electrical Schematic (1/3)	E04	1	28/01/2026
Electrical Schematic (2/3)	E05	1	28/01/2026
Electrical Schematic (3/3)	E06	1	28/01/2026
Control Panel Layout	E07	1	28/01/2026
Structural Notes	S1.0	2	30/01/2026
Electrical Kiosk Pad Details	S2.0	2	30/01/2026
SA- 12 Sanitary Pump Station Upgrades			
Cover Sheet	00	-	22/01/2026
Civil Site Plan	C01	3	22/01/2026
Section Views & BOM	P01	3	22/01/2026
Standard Details	P02	3	22/01/2026
Site Plan & Single Line Diagram	E01	1	28/01/2026

Kiosk Layout	E02	1	28/01/2026
Block Diagrams & Details	E03	1	28/01/2026
Electrical Schematic (1/3)	E04	1	28/01/2026
Electrical Schematic (2/3)	E05	1	28/01/2026
Electrical Schematic (3/3)	E06	1	28/01/2026
Control Panel Layout	E07	1	28/01/2026
Structural Notes	S1.0	2	30/01/2026
Electrical Kiosk Pad Details	S2.0	2	30/01/2026
Wet Well Cover Details	S2.1	2	30/01/2026
SA- 16 Sanitary Pump Station Upgrades			
Cover Sheet	00	-	22/01/2026
Site Location	C01	7	30/01/2026
Forcemain Plan & Profile	C02	7	30/01/2026
Plan & Section Views	P01	7	30/01/2026
Section Views	P02	7	30/01/2026
Mechanical Details	P03	7	30/01/2026
Forcemain Details	P04	7	30/01/2026
Security Fence Details	P05	7	30/01/2026
Site Plan & Single Line Diagram	E01	4	01/28/2026
Kiosk Layout	E02	4	01/28/2026
Block Diagrams & Details	E03	4	01/28/2026
Schematic Diagram	E04	4	01/28/2026
Schematic Diagram	E05	4	01/28/2026
Schematic Diagram	E06	4	01/28/2026

Schematic Diagram	E07	4	01/28/2026
Structural Notes	S-1	3	01/29/2026
Site Plan & Details	S-2	3	01/29/2026
Slab Plan, Sections, and Details	S-3	3	01/29/2026

Schedule 3
Prime Contractor Designation

Prime Contractor Designation

This Schedule forms part of the agreement between the Corporation of the City of New Westminster (the “City”) and _____ (the “Contractor”) respecting **NWIT-26-02 SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades** (the “Agreement”).

1. DEFINITIONS

- 1.1 In this Prime Contractor Designation schedule:
- (a) **“Agreement”** means the agreement entered into between the City and the Contractor on [date] in relation to [description of services] for the Project;
 - (b) **“Hazardous Materials Report”** means a report prepared by a qualified person in accordance with s. 20.112 of the *OH&S Regulation*;
 - (c) **“Owner”** means the City, which is the owner of the Project;
 - (d) **“Project”** means NWIT-26-02 SA-11, SA-12, and SA-16 Sanitary Lift Station Upgrades ;
 - (e) **“Project Manager”** means the City’s designate with responsibility to liaise with the Contractor for the purpose of managing, overseeing, coordinating or in any other way administering the Project

2. PRIME CONTRACTOR DESIGNATION

- 2.1 The Contractor agrees to assume the responsibilities of Prime Contractor for the Project, as set out in the *Workers Compensation Act* and the *OH&S Regulation*.

3. CONTRACTOR RESPONSIBILITIES AS PRIME CONTRACTOR

- 3.1 As Prime Contractor for the Project, the Contractor will:
- (a) ensure that the activities of employers, workers and other persons at the Project relating to occupational health and safety are coordinated; and
 - (b) do everything that is reasonably practicable to establish and maintain a system or process that will ensure compliance at the Project with the *Workers Compensation Act* and the *OH&S Regulation*.
- 3.2 Without limiting the generality of the foregoing, the Contractor will:
- (a) prior to beginning demolition or construction work on the Project, meet with the Project Manager to review and complete the Pre-Job Meeting Form, to review and discuss the information in the City’s Known Hazards Form and the Contractor’s pre-work hazard identification documents, and to review and discuss the Hazardous Materials Report (if any);
 - (b) conduct all necessary and appropriate inquiries of all relevant City staff and City records to ensure the Contractor is not missing any information from the City that is relevant to safety at the Project;
 - (c) review, plan to address, and address all hazards identified in the City’s Known Hazards Form, the Contractor’s pre-work hazard identification documents, any Hazardous Materials Report, and any hazards or risk identified in the *Workers Compensation Act* or the *OH&S Regulation*;

- (d) maintain and make available the documents listed on the Pre-Job Meeting Form, as appropriate;
- (e) inform all other employers working on the Project that the Contractor is designated as the Prime Contractor for the Project;
- (f) establish and maintain a system or process that will ensure compliance with the *OH&S Regulation* when visitors (i.e. couriers, inspectors, suppliers, etc.) enter the Project, which shall include site orientation and hazard communication to such visitors by the Contractor or the Contractor's designate;
- (g) maintain a current list of persons that each employer at the Project has designated to be responsible for that employer's health and safety activities at the Project;
- (h) ensure appropriate first aid resources are available for workers at the Project at all times work is being performed, in accordance with and as required by the *OH&S Regulation*;
- (i) if required by the *OH&S Regulation*, submit a Notice of Project to WorkSafeBC in accordance with the *OH&S Regulation*, and comply with all requirements of the *OH&S Regulation* concerning the Notice of Project;
- (j) if required by the *OH&S Regulation*, the Contractor will appoint a Qualified Coordinator for the purpose of ensuring the coordination of health and safety activities for the Project, and the Contractor shall ensure that any Qualified Coordinator so appointed is qualified to perform the responsibilities of his or her position and carries out the roles and responsibilities of a Qualified Coordinator as set out in the *OH&S Regulation*;
- (k) provide the following information, in an always updated form, in a readily available location at the Project;
 - (i) the name of any Qualified Coordinator appointed to the Project;
 - (ii) a site drawing, which must be posted, showing project layout, first aid location, emergency transportation provisions, and the evacuation marshalling station; and
 - (iii) a set of construction procedures designed to protect the health and safety of workers at the Project, developed in accordance with the requirements of the *OH&S Regulation*;
- (l) immediately notify the City of the identity of any Qualified Coordinator appointed by the Contractor at the Project, from time to time.

4. HAZARDOUS MATERIALS

- 4.1 If during demolition or construction work on the Project the Contractor discovers or has reason to believe that there are hazardous materials at the Project that were not set out in any Hazardous Materials Report, the Contractor will;
 - (a) immediately notify the Project Manager;
 - (b) take all reasonably appropriate measures to ensure the safety of workers at the Project; and
 - (c) take all reasonably appropriate measures to ensure the safety of the general public.
- 4.2 Upon notification by the Contractor of additional hazardous materials or suspected hazardous materials at the Project not set out in any Hazardous Materials Report, the City, in accordance with the *OH&S Regulation*, will obtain an updated Hazardous Materials Report, and will share such updated report with the Contractor. If the scope of work of the Project is changed as a result of the updated Hazardous Materials Report, the Project Manager will meet with the Contractor to discuss how the Project may be completed in a safe and cost effective manner.

5. GENERAL

- 5.1 In the event of a conflict between the Agreement and the Workers Compensation Act or the OH&S Regulation, the legislative requirement(s) will apply.
- 5.2 If any part of this schedule is held to be unenforceable by a court or tribunal of competent jurisdiction, that part shall be severed and the remaining parts of this schedule shall remain in full force and effect.
- 5.3 If the Contractor violates any of the requirements of this schedule or of the Workers Compensation Act or the OH&S Regulation, the City may treat such violation as a breach of the Agreement resulting in possible termination or suspension of the Agreement and/or any other actions deemed appropriate at the discretion of the City.
- 5.4 No failure or delay by either party to this schedule in exercising any power, right or privilege provided in this schedule will operate as a waiver, nor will any single or partial exercise of such rights, powers or privileges preclude any further exercise of them or the exercise of any other right, power or privilege provided in this schedule.
- 5.5 This schedule may be terminated in accordance with the terms of the Agreement.

SUPPLEMENTARY GENERAL CONDITIONS

- Supplementary General Conditions

SUPPLEMENTARY GENERAL CONDITIONS

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SUPPLEMENTARY GENERAL CONDITIONS

(TO BE READ WITH "GENERAL CONDITIONS" CONTAINED IN THE PLATINUM EDITION OF THE PUBLICATION
"MASTER MUNICIPAL CONSTRUCTION DOCUMENTS" SPECIFIED IN "INSTRUCTIONS TO TENDERERS" IT - 2.2)

DEFINITIONS

1

- 1.79 ***"(amend clause X.XX as follows)"*** preceding a supplementary clause means this clause modifies or provides additional information or restrictions to the referenced clause in the Master Municipal Construction Documents Platinum Edition, Volume II.
- 1.80 ***"(add new clause X.XX as follows)"*** preceding a supplementary clause means this clause provides additional requirements or information not found in the Master Municipal Construction Documents Platinum Edition, Volume II.
- 1.81 ***"(delete clause X.XX and replace as follows)"*** preceding a supplementary clause means this clause replaces the referenced clause in the Master Municipal Construction Documents Platinum Edition, Volume II in its entirety.

CONTRACTOR Control of Work

4

- 4.1 4.1.3 ***(add clause 4.1.3 as follows)***
The *Contractor* shall take precautions to reduce nuisance caused from mud or dust by clean-up, sweeping, sprinkling with water or other means as necessary to accomplish results satisfactory to the *Contract Administrator*. If the *Contractor* fails to maintain the site tidy or refuses to remove waste and debris as directed by the *Contract Administrator*, the *Owner*, at its own discretion, may proceed to clean the site, remove waste and debris from site, and deduct from any payment due the *Contractor* the cost of such cleaning or removing materials.

4.1.4 ***(add clause 4.1.4 as follows)***

The *Contractor* shall contain storage of material, equipment, and other facilities required to perform the *Works*, within designated areas agreed upon with the *Owner* in advance of commencing the *Works*. The *Contractor* shall consolidate materials, equipment, and facilities to minimize impact on access and street parking, to the satisfaction of the *Owner* and *Contract Administrator*.

Temporary storage of materials and stockpiles outside of the designated areas is limited to a maximum of 5 Days

Protection of Work, Property and the Public

4.3

- 4.3.1 ***(Delete the following from the last sentence of G.C.4.3.1 as follows)***
... except for damage, which, in the Performance of the Work, the *Contractor* could not reasonably avoid.

4.3.4 (*amend clause 4.3.4 as follows*)

- (1) expose and determine conclusively the location in the field all underground utilities and structures whether or not indicated on the *Contract Documents* as being at the *Place of the Work*. The *Contractor* shall also be responsible to consult with all utility corporations that provide electricity, communication, gas or other utility services in the area of the *Place of the Work*, to locate in three dimensions all underground utilities for which they have records. The *Contractor* shall also locate in three dimensions any other utilities or underground structures that are reasonably apparent in an inspection of the *Place of the Work*. The *Contractor* shall provide Fortis BC with three weeks' notice for relocation of any gas mains or services if it is required when crossing the gas lines.
- (2) The *Contractor* shall contact BC One Call at least forty eight (48) hours prior to excavating to advise of the *Work*.
- (3) The *Contractor* shall obtain all necessary permits from applicable agencies for *Work* around overhead utilities.

4.3.6 (*Delete 4.3.6 entirely*)**4.3.7 (*add new clause 4.3.7 as follows*)**

The *Contractor* shall locate, mark, and protect from damage or disturbance, any and all stakes, survey pins, monuments and markers at the *Place of the Work*. All survey stakes, survey pins, monuments, or markers that are damaged or disturbed shall be made good following construction by a registered B.C. Land Surveyor. Such repairs shall become part of the *Work* and shall be at the *Contractor's* expense.

4.3.8 (*add new clause 4.3.8 as follows*)

Contractor to submit, fourteen (14) calendar days prior to the start of construction, a Traffic Management Plan (TMP) provided by a qualified traffic management company, and prepared in accordance with the "Traffic Control Manual for Work in Roadways". Road closures will not be allowed without prior approval from the City of New Westminster. The cost of the TMP will be incidental to payment of work described in other sections.

The *Contractor* shall ensure that single lane traffic movement is available in each direction at all times and shall minimize impact to on-street parking and pedestrian access to commercial and residential properties during working hours.

The *Contractor* shall carry out the work such that access to commercial and residential properties is maintained at all times. The *Contractor* shall provide a minimum one week advance written notice to all property owners prior to construction, and shall also provide a minimum two (2)

working days' notice to individual property owners prior to commencing work affecting individual property access.

The *Contractor* shall give due notice to local police and fire department prior to beginning construction and shall comply in all respects with their requirements.

The *Contractor* shall comply with the requirements of the appropriate authority concerned with closure of streets or highways and shall post proper notices and/or signals, and provide necessary barriers, guards, lights, flagmen or watchmen as may be necessary for proper maintenance of traffic and protection of persons and property from injury or damage. All costs involved in respect of the above requirements will be deemed to be included in the *Contract Price*.

Where existing streets or roads are not available as detours, all traffic shall be permitted to pass through the *Work* with as little inconvenience and delay as possible unless otherwise provided or authorized. If half the street only is under improvement, the other half shall be conditioned and maintained as detour.

Where construction is to be carried out on highways or properties other than those of the *Owner* it shall be the responsibility of the *Contractor* to familiarize themselves with the requirements of the owners or controllers of these properties which pertain to traffic safety or control of the construction operation and to carry out their *Work* in accordance with these requirements.

Construction Schedule

4.6

4.6.8 (***add new clause 4.6.8 as follows***)

The *Contractor* may carry out the *Work* as per the applicable Bylaws of the *Owner*, or as instructed by the *Owner* in the *Contract Documents*.

4.6.9 (***add new clause 4.6.9 as follows***)

The *Contractor* shall not schedule work that will require inspection beyond an eight-hour day without the *Contract Administrator's* prior approval. Any extra cost incurred by the *Owner* for work done outside of normal office hours may be deducted from the *Contractor's* monthly payments.

4.6.10 (***add new clause 4.6.10 as follows***)

On the infrequent occasion that the *Contractor* finds it necessary to work on Saturday, Sunday or Statutory Holiday, the *Contractor* shall obtain the *Contract Administrator's* approval forty-eight (48) hours in advance. Work on Sundays or Statutory Holidays will also require the City's approval, with a minimum two weeks' notice. The *Contractor* shall also be charged a working day and may be charged the overtime inspection costs incurred by the *Owner*. Such costs shall be deducted from monthly progress payments.

Survey Layout and As-Constructed Information	4.17	4.17.1 (add new clause 4.17.1 as follows) The <i>Contractor</i> is responsible for all survey required for construction layout and for record drawings associated with this contract. The <i>Contractor</i> shall be responsible for recording of all field survey information pertaining to the as-constructed drawings. The <i>Contractor</i> shall provide, at no charge, a completed set of legible, marked-up as-constructed prints to the <i>Contract Administrator</i> on completion of the <i>Work</i>. The <i>Contractor</i> shall provide any additional information as requested to enable the <i>Contract Administrator</i> to prepare and submit as-constructed record drawings to the Municipality or the <i>Owner</i> for their records.
City Industrial Health and Safety Program	4.18	4.18.1 (add new clause 4.18.1 as follows) 4.18.1 All <i>Contractors</i> working for the City of New Westminster are required to be aware of the City's Industrial Health and Safety Program. It is the <i>Contractor's</i> responsibility to perform the job in compliance with the City's safety standards. The <i>Contractor</i> is responsible for the compliance of all employees for whom he is primarily responsible, with all WorkSafeBC Industrial Health and Safety Regulations, as well as all other applicable Regulations.
VALUATION OF CHANGES AND EXTRA WORK	9	
Valuation Method	9.2.1	9.2.1.1 (add to clause) ; subject to final approval of available funding by the <i>Owner</i>.
Quantity Variations	9.4	9.4.1 (delete clause 9.4.1 and replace as follows) The <i>Contractor</i> shall hold firm all unit prices submitted in the <i>Schedule of Quantities and Prices</i> regardless of the increase or decrease in quantities.
DELAYS	13	
Delay by Owner or Contract Administrator	13.1	13.1.2 (add clause 13.1.2 as follows) The <i>Owner</i> or <i>Contract Administrator</i> will not be liable for claims of delay caused by BC Hydro, TELUS, Fortis BC, Metro Vancouver, telecommunication companies, <i>Owner's</i> forces, or other utility corporations arising out of or connected to the <i>Work</i>.
Unavoidable Delay	13.3.1	13.3.1 (add to clause) After <i>Abnormal Weather</i> add "Global Pandemic,"
Unforeseeable Market Conditions	13.4.1	Delete 13.4.1 entirely

PAYMENT	18	
Supporting Documentation	18.2.2	18.2.2 (<i>amend clause 18.2.2 as follows</i>) If requested in writing by the <i>Owner</i>, the <i>Contractor</i> as a precondition to the issuance of the <i>Payment Certificate</i>, shall provide a sworn declaration in the form of a signed and properly sealed CCDC 9A-2001 Statutory Declaration to the <i>Contract Administrator</i> that all amounts relating to the <i>Work</i>, due and owing as of the end of the month covered by the <i>Payment Certificate</i> to third parties including all subcontractors and suppliers, have been paid.
	18.2.3	18.2.3 (<i>add clause 18.2.3 as follows</i>) If requested in writing by the <i>Owner</i>, the <i>Contractor</i> as a precondition to the issuance of the <i>Payment Certificate</i> shall provide a Clearance Letter from WorkSafeBC demonstrating that the Contractor is in Good Standing with WorkSafeBC.
	18.2.4	18.2.4 (<i>add clause 18.2.3 as follows</i>) The <i>Owner</i> retains the right to obtain proof of payment, in the form of a signed and properly sealed CCDC 9A-2001 Statutory Declaration, of all sub-trades and material suppliers from the <i>Contractor</i> prior to making final payment.
Payment	18.5	18.5.1 (<i>amend clause 18.5.1 as follows</i>) The net amount shown for payment on a <i>Payment Certificate</i> shall be due and payable to the <i>Contractor</i> on or before the 15th Day after the receipt by the <i>Owner</i> of the <i>Payment Certificate</i>.
WORKERS COMPENSATION REGULATIONS	21	
Contractor is “Prime Contractor”	21.2.1	Delete “Substantial Performance” and Replace with “Total Performance”
INSURANCE	24	
Required Insurance	24.1	24.1 (<i>amend 24.1 as follows</i>) 24.1.1 (1) Limits: \$5,000,000 inclusive per occurrence for bodily injury, death, and damage to property. 24.1.1(2) (<i>add to 24.1.1(2) as follows</i>) The following shall be named as additional insured on the Contract: • Corporation of the City of New Westminster • (Full name of Contract Administrator) • (Full name of Contract Administrator sub consultant)

-
(Full name of Contract Administrator sub consultant)

24.1.1(2) (add to 24.1.1(2) as follows)

In the last sentence replace "\$2,500.00" with "\$10,000.00"

24.1.2 (amend 24.1.2 as follows)

The above insurance policies listed in this GC, except Automotive Liability Insurance, shall have the right of subrogation waived as against the *Owner* and its respective employees, servants and agents.

24.1.5 (amend the first sentence of 24.1.5 as follows)

All policies referred to in this GC, except Automotive Liability Insurance, shall provide that thirty (30) days' notice of cancellation will be given in writing to the Named Insured and the *Owner*, otherwise the policies to remain in full force and effect until the *Work* has been completed.

24.1.7 (add new 24.1.7 as follows)

If the *Contractor* fails to provide or maintain insurance as required by the *Contract Documents*, then the *Owner* shall have the right to provide and maintain such insurance and give evidence to the *Contractor* and the *Contract Administrator*. The *Contractor* shall pay the cost thereof to the *Owner* on demand or the *Owner* may deduct the cost from the amount that is, or may become due to the *Contractor*.

**MAINTENANCE PERIOD
Correction of Defects**

25

25.1

25.1.4 (add clause 25.1.4 as follows)

The *Owner* is authorized to make repairs to defects or deficiencies if, ten days after giving written notice, the *Contractor* has failed to make or undertake with due diligence the required repairs. However, in the case of emergency where, in the opinion of the *Owner*, delay is not reasonable, repairs may be made without notice being sent to the *Contractor*. All expenses incurred by the *Owner* in connection with repairs made pursuant to GC 25 shall be paid by the *Contractor* and may be deducted from the Maintenance Security, or other holdbacks. The *Contractor* shall promptly pay any shortfall.

**Commencement of
Maintenance Period**

25.2

25.2.2 (amend clause 25.2.2 as follows)

All warranties under this *Contract* commence from the date of *Substantial Performance* of the *Contract*, regardless of whether any *Subcontractor* achieves *Substantial Performance* of its Subcontract prior to *Substantial Performance* of the *Contract*.

SUPPLEMENTARY SPECIFICATIONS

- Supplementary Specifications

SUPPLEMENTARY SPECIFICATIONS

City of New Westminster Supplementary Specifications and Detail Drawings can be obtained in the Subdivision and Development Control Bylaw at this [link](#)



CITY OF NEW WESTMINSTER
SA-11, SA-12 & SA-16 Sanitary Pump Station Upgrades
Project Specific Specifications

Municipal Contract No.: NWIT-26-02
Project No: 24-5038
February 5, 2026
Aplin & Martin Consultants Ltd.

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CITY OF NEW WESTMINSTER PRUNING STANDARD (2021) - ATTACHED

1. GENERAL

1.1 ADMINISTRATIVE

- .1 The Contract Administrator (CA) will administer pre-construction meeting and progress meetings. Progress meeting to be held bi-weekly and can be adjusted by CA based on construction schedule and activities.
- .2 Contractor's superintendent, senior representatives of major subcontractors to attend all meetings.
- .3 Provide physical space and for meetings.
- .4 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Senior representatives of the Owner, Engineer, Contractor, major Subcontractors, and field inspectors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Agenda to include:
 - .1 Appointment of official representative of participants in the Work
 - .2 Schedule of work, construction progress schedule
 - .3 Schedule of submission of shop drawings, samples and colour chips for architectural and art work.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences
 - .5 Delivery schedule of specified equipment
 - .6 Site security
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements
 - .8 Record drawings
 - .9 Operation & Maintenance Manuals

- .10 Take-over procedures, acceptance, warranties
- .11 Monthly progress claims, administrative procedures, photographs, hold backs
- .12 Appointment of inspection and testing agencies or firms
- .13 Safety issues

1.3 PROGRESS MEETINGS

- .1 During course of Work schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work, Engineer, Owner are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Agenda to include the following:
 - .1 Review, approval of minutes of 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 delivery schedules
 - .6 Corrective measures and procedures to regain projected schedule
 - .7 Revision to construction schedule
 - .8 Progress schedule, during succeeding work period
 - .9 Review submittal schedules: expedite as required
 - .10 Maintenance of quality standards
 - .11 Review proposed changes for affect on construction schedule and on completion date
 - .12 Safety issues
 - .13 Other business

2. PRODUCTS

2.1 NOT USED

.1 Not Used.

3. EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION 01 31 19

1. GENERAL

1.1 REQUIRED SUBMITTALS

- .1 Construction schedule at pre-construction meeting and when requested by the CA during construction
- .2 Shop drawings and product data
- .3 Samples and color chips for architectural and art work
- .4 Operation & Maintenance Manual
- .5 Contractor's redline record drawings
- .6 Certificates

1.2 ADMINISTRATIVE

- .1 Submit to Engineer submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed. Allow 1 week for review.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 At Engineer's request, prepare and submit schedule fixing the dates for submission and return of shop drawings, product data or samples.
- .4 Review submittals prior to submission to 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 requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .5 Notify Engineer in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Verify field measurements and affected adjacent Work are co-ordinated.
- .7 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer review.
- .9 Keep one reviewed copy of each submission on site.

1.3 WORK PLAN

- .1 Provide Work Plan for each key activity, as requested by the Engineer, to show construction methods. Relate Work Plan to activities shown on Construction Schedule.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Detail all shop drawings using the metric system. Prepare shop drawings to a drafting standard equivalent to the Contract Drawings.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 1 week for Engineer's review of each submission.
- .5 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .6 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of revisions other than those requested.
- .7 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.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:

- .1 Subcontractor.
- .2 Supplier.
- .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 Submit 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Engineer where shop drawings will not be prepared due to standardized manufacture of product.
- .10 Submit 1 electronic copy of shop drawings for each requirement requested in specification Sections and as the Engineer may reasonably request.
- .11 Submittals will be returned with one of the following notations. Take action as noted:
 - .1 "REVIEWED" – Make and distribute additional copies as required for execution of the Work.
 - .2 "REVIEWED AS NOTED" – Make and distribute additional copies as required for execution of the Work, incorporating the revisions noted by the Engineer.
 - .3 "REVISE AND RESUBMIT" – Make the necessary revisions and resubmit revised drawings for review. Show the drawing number of the first such revised drawings and

show the latest revision number applicable to the drawing by adding a suffix to the drawing number as “REV.1”, “REV.2” etc.

- .4 “REJECTED” – This notation indicates that the Engineer may not have reviewed the shop drawing due to lack of sufficient information or contents on shop drawing deviates significantly from the design.
- .12 Use only those shop drawings on the Work that bear the “REVIEWED” or “REVIEWED AS NOTED” notation.
- .13 Do not revise shop drawings marked “REVIEWED” or “REVIEWED AS NOTED” unless resubmitted to the Engineer for further review.
- .14 Where more than one type of shop drawing has been specified for on item, e.g., wiring diagrams, layout details, and dimensional drawings, the shop drawings shall be submitted together, to enable the Engineer to review the drawings as a package
- .15 Catalogue pages or drawings applicable to an entire or range of equipment will not be accepted as shop drawings unless they are clearly marked to show the pertinent data for the particular materials.
- .16 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.
- .17 Determine which shop drawings have, in addition to the drawings specifically mentioned in the Contract, design elements requiring the seal of the Professional Engineer registered in the Province of British Columbia. 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.
- .18 Owner may deduct, from payments due to Contractor, costs of additional engineering work incurred if correct shop drawings are not submitted after one review by Engineer.
- .19 Review by the Engineer is for the sole purpose of ascertaining conformance with the general design concept. The review does not mean that the Engineers approves the detail design inherent in the shop drawing, responsibility for which remains with the Contractor, and such review does not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or his responsibility for meeting all requirements for 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 process or to techniques of construction and installation and for coordination of the work of all sub-trades.

1.5 SAMPLES

- .1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Engineer's business address.

- .3 Notify Engineer in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .6 Make changes in samples which Engineer may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 OPERATION AND MAINTENANCE MANUALS

- .1 Submit O&M Manuals to Engineer.
- .2 Submit transcription of insurance immediately after award of Contract.

1.7 RECORD DRAWINGS

- .1 Submit record drawings to Engineer, per MMCD Section 01721 – Project Record Documents, upon completion of Work and prior to final inspection.

1.8 CERTIFICATES

- .1 Immediately after award of Contract, submit WorkSafeBC status and certificate of insurances.

2. PRODUCTS

2.1 NOT USED

- .1 Not Used.

3. EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION 01 33 00

1. GENERAL

1.1 REGULATIONS

.1 Regulations affecting the Work imposed by:

- .1 BC Hydro
- .2 City of New Westminster
- .3 BC Building Code

1.2 COMPLIANCE WITH REGULATIONS

- .1 Ascertain requirements and regulations of authorities listed under 1.1.1 above.
- .2 Comply with all such requirements and regulations as applicable to the Work.
- .3 Requirements set out in this Section are for guidance and information and are not necessarily complete.

1.3 PERMITS

- .1 Notwithstanding the provisions of the General Conditions, the Contractor will obtain the required building permit.
- .2 Obtain all construction permits necessary for the Works other than those listed under the above item.

2. PRODUCTS

2.1 NOT USED

- .1 Not Used.

3. EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION 01 41 00

1.0	GENERAL	.1 Section 01 43 00 addresses general requirements for measurement and payment for all items under the Schedule of Quantities and Prices. This section must be referenced to and interpreted simultaneously with the measurement and payment clauses in all other Sections pertinent to the items described in the Schedule of Quantities and Prices. The measurement and payment paragraphs in the MMCD and City of New Westminster Supplementary Specifications are superseded by the pay items descriptions provided. .2 All measurement and payment provisions under any particular Section are applicable to the same items or components of work involved in other Sections.
1.1	Measurement and Payment	.1 All units of measurement for payment will be as given in Schedule of Quantities and Prices. All payments will be based on respective unit or lump prices in Schedule of Quantities and Prices or Change Orders issued. .2 Payment for items under Schedule of Quantities and Prices cover supply and installation of work described under the items and referenced Measurement and Payment clauses including all necessary materials, equipment and labour, cut and waste, working clearance, specified testings for the finished items of work, coordination efforts, dewatering and groundwater treatment including discharge and permitting, shoring, cofferdam design and installation, traffic control and any other incidental and miscellaneous materials and services, fittings, appurtenances and work and requirements as specified Costs of bonds, insurance, Workers Compensation contribution, superintendence, overheads, profits and other incidentals are deemed to have been included in pay items of Schedule of Quantities and Prices. No payment will be made for unauthorized work or work beyond limits shown on Contract Drawings. Any component of the project not explicitly described in the pay items and descriptions below must be accounted for by the Contractor and included under an associated pay item. .3 Unless specified otherwise, the standard methods of measurements will be as follows: • Linear measurement will be taken from end to end of measured items. • Area measurement will be the geometric area derived from conventionally accepted linear measurements of applicable dimensions of area to be measured. • Cubic measurement will be made in place using end area method or by loose truck box volume, all as specified under individual payment Sub-sections.

- Weight measurement for items with materials delivered in truck loads will be made by weigh tickets to be verified in accordance to Force Account method, or by actual weighing if total weight is less than one tonne.
- .4 Unless otherwise specified, accuracy of measurement will be to the nearest significant decimal value as given below:

Asphalt	0.1 tonne
Concrete	0.01 cubic metre
Excavation, earth and granular materials	0.1 tonne or cubic metre
Pipes	0.02 metre
All unit items	Each
Clearing, top soil, seeding, sodding	0.2 metre in both directions
Asphalt or concrete area	Length to 0.1 metre Width as specified and constructed, otherwise to 0.1 metre
Lump sum	All works associated with each item

2.0 DESCRIPTION OF PAY ITEMS

The following description of items is for payment purposes only and does not describe or define the scope of work.

FORM OF TENDER APPENDIX 1 – SCHEDULE FO QUANTITIES AND PRICES

.1 Section 1 - General Requirements

Item 1.01 Mobilization and Demobilization

This item includes all costs associated with mobilization and demobilization associated with the Contractors equipment, safety equipment, site facilities and services and the costs of bonding, insurance permits, fees, and security necessary to carry out and complete the work.

This item shall include costs associated with carrying out the work.

The total amount of this item shall not exceed five percent of the total tendered price. Mobilization will be processed under the first progress claim certificate and demobilization will be processed after completion of the work.

Two payments will be made at fifty percent (50%) of the lump sum price tendered for this item (one for mobilization and demobilization) in the schedule of Quantities and Prices.

Item SA-11-1.02 Traffic Control

This item includes all costs associated with obtaining relevant permits and approval from the City for carrying out traffic control at the time of construction. As well as the costs associated, including but not limited to staffing and equipment.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-1.03 Erosion & Sediment Control

This item includes all costs associated with obtaining relevant permits and approval from the City, Provincial authorities, and Ministries for carrying out construction as it pertains to health, safety, and protection and conservation of the environment.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-1.04 Quality Control/ Testing/ Start up/ Commissioning

This item includes all costs associated with the onsite testing and commissioning of all pumping and electrical equipment to confirm correct operation of all equipment including but not limited to:

- Sewage Pumps
- Valves
- Electrical Control Kiosk
- Ultrasonic and Pressure Transmitter level sensing systems in the valve chamber.
- Other related Equipment.

Specific testing and commissioning requirements are specified in the governing technical specifications and shall be used for specified procedures and tests and test reports to be carried out and provided by the contractor.

This item includes the cost for the onsite attendance of all equipment suppliers required for testing commissioning work.

Incorrect operation and/or deficiencies found during testing and commissioning will be corrected by the Contractor as required by the contract documents.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

This lump sum value of this item must be no less than 5% of the overall tender amount for this project, excluding GST.

Item SA-11-1.05 O&M Manuals & Redline Drawings

This item includes all costs associated with supplying operation and maintenance manuals, and redline as-constructed drawings for the project, to the Engineers satisfaction and approval, as specified in the contract documents.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-1.06 Contractor Design Temporary Bypass System

This item includes all costs associated with the coordination, design, supply, installation, and ongoing maintenance and monitoring of the sanitary bypassing system. The proposed pumps and system just be submitted to the Engineer for review and approval. Refer to specification 015000.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-1.07 Temporary Facilities

This item includes all costs associated with installing and eventually removing temporary (limited time and/or purpose during construction duration) facilities such as construction fences, temporary access way and other approved temporary facilities.

Incorrect removal of and/or presence of unwanted temporary facilities found after construction will be corrected by the Contractor as required by the contract documents.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-1.08 Project Identification (*INCIDENTAL*)

All signaling and project identification; Is incidental to the contract work.

This item includes all costs associated with material, labour, and equipment, selecting, and providing of site signaling during construction phase. The contractor shall meet City requirements for signaling and project identification. All permitting required for project identification is the responsibility of the contractor.

Item SA-11-1.09 Groundwater Control, Treatment, and Disposal (INCIDENTAL)

All groundwater control, treatment and disposal required; Is incidental to the contract work.

This item includes all costs associated with material, labour, and equipment, selecting, and providing groundwater treatment prior to discharge to the sanitary or drainage sewer systems. The contractor shall ensure quality of water discharged from work or extracted from ground meets City requirements for discharging into watercourse, storm sewers and sanitary sewers throughout the dewatering period. All permitting required for discharge is the responsibility of the contractor.

Item SA-12-1.01 Mobilization and Demobilization

This item includes all costs associated with mobilization and demobilization associated with the Contractors equipment, safety equipment, site facilities and services and the costs of bonding, insurance permits, fees, and security necessary to carry out and complete the work.

This item shall include costs associated with carrying out the work.

The total amount of this item shall not exceed five percent of the total tendered price. Mobilization will be processed under the first progress claim certificate and demobilization will be processed after completion of the work.

Two payments will be made at fifty percent (50%) of the lump sum price tendered for this item (one for mobilization and demobilization) in the schedule of Quantities and Prices.

Item SA-12-1.02 Traffic Control

This item includes all costs associated with obtaining relevant permits and approval from the City for carrying out traffic control at the time of construction. As well as the costs associated, including but not limited to staffing and equipment.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-1.03 Erosion & Sediment Control

This item includes all costs associated with obtaining relevant permits and approval from the City, Provincial authorities, and Ministries for carrying out construction as it pertains to health, safety, and protection and conservation of the environment.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-1.04 Quality Control/ Testing/ Start up/ Commissioning

This item includes all costs associated with the onsite testing and commissioning of all pumping and electrical equipment to confirm correct operation of all equipment including but not limited to:

- Sewage Pumps
- Electrical Control Kiosk
- Other related Equipment.

Specific testing and commissioning requirements are specified in the governing technical specifications and shall be used for specified procedures and tests and test reports to be carried out and provided by the contractor.

This item includes the cost for the onsite attendance of all equipment suppliers required for testing commissioning work.

Incorrect operation and/or deficiencies found during testing and commissioning will be corrected by the Contractor as required by the contract documents.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

This lump sum value of this item must be no less than 5% of the overall tender amount for this project, excluding GST.

Item SA-12-1.05 O&M Manuals & Redline Drawings

This item includes all costs associated with supplying operation and maintenance manuals, and redline as-constructed drawings for the project, to the Engineers satisfaction and approval, as specified in the contract documents.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-1.06 Contractor Design Temporary Bypass System

This item includes all costs associated with the coordination, design, supply, installation, and ongoing maintenance and monitoring of the sanitary bypassing system. The proposed pumps and system just be submitted to the Engineer for review and approval. Refer to specification 015000.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-1.07 Temporary Facilities

This item includes all costs associated with installing and eventually removing temporary (limited time and/or purpose during construction duration) facilities such as construction fences, temporary access way and other approved temporary facilities.

Incorrect removal of and/or presence of unwanted temporary facilities found after construction will be corrected by the Contractor as required by the contract documents.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-1.08 Project Identification (INCIDENTAL)

All signaling and project identification; Is incidental to the contract work.

This item includes all costs associated with material, labour, and equipment, selecting, and providing of site signaling during construction phase. The contractor shall meet City requirements for signaling and project identification. All permitting required for project identification is the responsibility of the contractor.

Item SA-12-1.09 Groundwater Control, Treatment, and Disposal (INCIDENTAL)

All groundwater control, treatment and disposal required; Is incidental to the contract work.

This item includes all costs associated with material, labour, and equipment, selecting, and providing groundwater treatment prior to discharge to the sanitary or drainage sewer systems. The contractor shall ensure quality of water discharged from work or extracted from ground meets City requirements for discharging into watercourse, storm sewers and sanitary sewers throughout the dewatering period. All permitting required for discharge is the responsibility of the contractor.

Item SA-16-1.01 Mobilization and Demobilization

This item includes all costs associated with mobilization and demobilization associated with the Contractors equipment, safety equipment, site facilities and services and the costs of bonding, insurance permits, fees, and security necessary to carry out and complete the work.

This item shall include costs associated with carrying out the work.

The total amount of this item shall not exceed five percent of the total tendered price. Mobilization will be processed under the first progress claim certificate and demobilization will be processed after completion of the work.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Two payments will be made at fifty percent (50%) of the lump sum price tendered for this item (one for mobilization and demobilization) in the schedule of Quantities and Prices.

Item SA-16-1.02 Traffic Control

This item includes, but is not limited to, all materials, labour, equipment, and rental equipment required for traffic control for the full duration of construction, including coordination for City approved traffic management plans.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-1.03 Erosion & Sediment Control

This item includes all costs associated with the effort of minimizing surface soil erosion during construction to satisfy applicable goals and standards set by the City, Province and/or Federal regulations (whichever is the most stringent).

This item also includes but are not limited to Sediment Control Techniques:

- Installation of silt fencing
- Cover of exposed soils subject to weathering or sloping
- Use of sediment basins and traps
- Other related and approved techniques.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-1.04 Start-Up & Commissioning

This item includes all costs associated with the onsite testing and commissioning of all pumping and electrical equipment to confirm correct operation of all equipment including but not limited to:

- Sewage pumps and motors
- Variable Frequency Drives
- Ultrasonic and Pressure Transmitter level sensing systems
- Control panel and instrumentation systems

- Bypass piping
- HVAC systems
- Lighting
- All other related Equipment.

Specific testing and commissioning requirements are specified in the governing technical specifications and shall be used for specified procedures and tests and test reports to be carried out and provided by the contractor.

This item includes the cost for the onsite attendance of all equipment suppliers required for testing commissioning work.

This item also includes all costs associated with the onsite testing and commissioning of the generator system as outlined in the contract documents to confirm correct operation of all equipment including but not limited to:

- Generator Set controls and fuel system
- Generator Ventilation
- Automatic Transfer Switch
- Generator system operation under specified loads.

Included is the testing of the fan, the sump pump, the sprinklers and moisture sensor, electrical equipment and all gauges and controls in the whole project.

Incorrect operation and/or deficiencies found during testing and commissioning will be corrected by the Contractor as required by the contract documents.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

This lump sum value of this item must be no less than 2% of the overall tender amount for this project, excluding GST.

Item SA-16-1.05 O&M Manuals & Redline Drawings

This item includes all costs associated with supplying operation and maintenance manuals, and redline as-constructed drawings for the project, to the Engineers satisfaction and approval, as specified in the contract documents.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-1.06 Contractor Design Temporary Bypass System

This item includes, but is not limited to, all materials, labour, equipment, and all other work and materials necessary to complete the work as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer.

The bypass system must be capable of managing the interim duty conditions of the proposed pump station. The Contractor must submit a bypass plan to the Engineer for review and approval

Payment for contractor designed temporary bypass system will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Two payments will be made at fifty percent (50%) of the lump sum price tendered for this item (one for bypass installation and one for bypass removal) in the schedule of Quantities and Prices.

Item SA-16-1.07 Temporary Facilities

This item includes, but is not limited to, all materials, labour, equipment, and rental equipment required to provide the necessary temporary facilities for the full duration of construction.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-1.08 Project Identification

This item includes, but is not limited to, all materials, labour, equipment, and rental equipment required to provide the necessary project identification, including coordination for City approved signage and information distribution.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-1.09 Dewatering and Groundwater Control

This item includes, but is not limited to, all materials, labour, equipment, and rental equipment, consultation, and third-party testing for all groundwater dewatering, management, and treatment required to comply with local bylaws.

This item is incidental to the contract.

.2 Section 2 – Demolition and Removals

Item SA-11-2.01 Salvage and Disposal of Existing Electrical Kiosk and Concrete Slab

Payment for salvage and disposal will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

This item shall include, but is not limited to all materials, labour, and equipment for removal, salvage and disposal of the existing electrical kiosk specified on the drawings, and all other work and materials necessary to complete the work as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-2.02 Preparation of Existing Wet Well for Upgrades

Payment for preparation of the existing wet well for the upgrade work will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

This item shall include, but not limited to all materials, labour, and equipment required for removal and disposal of all internal parts of the existing station including the ladder and intermediate platform, hoarding, and cleaning and sanitization of the inside of the wet well.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-2.01 Salvage and Disposal of Existing Electrical Kiosk and Concrete Slab

Payment for salvage and disposal will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

This item shall include, but is not limited to all materials, labour, and equipment for removal, salvage and disposal of the existing electrical kiosk specified on the drawings, and all other work and materials necessary to complete the work as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-2.02 Preparation of Existing Wet Well for Upgrades

Payment for preparation of the existing wet well for the upgrade work will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

This item shall include, but not limited to all materials, labour, and equipment required for removal and disposal of internal parts of the existing station including the ladder and cleaning and sanitization of the inside of the wet well.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-2.01 Removal and Disposal of Existing Pump Station Building

This item includes, but is not limited to, all materials, labour, equipment, required for the removal and disposal of the existing pump station building, and internal equipment as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer. The contractor is responsible for coordinating with the owner to confirm any items to be salvaged by the City.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-2.02 Removal and Disposal of Existing Concrete

This item includes, but is not limited to, all materials, labour, equipment, required for the removal and disposal of the existing building foundation and wet well and dry well concrete cover, including concrete removals for new concrete cover installation as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer. The contractor is responsible for coordinating with the owner to confirm any items to be salvaged by the City.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

.3 Section 3 – Civil and Geotechnical

Item SA-11-3.01 Landscape Reinstatement

This item includes all costs associated with reinstatement of disturbed ground within the working area to match existing ground conditions.

Included in this item are supply, placement, grading and compaction of stone as required, supply and placement of topsoil, seeding with approved grass seed, watering, surface preparation, erosion control measures, and all other work necessary to restore the area to pre-construction condition or better.

Payment will be made at the unit rate price tendered for this item in the Schedule of Quantities.

Item SA-11-3.02 Excavation and Disposal Offsite

This item includes all costs associated with the excavation and disposal offsite for installation of the valve chamber and new yard surface.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-3.03 New Sanitary Forcemain

This item includes all costs associated with the supply and installation of the forcemain including but not limited to labour, survey layout, traffic control, saw cut pavements, excavation and disposal, shoring, bedding, imported backfill, granular base and sub-base, pipe installation, fusion welding, grading, compaction, testing, flushing, and all other work and materials necessary to complete the installation as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer. All utility crossing, including but not limited to those shown in the contract drawings, and included in the unit price provided. All fusion welding must be documented using a data logger to certify that all joints are fused at the required temperature and pressure. A copy of the results shall be provided to the Engineer.

Payment will be made at the unit rate price tendered for this item in the Schedule of Quantities.

Item SA-11-3.04 Connection to Existing Sanitary Forcemain

This item includes all costs associated with the forcemain connection including but not limited to labour, excavation and disposal, shoring, bedding, imported backfill, granular base and sub-base, pipe installation, fusion welding, grading, compaction, testing, flushing, and all other work and materials necessary to complete the installation as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-3.05 Pre-Locate Existing Utilities (INCIDENTAL)

This item includes all costs associated with locating existing utilities prior to construction. This item includes but is not limited to the site hours, coordination and reporting.

This work is incidental to the contract.

Item SA-11-3.06 CCTV Inspection of Pipelines (Initial)

This item includes all costs associated with the initial CCTV Inspection of pipelines.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-3.07 CCTV Inspection of Pipelines (1 Year)

This item includes all costs associated with the CCTV Inspection of pipelines after 1 year from substantial completion.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-3.08 Cap and Abandon Existing Forcemain

This item includes all costs associated with the permanent capping and abandonment of the existing sanitary discharge pipe outside of the existing wet well.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-3.09 Relocate Existing Hydrant-Controlled Water Valve

This item includes all costs associated with the relocation of the existing hydrant-controlled water valve, including excavation, removal, adjustment, reconnection to the existing watermain, and reinstatement of all affected surfaces, as shown on the contract drawings and as directed by the Contract Administrator.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-3.01 Asphalt Reinstatement

This item includes all costs associated with the supply, placement, and compaction of asphalt pavement for reinstatement of all disturbed areas, including tie-in of new asphalt pavement to existing asphalt pavement, as shown on the contract drawings and in accordance with the specifications.

Payment will be made at the unit rate price tendered for this item in the Schedule of Quantities.

Item SA-12-3.02 Site Fill & Base Material

This item includes all costs associated with the excavation and disposal offsite for installation of the new yard surface.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-3.03 Excavation and Disposal Offsite

This item includes all costs associated with the excavation and disposal offsite for installation of the valve chamber and new yard surface.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-3.04 Pre-Locate Existing Utilities (INCIDENTAL)

This item includes all costs associated with locating existing utilities prior to construction. This item includes but is not limited to the site hours, coordination and reporting.

This work is incidental to the contract.

Item SA-16-3.01 Pre-Locate Existing Utilities

This item includes, but is not limited to, all materials, labour, equipment, required to pre-locate all utility crossings and provide survey files to the Engineer for review.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-3.02 Site Grading and Restoration

This item includes, but is not limited to, all materials, labour, equipment, and third party testing required for site grading and restoration, as per Contract Drawings and specifications.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-3.03 CCTV Inspection of Pipelines (Initial)

This item includes, but is not limited to, all materials, labour, equipment, required for video inspection of all sanitary pipe, including a written report, immediately after completion of construction.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-3.04 CCTV Inspection of Pipelines (One Year)

This item includes, but is not limited to, all materials, labour, equipment, required for video inspection of all sanitary pipe, including a written report, one year after issuance of Substantial Completion.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-3.05 Supply and Install Sanitary Forcemain

This item includes, but is not limited to, all materials and labour, survey layout, traffic control, saw cut pavements, excavation and disposal, shoring, dewatering, bedding, imported backfill, granular base and sub-base, pipe installation, fusion welding, air and vacuum release valve assembly, backfilling, grading, compaction, pressure testing, flushing, and all other work and materials necessary to complete the installation as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer.

All fusion welding must be documented using a data logger to certify that all joints are fused at the required temperature and pressure. A copy of the results shall be provided to the Engineer. Restoration of surfaces shall be included in this pay item including full depth initial asphalt restoration, restoration of curb and gutter, and restoration of sidewalks and boulevards per city standards.

All dewatering, groundwater treatment and discharge, and permitting are incidental to the work.

Payment for this item will be made at the unit rate price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-3.06 Water Service and Associated Works

This item includes all costs associated with the supply and installation of water service piping and fittings required for the work as indicated on the drawings or as required for a complete installation. This item also includes valve boxes, backflow preventers, water meters, curb stops, tie-ins, and flushing and testing. Excavation, trenching, placements, bedding, backfilling and surface restoration is also included.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-3.07 Asphalt Parking Pad

This item includes all costs associated with the construction of an asphalt parking area for City of New Westminster Maintenance Vehicles. The driveway structure shall be designed and

constructed in accordance with the applicable City of New Westminster standards and specifications.

Work includes final grading, supply and placement of base materials, concrete curbs where required, compaction of granular road materials, hot mix asphalt pavements, and other related items to paved areas.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-3.08 Rollover Curb and Sidewalk

This items includes, but not limited to, all materials, equipment and labour, survey layout, traffic control, excavation and disposal, all appurtenant structures, shoring, dewatering, concrete, rebar, compaction, form work, grading, testing, and all other work and materials necessary to complete the construction as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Contract Administrator.

Payment for this item will be made at the unit rate price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-3.09 Supply and Install Perimeter Security Fence c/w Roller Gate

This item includes, but is not limited to, all materials, equipment and labour, traffic control, excavation and disposal, concrete bases, grading and all other work and materials necessary to complete the perimeter fencing and roller gate as specified in the Contract Drawings and Specifications.

Payment for this item will be made at the lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-3.10 Supply and Install Bollards

This item includes, but is not limited to, all materials, equipment and labour, survey layout, traffic control, supply and install bollards including accessories, painting, and all other work and materials necessary to complete the installation as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Contract Administrator.

Payment for this item will be made at the unit rate price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-11-4.01 Flygt NP 3102 SH 6.43HP Submersible Pumps

This item includes all costs associated with the installation of two (2) Flygt NP 3102 SH 6.43HP Submersible Pumps complete with guide rails, brackets, and base elbows and all appurtenances, as per Contract Drawings and Specifications.

Installation of the pumps must be performed by the pump supplier (Xylem) and the FRP supplier (Barski).

Payment will be made at the unit rate price tendered for this item in the Schedule of Quantities.

Item SA-11-4.02 Piping & Valves

This item includes all costs associated with the supply and installation of the following:

1. Stainless steel piping in the valve chamber, and direct buried in the yard.
2. All check valves, plug valves, knife gate valves, air valves, bypass camlock and flow meter located inside and outside the valve chamber, including actuators, drains, and all related fittings, brackets, assemblies and related components.
3. Contractor designed pipe supports.
4. Supplier shop drawings.

Refer to Contract Drawings and Specifications for piping and valves details.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-4.03 FRP Wet Well Modifications

This item includes all costs associated with the modifications required inside of the existing FRP wet well. This work includes, but is not limited to:

- Repair to the existing FRP wet well to seal existing penetrations.
- Modifications to the existing FRP wet well to create new penetrations for the proposed pipes and conduits.
- Modifications to remodel the existing wet well floor to accommodate rotation of pumps, including concrete removal as required.
- Supply and installation of an aluminum ladder.
- Supply and installation of a new exhaust fan.

All work associated with FRP modifications, including any and all modifications to the existing wet well, must be carried out exclusively by Barski Industries personnel.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11 4.04 FRP Piping within Wet Well

This item includes all costs associated with the supply and installation of the FRP discharge piping inside of the existing wet well.

All work associated with FRP modifications, including any and all modifications to the existing wet well, must be carried out exclusively by Barski Industries personnel.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-4.01 Flygt NP 3085 MT 3HP Submersible Pumps

This item includes all costs associated with the installation of two (2) Flygt NP 3805 MT 3HP Submersible Pumps complete with guide rails, brackets, and base elbows and all appurtenances, as per Contract Drawings and Specifications.

Installation of the pumps must be performed by the pump supplier (Xylem) and the FRP supplier (Barski).

Payment will be made at the unit rate price tendered for this item in the Schedule of Quantities.

Item SA-12-4.02 FRP Wet Well Modifications

This item includes all costs associated with the modifications required inside of the existing FRP wet well. This work includes, but is not limited to:

- Repair to the existing FRP wet well to seal existing penetrations.
- Modifications to the existing FRP wet well to create new penetrations for the proposed pipes and conduits.
- Modifications to remodel the existing wet well floor to accommodate rotation of pumps, including concrete removal as required.
- Supply and installation of an aluminum ladder.
- Supply and installation of a new exhaust fan.

All work associated with FRP modifications, including any and all modifications to the existing wet well, must be carried out exclusively by Barski Industries personnel.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-4.01 Flygt Model 3127 LT 3 Phase 425 Sanitary Pumps

This item includes all costs associated with supplying and installation of two (2) sewage pumps complete with guide rails, brackets, and base elbows.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Fifteen percent (15%) of the submitted price for this item in the Schedule of Quantities and Prices in the Proposal Submission Form will be held back until after the testing and commissioning is complete and the O&M manuals have been submitted.

Item SA-16-4.02 Piping & Valves

This item includes all costs associated with the supply and installation of the following:

5. 316L SCH10 stainless steel piping in the wet well and valve chamber.
6. All check valves, plug valves, knife gate valves, air valves, actuators, drains, including all related fittings, supports, brackets, assemblies and related components.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Fifteen percent (15%) of the submitted price for this item in the Schedule of Quantities and Prices in the Proposal Submission Form will be held back until after the testing and commissioning is complete and the O&M manuals have been submitted.

Item SA-16-4.03 Metal Works

This item includes all costs associated with the supply, fabrication, and installation of all metal works required for the pump station, including but not limited to:

1. Aluminum USF Access Hatches.
2. Ladder and Pull-Up Bars.
3. Pipe Supports & Anchors Designed by Contractor.
4. Lifting Davits.
5. Grating.
6. Vent Pipes.

Included in this item are any hardware, galvanizing, painting, welding, shop drawing review, engineering services and anything else required to complete the metal works as identified on the Contract Drawings and Specifications.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities and Prices.

.5 Section 5 – Structural

Item SA-11-5.01 Pre-Cast Reinforced Concrete Valve Chamber.

This item includes all costs associated with the supply and installation of the pre-cast reinforced concrete valve chamber, including the custom access hatch cast-in to the valve lid.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-5.02 Cast-In-Place Concrete Slab

This item includes all costs associated with the supply and installation of cast-in-place reinforced concrete slabs for the electrical control's kiosk, as per contract drawings and specifications.

This includes coordinating confirmation from the structural engineer that the pads designed are suitable for the final approved shop drawings for the kiosk, and coordination of all conduit locations.

Payment will be made at the unit rate price tendered for this item in the Schedule of Quantities.

Item SA-12-5.01 Cast-In-Place Concrete Slabs

This item includes all costs associated with the supply and installation of cast-in-place reinforced concrete slabs for the electrical control's kiosk, as per contract drawings and specifications.

This includes coordinating confirmation from the structural engineer that the pads designed are suitable for the final approved shop drawings for the kiosk, and coordination of all conduit locations.

Payment will be made at the unit rate price tendered for this item in the Schedule of Quantities.

Item SA-12-5.02 Cast-In-Place Wet Well Slab

This item includes all costs associated with the supply and installation of cast-in-place reinforced concrete cover slabs for the wet well, in accordance with the contract drawings and specifications.

This work includes all formwork, reinforcing steel, openings, anchor points, and coordination with all penetrations shown on the drawings.

Payment will be made at the unit price tendered for this item in the Schedule of Quantities.

Item SA-16-5.01 Polyurethane Liner for Wet Well and Valve Chamber

Payment for this item will be at lump sum price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

The lump sum price shall include but not limited to all work and materials necessary to supply and install OBIC Guard 1306 Armor liner to all interior wet well and valve chamber concrete surfaced. including preparation of existing surfaces as per manufacturers recommendations.

The Contractor must consult with a technical representative regarding installation procedures and priming requirements, and submit a proposed procedure to the Engineer for information.

Item SA-16-5.02 Cast-In-Place Wet Well and Valve Chamber Cover

This item includes all costs associated with the construction of the wet well and valve chamber concrete cover.

Included in this item are formwork, formwork supports, steel reinforcement, block-outs, metal inserts, fasteners, embedded metals, concrete, concrete mix submissions, concrete additives, concrete placement, concrete compaction, curing, concrete finishing, concrete testing and other related items, including adherence to all specifications on the structural drawings.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities and Prices.

Item SA-16-5.03 Cast-In-Place Concrete Pads

This item includes all costs associated with the construction of the concrete pads for the electrical kiosk and generator.

Included in this item are formwork, formwork supports, steel reinforcement, block-outs, concrete benching metal inserts, fasteners, embedded metals, pipe penetrations, concrete, concrete mix submissions, concrete additives, concrete placement, concrete compaction, curing, concrete finishing, concrete testing and other related items, including adherence to all specifications on the structural drawings.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities and Prices.

Item SA-16-5.04 **Cast-In-Place Wet Well and Valve Chamber Walls, Floors and Benching**

This item includes all costs associated with the construction of the below grade walls and floors inside the wet well and valve chamber.

Included in this item are formwork, formwork supports, steel reinforcement, block-outs, concrete benching metal inserts, fasteners, embedded metals, pipe penetrations, concrete, concrete mix submissions, concrete additives, concrete placement, concrete compaction, curing, concrete finishing, concrete testing and other related items, including adherence to all specifications on the structural drawings. This also includes all preparatory work to the existing structure, and structure fill, as required to complete the work.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities and Prices.

.6 Section 6 – Pump Station Electrical

Item SA-11-6.01 **Instrumentation in Wet Well, Wiring and Communications System**

This item includes all costs associated with the supply and installation of all electrical works required to complete the pump station as per the Contract Drawings and Specifications, which isn't otherwise explicitly noted in other pay items to complete the electrical systems, including wiring, conduits, junction boxes and all electrical and communications systems.

This includes any, and all coordination, labour, equipment and materials required to complete the work.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-6.02 **Generator Restoration**

This item includes all costs associated with the cleaning, sanding and re-painting of the existing standby generator system as specified in the contract documents.

This item includes labor, equipment and materials required to supply all related equipment to carry out the cleaning, sanding & painting of the existing generator enclosure.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-6.03 Electrical Kiosk and Controls

This item includes all costs associated with the supply, installation, testing and commissioning of a new electrical kiosk on a concrete pad. Refer to electrical specifications for details.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-11-6.04 SCADA Communications Including Antenna, Assembly and Pole

This item includes all costs associated with the supply and installation of the SCADA antenna, mast, base, assembly, wiring and conduits, and all other items required as per the Contract Drawings and Specifications.

This item also includes all shop testing, field testing, and commissioning of the SCADA system.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-6.01 Instrumentation in Wet Well, Wiring and Communications System

This item includes all costs associated with the supply and installation of all electrical works required to complete the pump station as per the Contract Drawings and Specifications, which isn't otherwise explicitly noted in other pay items to complete the electrical systems, including wiring, conduits, junction boxes and all electrical and communications systems.

This includes any, and all coordination, labour, equipment and materials required to complete the work.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-6.02 Electrical Kiosk and Controls

This item includes all costs associated with the supply, installation, testing and commissioning of a new electrical kiosk on a concrete pad. Refer to electrical specifications for details.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-12-6.03 SCADA Communications Including Antenna, Assembly and Pole

This item includes all costs associated with the supply and installation of the SCADA antenna, mast, base, assembly, wiring and conduits, and all other items required as per the Contract Drawings and Specifications.

This item also includes all shop testing, field testing, and commissioning of the SCADA system.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-6.01 Electrical Service

This item covers all costs associated with the coordination and scheduling with new power service, including but not limited to materials, labour, and coordination, as indicated on the Contract Drawings and Specifications.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-6.02 Generator Set

This item includes all costs associated with the supply, installation, testing and commissioning of a new standby generator system on a concrete pad as specified in the contract documents.

This item includes labor, equipment and materials required to supply and install the complete generator set and all related items required for the generator system including interconnecting control and power wiring to the electrical kiosk and transfer switch.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Fifteen percent (15%) of the submitted price for this item in the Schedule of Quantities and Prices in the Proposal Submission Form will be held back until after the testing and commissioning is complete and the O&M manuals have been submitted.

Item SA-16-6.03 Electrical Kiosk

This item includes all cost associated with supply and installation of the electrical kiosk, including but not limited to materials and labour, survey layout, traffic control, supply and install electrical kiosk and control, supply and install all electrical wiring and conduits including the power supply to pump station, flow meter chamber and kiosk, testing, and all other work and materials necessary to complete the installation as specified in the specifications or as shown on the Contract Drawings or as otherwise directed by and to the satisfaction of the Engineer.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Fifteen percent (15%) of the submitted price for this item in the Schedule of Quantities and Prices in the Proposal Submission Form will be held back until after the testing and commissioning is complete and the O&M manuals have been submitted.

Item SA-16-6.04 Instrumentation

This item includes all costs associated with the supply and installation of the following:

1. Pressure transmitters.
2. Pressure gauges.
3. Flow meters
4. Flow switches.
5. Ultrasonic level sensors.
6. All other related equipment identified in the Contract Drawings and Specifications.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Fifteen percent (15%) of the submitted price for this item in the Schedule of Quantities and Prices in the Proposal Submission Form will be held back until after the testing and commissioning is complete and the O&M manuals have been submitted.

Item SA-16-6.05 SCADA Antenna and Assembly

This item includes all costs associated with the supply and installation of the SCADA antenna, mast, base, assembly, wiring and conduits, and all other items required as per the Contract Drawings and Specifications.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-6.06 Electrical Systems

This item includes all costs associated with the supply and installation of all electrical works required to complete the pump station as per the Contract Drawings and Specifications, which isn't otherwise explicitly noted in other pay items to complete the electrical systems including power, distribution, lighting, and instrumentation.

This includes any and all labour, equipment and materials required.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Fifteen percent (15%) of the submitted price for this item in the Schedule of Quantities and Prices in the Proposal Submission Form will be held back until after the testing and commissioning is complete and the O&M manuals have been submitted.

Item SA-16-6.07 4" Communication Conduit

This item includes all costs associated with the supply and installation of the communications conduit as per the Contract Drawings and Specifications.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

.7 Section 7 – Optional

Item 7.01 Over Excavation and Disposal Offsite (*PROVISIONAL*)

This item includes all costs associated with over excavation and disposal of the unsuitable native materials at the subgrade level, as directed by the Engineer, and the replacement of unsuitable materials with imported granular materials meeting the contract specifications.

All dewatering, groundwater treatment and discharge, and permitting are incidental to the work.

Payment for this item will be made at the unit price tendered for this item for each cubic meter in place based on site measurements taken and agreed to prior to backfilling.

Item 7.02 Stainless Steel Piping within Wet Well (*PROVISIONAL*)

This item includes all costs associated with the supply and installation of SS 316L SCH10S discharge piping inside of the existing wet well.

If the owner elects to use stainless steel piping instead of FRP piping, payment for this item will be made at the lump sum price tendered for this item in the Schedule of Quantities, in lieu of pay item 4.04.

Item SA-16-7.01 Alternate Forcemain Profile and Blow-Down Assembly (*Provisional*)

This item covers all costs associated with the alternate forcemain profile identified in the contract drawings, to avoid conflicts with existing utilities, and supply and installation of the blow-down chamber as per Contract drawings and specifications. This include all labour and materials, including additional shoring, excavation, and backfill, to achieve the lower pipe elevations and chamber installation.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

Item SA-16-7.02 Rock Removal (*Provisional*)

Rock will be measured in cubic meters. This item provides compensation for the additional cost of removing and disposing of rock not included as excavation work under other related excavation pay items. Rock excavation shall include the excavation and disposal of all rock materials which in the opinion of the Engineer requires for its removal either drilling, blasting, or breaking with a power-operated hand tool. Rock does not include clay, hardpan, or boulder clays.

Rock excavation shall include individual boulders or other continuous unbreakable concrete debris having individual volumes more than 1 cubic meter. Volume will be calculated from cross-section of original rock surface and design subgrade lines for excavation.

Payment for this item will be made at the unit rate price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-7.03 Over Excavation (Provisional)

This item includes all costs associated with over excavation and disposal of the unsuitable native materials at the subgrade level, as directed by the Engineer, and the replacement of unsuitable materials with imported granular materials meeting the contract specifications.

All dewatering, groundwater treatment and discharge, and permitting are incidental to the work.

Payment for this item will be made at the unit rate price submitted in the Schedule of Quantities and Prices in the Proposal Submission Form.

Item SA-16-7.04 Allowance for Structural Assessment of Existing Overflow Tank

This item includes all costs associated with providing unimpeded access and accommodating a structural assessment of the existing overflow tank during construction while the system is under bypass operations.

Included in this item are coordination with the City and the City's structural consultant, maintaining the bypass system as required, safe access, lighting, ventilation, cleaning as required, scheduling constraints, and all other measures necessary to allow the structural assessment to be carried out without obstruction for a minimum duration of three (3) consecutive working days.

Payment will be made at the lump sum price tendered for this item in the Schedule of Quantities.

END SECTION 01 43 00

1. GENERAL

1.1 INSPECTION

- .1 Refer to General Conditions.

1.2 TESTING SERVICES

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Engineer are specified under various sections.
- .2 Engineer will appoint and pay for services of testing laboratory except for the following:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of conveying system, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests specified to be carried out by Contractor under the supervision of Engineer.
- .3 Where tests or inspections by designated testing laboratory reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests or inspections as Engineer may require to verify acceptability of corrected work.
- .4 Contractor's responsibilities include:
 - .1 Furnish labour and facilities to:
 - .1 Provide access to work to be inspected and tested.
 - .2 Facilitate inspections and tests.
 - .3 Make good work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
 - .2 Notify Engineer/Inspector 48hrs in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
 - .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

- .4 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Engineer.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency and Engineer in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 DEFECTIVE OR IMPROPER WORK

- .1 Refer to General Conditions.

1.6 REPORTS

- .1 Submit 1 electronic copy of inspection and test reports to Engineer.
- .2 Provide copies to subcontractor of work being inspected or tested.

1.7 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Engineer and may be authorized as recoverable.

1.8 MILL TESTS

- .1 Submit mill test certificates as may be requested.

1.9 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to individual for definitive requirements.

2. PRODUCTS

2.1 NOT USED

.1 Not Used.

3. EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION 01 45 00

1. GENERAL

1.1 DESCRIPTION

- .1 The work of this section includes the provision of a temporary bypass pumping system to operate during the duration of the pump station upgrade work and as required to carry out the work of the contract. The bypass pumping system is to be installed, tested, and confirmed to be fully operational prior to isolation of the existing pump station and remain operational until all upgrades are complete and the new pumps and valves are fully commissioned and accepted, as determined by the Contract Administrator at which time the bypass system is to be removed.
- .2 The bypass pumping system is a critical component of the Work and all components thereof must be of adequate quality and reliability.
- .3 The required capacity of the contractor designed bypass pumping system is 9.0 L/s. The contractor is responsible for electing the bypass collection and discharge location, and for confirming the total head for sizing the pumps.

1.2 GENERAL DESCRIPTION OF COMPONENTS

- .1 The main components of the bypass pumping system include:
 - .1 Bypass pumps and automatic level control systems;
 - .2 Suction and discharge piping, valves and fittings including road ramps as required to maintain safe vehicle and pedestrian access;
 - .3 Electric and/or diesel powered;
 - .4 Redundancy in case of power failure or pump malfunction;
 - .5 Automated alarm and control system;
 - .6 Testing and commissioning of the bypass pumping system;
 - .7 Bypass system shall be from portable diesel generator or from a temporary power service (fully coordinated and provided by the Contractor) a BC Hydro service.

1.3 CONTRACTOR RESPONSIBLE FOR BYPASS SYSTEM

- .1 The bypass system shall be designed, installed, operated and maintained solely by the Contractor.
- .2 The Contractor shall submit an emergency response plan which will be implemented in the event of a bypass system failure or malfunction which results in high water levels (above high water alarm float) and can be implemented in an acceptable time period.
- .3 In the event of a backup, overflow, or other malfunction attributable to the bypass

pumping system which causes damage to the surrounding areas, the Contractor shall be solely responsible for all costs and repairs associated by such event.

1.4 SUBMITTALS

- .1 Details of the bypass pumping system, including the emergency response plan, must be submitted to the Contract Administrator as part of the Environmental Protection Plan (EPP) for review prior to installation. A bypass design and operational memorandum detailing the emergency response plan, system components, performance, spill contingency and operational details is to be submitted to the Contract Administrator for review prior to installation.

1.5 ADDITIONAL BYPASS PUMPING SYSTEM REQUIREMENTS

- .1 The basic requirements of the bypass pumping system include:
 - .1 Mufflers or enclosures for diesel engines to reduce noise from the generator and must not exceed allowable levels (70 dB), minimizing disturbance to local residence.
 - .2 Remedial measures to restore the temporary bypass system to proper operation in the event of a system malfunction of local or remote alarm.
 - .3 Emergency generator power plug for connecting to the bypass pump electrical system (in the event of a loss of power) adequate to run the bypassing system.
- .2 The Contractor shall must provide at their cost a generator system, or vacuum trucking plan, adequate to run all pumps during all power cut-overs and BC Hydro switchovers.

2. PRODUCTS

Not Used

3. EXCUTION

Not Used

END OF SECTION 01 50 00

1. GENERAL

1.1 INSTALLATION AND REMOVAL

- .1 Provide lockable temporary field office as required during construction in locations directed by the CA.
- .2 Remove promptly from site all such facilities after use.

1.2 SECURITY

- .1 Provide adequate site security at all times to prevent unauthorized entry into the work area.
- .2 Repair, at no cost to the Owner, any damage to the Work caused by theft or vandalism.

1.3 CONTRACTOR'S SITE OFFICE

- .1 Provide office of sufficient size to accommodate site meetings and furnished with drawing laydown table.

1.4 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide adequate weathertight shed(s) for storage of materials, tools, and equipment which are subject to damage by weather.
- .2 Maintain shed(s) in a neat and clean condition.

1.5 FIRST AID FACILITIES

- .1 Provide and maintain on site, in a clean orderly condition, completely equipped First-Aid facilities readily accessible at all times to Contractor's employees. Facilities and staffing to be in accordance with the WorkSafeBC requirements.

1.6 ACCESS ROADS AND PARKING AREA

- .1 Provide temporary access, parking areas and coordination with Queen Elizabeth Elementary School as required.
- .2 Remove from site all such work after use.
- .3 Parking will be permitted on site provided it does not disrupt the performance of Work.

2. PRODUCTS

2.1 NOT USED

- .1 Not Used.

3. EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION 01 52 00

1. GENERAL

1.1 INSTALLATION AND REMOVAL

- .1 Provide temporary barriers and enclosures as required to protect against injury and damage.
- .2 Remove from site all such work after use.

1.2 HOARDING

- .1 Provide hoarding and fencing where required to protect public and private property from injury or damage.

1.3 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

1.4 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.5 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Be responsible for damage incurred due to lack of or improper protection.

2. PRODUCTS

2.1 NOT USED

- .1 Not Used.

3. EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION 01 56 00

1. GENERAL

1.1 FINAL CLEANING

- .1 In preparation for Substantially Performance, perform final cleaning.
- .2 Prior to final review, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by Owner or other contractors.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris other than that caused by Owner or other Contractors.
- .6 Remove waste materials from site at regularly scheduled times or dispose of as directed by Engineer. Do not burn waste materials on site, unless approved by Engineer.
- .7 Remove stains, spots, marks and dirt from public art work, electrical and mechanical equipment, walls, roofs, and floors.
- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .10 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .11 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .12 Remove dirt and other disfiguration from exterior surfaces.
- .13 Clean and sweep roofs, boardwalk, and genset area..
- .14 Sweep and wash clean paved areas.
- .15 Clean roofs, downspouts, and drainage systems.
- .16 Remove snow and ice from access to building.

2. PRODUCTS

2.1 NOT USED

- .1 Not Used.

3. EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION 01 74 11

1. GENERAL

1.1 REQUIRED

- .1 As-built drawings
- .2 Equipment and systems
- .3 Product data, materials and finishes, and related information
- .4 Operation and maintenance data
- .5 Final site survey
- .6 Spare parts, special tools and maintenance materials
- .7 Warranties and bonds

1.2 SUBMISSION

- .1 Prepare instructions data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Engineer's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to Engineer, a PDF copy of the maintenance manuals.
- .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 provide.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at Contractor's expense.
- .8 Pay costs of transportation.

1.3 FORMAT

- .1 Organize data as instructional manual.
- .2 PDF submission via email and download link.
- .3 Cover: identify PDF with title 'Project Record Documents'; list title of project and identify subject matter of contents.

- .4 Arrange content by systems, under Section numbers and sequence of Table of Contents.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Engineer 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: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Engineer 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.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.

- .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
- .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
- .4 Field changes of dimension and detail.
- .5 Changes made by change orders.
- .6 Details not on original Contract Drawings.
- .7 References to related shop drawings and modifications.
- .2 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .3 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .4 Provide digital photos, if requested, for site records.

1.7 FINAL SURVEY

- .1 Submit final site survey drawing certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Include installed colour coded wiring diagrams.
- .3 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.

- .4 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .5 Provide servicing and lubrication schedule, and list of lubricants required.
- .6 Include manufacturer's printed operation and maintenance instructions.
- .7 Include sequence of operation by controls manufacturer.
- .8 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .9 Provide installed control diagrams by controls manufacturer.
- .10 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .11 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .12 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .13 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .14 Additional requirements: as specified in individual specification sections.

1.9 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

1.10 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.

- .4 Receive and catalogue items.
- .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.

1.11 STORAGE, HANDLING, AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Engineer.

1.12 WARRANTIES AND BONDS

- .1 Identify each individual warranty and list in a Table of Contents.
- .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 10 days after completion of applicable item of work.

- .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .1 Co-execute submittals when required.
 - .2 Retain warranties and bonds until time specified for submittal.
- .5 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .6 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .7 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Engineer to proceed with action against Contractor.

2. PRODUCTS

2.1 NOT USED

- .1 Not Used.

3. EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION 01 78 00

1. GENERAL

1.1 GENERAL

- .1 This Section contains general requirements for testing and commissioning of all equipment supplied and/or installed under this Contract. This Section supplements but does not supersede specific testing requirements found elsewhere in the Specifications.
- .2 The Contractor shall not cover up any previously completed work until that work has been inspected and approved. The Contractor shall notify the Engineer in writing at least five (5) working days in advance of the required approval. The Contractor shall not be entitled to claim extra payment for delays caused by late approval.
- .3 The Contractor shall be responsible for all pre-start checks, testing, commissioning and start-up of equipment installed under this Contract unless otherwise noted. Detailed requirements for each system and item of equipment are provided in the appropriate technical specification sections.
- .4 The Contractor shall be responsible for providing and filling all process units and process systems with the specified fluids except as noted.

1.2 CONTRACTOR'S TESTING AND COMMISSIONING TEAM

- .1 The Contractor shall establish a testing and commissioning team that includes representatives of his mechanical, electrical and instrumentation subtrades, and others as appropriate. The testing and commissioning witness team shall include representatives of the Owner and the Engineer.

1.3 TESTING AND COMMISSIONING PLAN

- .1 The Contractor shall provide a commissioning plan to the Engineer for approval in accordance with Section 01 91 13.13. The plan will include all testing as specified in this section as well as standard manufacturer's testing for the equipment, as appropriate.
- .2 The testing and commissioning plan will include:
 - .1 A calibration program for temporary instruments, gauges, meters, and thermometers used for determining the performance of equipment and systems.
 - .2 A calibration program for permanently installed instruments, meters, monitors, gauges, and thermometers.
 - .3 A detailed testing and commissioning plan, setting forth step-by-step descriptions of the procedures proposed for the testing and commissioning of all equipment. This shall include a description of each test, date of test, tasks to be completed prior to the test, tasks for each test and assigned responsibility, the test duration, test operational or performance requirement to be met.

- .4 A detailed plan for commissioning the equipment and integrating it into the overall system.
- .5 A description of the temporary systems and installations planned to allow testing to take place.
- .6 A schedule establishing the expected time period (calendar dates) when the Contractor plans to commence pre-operational (installation) checks, performance testing, operational testing and commissioning of the completed systems.
- .7 Documentation to record the results of equipment and system tests, including a system to catalogue and sign-off on each test.
- .8 Pre-operational Checkout test results of equipment and systems prior to commencing Equipment and System Performance testing.

2. PRODUCTS

2.1 GENERAL

- .1 Industry standard test equipment required for performing the specified tests shall be provided by the Contractor and approved by the Engineer. Any proprietary vendor specific test equipment or software shall be provided by that vendor or manufacturer

3. EXECUTION

3.1 GENERAL

- .1 The three (3) phases of Testing and Commissioning include Pre-operation Checkout, Start-up and Functional Test, and Commissioning.
- .2 The Work is to be done in accordance with the detailed testing and commissioning specification 01 81 00 and Divisions 16 electrical specifications.

3.2 PRE-OPERATIONAL CHECK-OUT

- .1 Continuity Testing
 - .1 Testing of the circuit from the field to the termination assembly (or from the termination assembly to the field) to ensure that the circuit is complete and wiring is correct and properly landed. Note that for circuits utilizing buss technology, (devicenet, foundation field buss), continuity testing becomes less practical and may be included as part of loop testing.
 - .2 The Engineer is responsible for the acceptance or rejection of any and all test results.
 - .3 The Contractor is to provide the following deliverables:

- .1 Documented test results and provide a record of the test in the commissioning package.
 - .2 Correctly wired system(s).
 - .3 Confirmation of instrument loop drawing and motor control schematic drawing accuracy.
- .2 Process Mechanical Pre-Operational Checkout
 - .1 Checkouts are to include, but are not limited to, alignment of equipment, adherence to manufacturer's installation and pre start-up specifications, equipment lubrication, tank and vessel inspections, hydrostatic and pneumatic pressure tests etc.
 - .2 Contractor is responsible for confirmation of satisfactory equipment installation and set-up required for subsequent operation and commissioning, and for providing a record of the tests and checkouts performed in the commissioning package.
 - .3 The Contractor is to supply to the Engineer documented confirmation of mechanical equipment installation accuracy and any pre-operational testing. Submit for approval:
 - .1 Pipe Flushing and Cleaning Forms (as required)
 - .2 Pipe Pressure Test Record Form
 - .3 Pipe and Equipment Disinfection Certification Forms where applicable.
 - .4 Equipment Installation Certification Form
 - .5 Pre-Commissioning Certification Form
 - .4 In coordination with the equipment and systems testing requirements in Divisions 11 and 16, the Contractor is to submit:
 - .1 Manufacturers' factory test reports.
 - .2 Field inspection and test reports.
 - .3 Manufacturers' check-test-start report
- .3 Bump Testing
 - .1 Momentarily starting motors to confirm direction of rotation and powering field instrumentation to confirm correctness of wiring.
 - .2 Contractor is responsible for the performance of the test and providing a record of the results in the commissioning package.

- .3 The Engineer will monitor the activities of the Contractor.
- .4 The Contractor is to supply to the Engineer documented test results and confirmation of wiring accuracy.

3.3 EQUIPMENT AND SYSTEM PERFORMANCE TESTING

.1 Functional Testing

- .1 All O&M Manuals must be received and approved by the Owner and Engineer prior to Functional Testing.
- .2 Operate equipment for a sufficient period of time to determine operating characteristics.
- .3 Contractor is responsible for the performance of the test and providing a record of the results in the commissioning package.
- .4 The Engineer is to monitor the activities of the Contractor. Engineer is responsible for the acceptance or rejection of the test results.
- .5 The Contractor is to supply to the Engineer:
 - .1 Documented test results,
 - .2 Equipment performance that meet contract specifications, and
 - .3 Performance benchmarks for future testing.

.2 Operational Testing

- .1 Contractor is responsible for the performance of the test and providing a record of the results in the commissioning package.
- .2 The Engineer will monitor the activities of the Contractor. Engineer is responsible for the acceptance or rejection of the test results.
- .3 The Contractor is to supply to the Engineer:
 - .1 Documented test results.
 - .2 Equipment performance that meet contract and manufacturers' specifications.
 - .3 Equipment with a proven degree of reliable operation.

.3 Acceptance for Commissioning

- .1 Acceptance by the Owner that the equipment and/or systems and all deliverables are sufficient to start the commissioning phase.

- .2 Contractor is responsible for delivering to the Engineer all test documentation and a complete commissioning package.
- .3 The Engineer will review the test documentation and commissioning package and provide feedback to the Contractor.
- .4 The Engineer is responsible for reviewing the commissioning package and either:
 - .1 Accepting it,
 - .2 Accepting it with outstanding deficiencies or
 - .3 Rejecting it.
- .5 The commissioning package, completed in advance of the final commissioning, is to include, but not be limited to:
 - .1 Commissioning plan (to be prepared by the Contractor and approved by the Engineer)
 - .2 O&M manuals
 - .3 Binder complete with all test results and deficiency list
 - .4 Maintenance folders (Fact Files)
 - .5 Spare parts
 - .6 Specialized tools
 - .7 Software and hardware
 - .8 Training materials
 - .9 Construction drawings with Contractor mark-ups
 - .10 Equipment list
 - .11 Deficiency log
 - .12 Warrantee material

3.4 COMMISSIONING

- .1 Owner Commissioning
 - .1 A process of starting the equipment and processes to run in normal and abnormal conditions as defined in the commissioning plan.
 - .2 Contractor is responsible for:

- .1 Correcting any deficiencies identified in the commissioning binder.
- .2 Providing personnel on site during normal working hours for the first two (2) days after the final commissioning to correct any deficiencies identified.
- .3 Providing personnel within two (2) hours of notice for the subsequent two (2) weeks after the final commissioning to correct any deficiencies identified.
- .3 The Engineer will maintain the deficiency list and monitor the correction of deficiencies. The Engineer will attend commissioning meetings, as required.
- .4 The Contractor is responsible for operating the equipment and/or systems as per the commissioning plan and for notifying the Engineer of any deficiencies.
- .2 Post Commissioning
 - .1 The management of any deficiencies after the closure of owner commissioning.
 - .2 Contractor is responsible for correcting any deficiencies.
 - .3 The Engineer will maintain the deficiency list and monitor the correction of deficiencies.
 - .4 The post commissioning work is completed upon sign off of the deficiency log by the Engineer.

END OF SECTION 01 81 00

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Description of overall structure of Plan and roles and responsibilities of commissioning team.
- .2 Related Requirements
 - .1 Section 01 81 00.

1.2 REFERENCE STANDARDS

- .1 American Water Works Association (AWWA)
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA-13- [02], Installation of Sprinkler Systems Handbook.
 - .2 NFPA-13-[02], Automatic Sprinkler Systems Handbook.
 - .3 NFPA-20-[03], Standard for the Installation of Stationary Fire Pumps for Fire Protection.
- .3 Public Works and Government Services Canada (PWGSC)
 - .1 PWGSC - Commissioning Guidelines CP.4 -3rd edition-[03].
- .4 Underwriters' Laboratories of Canada (ULC)

1.3 GENERAL

- .1 Provide a fully functional facility:
 - .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 City of Maple Ridge O&M personnel have been fully trained in aspects of installed systems.
 - .3 Optimized life cycle costs.
 - .4 Complete documentation relating to installed equipment and systems.
- .2 Term Cx in this section means Commissioning.
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet Owner requirements.

- .5 Produces a complete functional system prior to issuance of *Substantial Completion*.
- .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
 - .1 Overview of Cx.
 - .2 General description of elements that make up Cx Plan.
 - .3 Process and methodology for successful Cx.
- .4 Acronyms:
 - .1 Cx - Commissioning.
 - .2 BMM - Building Management Manual.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 WHMIS Safety Data Sheets (SDS).
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.
 - .7 TAB - Testing, Adjusting and Balancing.
 - .8 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
 - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
 - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.4 DEVELOPMENT OF 100% CX PLAN

- .1 Cx Plan to be 100% completed within 8 weeks of award of contract, or within 2 weeks of final approved shop drawings, to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
- .2 Submit completed Cx Plan to the Engineer and Owner and obtain written approval.

1.5 REFINEMENT OF CX PLAN

- .1 During construction phase, revise, refine and update Cx Plan to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update as required during the construction phase, and in advance of completion of the work. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to The Engineer and Owner for review and obtain written approval.

- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 The Contractor is to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 The Cx Team will consist of following members:
 - .1 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
 - .2 PWGSC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.
 - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .3 Protection of health, safety and comfort of occupants and O M personnel.
 - .4 Monitoring of Cx activities, training, development of Cx documentation.
 - .5 Work closely with members of Cx Team.
 - .3 The Contractor, subcontractors, and suppliers are responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Developing BMM.
 - .6 Ensuring implementation of final Cx Plan.
 - .7 Performing verification of performance of installed systems and equipment.
 - .8 Implementation of Training Plan.
 - .4 Construction Team: contractor, subcontractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
 - .5 Contractor's Cx agent implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.
 - .4 Preparation, submission of test reports.

- .6 City of Maple Ridge O&M team represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.
 - .2 Day-To-Day operation and maintenance of facility.

1.7 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
 - .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
 - .3 Provide names of participants to the Engineer and Owner and details of instruments and procedures to be followed.

1.8 EXTENT OF CX

- .1 Commission mechanical systems and associated equipment:
 - .1 Plumbing systems:
 - .1 Domestic CWS and HWS.
 - .2 Regular sanitary waste systems.
 - .3 Sewage pumps.
 - .4 Process Valves and Piping, including bypass and flushing systems.
 - .5 Storm water systems.
 - .6 Wel Well troll-ball washdown system.
 - .2 HVAC and exhaust systems:
 - .1 HVAC systems.
 - .2 General exhaust and louver systems.
 - .3 Smoke control systems installed is contract.
 - .4 Fire and safety systems, including fire extinguishers.
- .2 Commission electrical systems and equipment:
 - .1 High voltage:
 - .1 High voltage switch gear and transformation equipment.
 - .2 High voltage distribution systems.
 - .2 Low voltage below 750 V:
 - .1 Low voltage equipment.
 - .2 Low voltage distribution systems.
 - .3 Electronic data and communications information systems.
 - .4 Simultaneous translation systems.
 - .5 Communications systems.
 - .3 Emergency power generation systems:

- .1 Generators.
- .2 Fuel systems.
- .3 Transfer switchgear and controllers.
- .4 Uninterruptible power systems.
- .4 Lighting systems:
 - .1 Lighting equipment.
 - .2 Distribution systems.
 - .3 Emergency lighting systems, including battery packs.
 - .4 Fire exit emergency signage.
- .5 Fire alarm systems, equipment:
 - .1 Annunciators.
 - .2 Control panels.
 - .3 Fire alarm battery banks.
- .6 Other systems and equipment:
 - .1 Intrusion and access security and safety systems as follows:
 - .1 Security systems.
 - .2 Lightning protection systems.

1.9 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements:
 - .1 Compile English documentation.
 - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
 - .1 Warranties.
 - .2 Project record documentation.
 - .3 Inventory of spare parts, special tools and maintenance materials.
 - .4 Maintenance Management System (MMS) identification system used.
 - .5 WHMIS information.
 - .6 WHMIS Safety Data Sheets (SDS).
 - .7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.10 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing and Cx requirements, Cx and testing forms, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:

- .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed installation checklists (ICL).
 - .4 Completed product information (PI) report forms.
 - .5 Completed performance verification (PV) report forms.
 - .6 Results of Performance Verification Tests and Inspections.
 - .7 Description of Cx activities and documentation.
 - .8 Description of Cx of integrated systems and documentation.
 - .9 Training Plans.
 - .10 Cx Reports.
 - .11 Prescribed activities during warranty period.
- .4 Engineers and City of Maple Ridge O&M personnel to witness and certify tests and reports of results provided to by the Contractor.

1.11 COMMISSIONING FORMS

- .1 All forms included below must be executed by the Contractor for all relevant equipment. and distributed to subcontractors, suppliers' representatives, engineers, and the owner for review and acceptance.

Item	Description	Total number of days	Form
	Certificate of Satisfactory Installation (pre-commissioning)	1	100
2	Certificate of Equipment Satisfactory Performance	1	101
3	Certificate of System Performance	1	102

**CERTIFICATE OF SATISFACTORY INSTALLATION
(PRE-COMMISSIONING)
FORM 100**

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

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

**REFERENCE
SPECIFICATION:** _____

**OUTSTANDING
DEFECTS:** _____

(Authorized Signing Representative of the Manufacturer)

Date

(Authorized Signing Representative of the Contractor)

Date

**CERTIFICATE OF EQUIPMENT SATISFACTORY PERFORMANCE
FORM 101**

We certify that the equipment listed below has been operated for at least seven (7) days of which the last three (3) are consecutive and that the equipment operates satisfactorily and meets its specified operating criteria. No defects in the equipment were found. The equipment is therefore classed as “conforming”.

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

**REFERENCE
SPECIFICATION:** _____

(Authorized Signing Representative of the Manufacturer)

Date

(Authorized Signing Representative of the Subcontractor)

Date

(Authorized Signing Representative of the Contractor)

Date

(Authorized Signing Representative of the Engineer)

Date

Acknowledgement of Receipt of O&M Manuals.

(Authorized Signing Representative of the Owner)

Date

**CERTIFICATE OF SYSTEM PERFORMANCE
FORM 103**

We certify that the equipment listed below has been operated and tested as per the Specifications using wastewater for at least twenty-eight (28) days and that the equipment meets its Performance Testing Criteria, including fully automatic controls. The equipment is therefore classed as "conforming".

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

**REFERENCE
SPECIFICATION:** _____

(Authorized Signing Representative of the Supplier) Date

(Authorized Signing Representative of the Contractor) Date

(Authorized Signing Representative of the Engineer) Date

(Authorized Signing Representative of the Owner) Date

1.12 START-UP

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction.
- .3 The Engineer and City of Maple Ridge O&M personnel to monitor all of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of the Engineer and the Owner.
- .4 Performance Verification (PV):
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to the Engineer.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 The Engineer to witness and certify reported results using approved PI and PV forms.
 - .4 Contractor to completed PV reports and provide to the Engineer for acceptance.
 - .5 The Owner reserves right to verify all reported results.
 - .6 Failure of selected item shall result in rejection of PV report or report of system startup and testing.

1.13 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of HVAC systems.
 - .2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.
 - .3 Full-scale emergency evacuation exercises.

1.14 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of the Engineer and Owner, lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1. GENERAL

1.1 SCOPE OF WORK

- .1 This section specifies the requirements for supply, fabrication, coating, and installation of all non-structural metal work on the drawings and described herein. This includes but not necessarily limited to, miscellaneous embedded and non-embedded metal work, anchor bolt assemblies, lifting eyes, ladders, grating, railings, and all other metal items required for completion of all mechanical, electrical, and architectural work.
- .2 All anchors, plates, bolts, nuts and screws etc. as may be required to complete all Work and to join work of others.
- .3 All bracing cutting, drilling etc. as required to complete work and to join the work of others.

1.2 REFERENCES

- .1 CAN/CSA-G40.20, General Requirements for Rolled or Welded Structural Quality Steel
- .2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles
- .3 CAN/CSA-S16.1, Limit States Design of Steel Structures
- .4 ASTM A325, Specifications for High Strength Steel Bolts
- .5 CSA W48, Filler Metals and Allied Materials for Metal Arc
- .6 CSA W59, Welded Steel Construction
- .7 CSA W59.2, Welded Aluminum Construction
- .8 ASTM A611, Specification for Steel, Cold Rolled Sheet, Carbon, Structural
- .9 ASTM F738-M, Specification for Stainless Steel Metric Bolts, Screws, and Studs
- .10 ANSI B36.10, Pipe, Steel

1.3 SUBMITTALS

- .1 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittals.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .3 Drawings to bear the seal of a Professional Engineer registered in the Province of British Columbia for all fabricator designed assemblies, components, connections and supports.

2. PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 350W.
- .2 Steel pipe: to ASTM A53/A53M standard weight, epoxy coated.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600g/m² to CAN/CSA-G164.
- .2 Shop coat primer: to CAN/CGSB-1.40.
- .3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.
- .4 Liquid epoxy coating to AWWA C210

2.4 ISOLATION COATING

- .1 Isolate aluminum from following components, by means of bituminous paint:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.

2.5 SHOP PAINTING

- .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

2.6 ACCESS LADDERS

- .1 Stringers: 50 wide x 6 mm thick, 304L stainless steel or marine grade aluminum.
- .2 6061 marine grade aluminum rungs: 25 mm diameter 304L stainless steel or marine grade aluminum round bar.
- .3 Brackets: 50 wide x 6 mm thick, 304L stainless steel or marine grade aluminum, weld to stringers as shown on Contract Drawings, complete with fixing anchors.

2.7 TRENCH GRATING AND FRAMES

- .1 Grating for trench between wet well and MCC room shall be Fisher-Ludlow Tru-Weld Type 30-102, 38x3.2, 304L stainless steel. Tolerances and clearances should be as per manufacturer's instructions. Panel width shall not exceed 1.0m.
- .2 Grating frame shall be angle steel sized to suit the grating panels. The grating panel shall be flush with the frame after installation.

2.8 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

2.9 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION 05 50 00

1. GENERAL

1.1 DESCRIPTION

- .1 This specification details anchor bolt requirements for all equipment, machinery, and structural supports. All anchor bolts are to be cast-in-place. Substitution will only be acceptable if approved by Engineer.

1.2 REFERENCE STANDARDS

- .1 Conform to the following reference standards in accordance with project specific specifications:
 - .1 Building Code of British Columbia (BCBC)
 - .2 CAN3 A23.3, Design of Concrete Structures for Buildings.
 - .3 CSA/CAN3-S16.1, Steel Structures for Buildings (Limit States Design)

1.3 SUBMITTALS FOR REVIEW

- .1 Submit the following in accordance with Section 01 33 00:
 - .1 Product information for all bolt systems not cast-in-place to include:
 - .1 Data, indicating load capacities and embedment requirements.
 - .2 Chemical resistance.
 - .3 Temperature limitations
 - .4 Installation instructions.
 - .2 Samples of proposed adhesive and expansion type anchors.

1.4 SUBMITTALS FOR INFORMATION ONLY

- .1 Submit shop drawings in accordance with Section 01300, clearly indicating; anchor bolt type, diameter, minimum embedment length, location, materials, projection, plates, washers, nuts, sleeves and torque requirements of anchor bolts to be used.
- .2 Shop drawings to bear the seal of a professional engineer registered in the Province of British Columbia.

1.5 QUALITY CONTROL

- .1 Arrange a field demonstration of correct installation procedures with bolt manufacturer, for all adhesive and expansion anchors. Notify Engineer a minimum of forty-eight (48) hours in advance of the demonstration.

- .2 Pull out tests will be carried out by a Testing Laboratory designated by Engineer.
- .3 Pull out tests must be performed prior to the use of the anchors on site.

2. PRODUCTS

2.1 ACCEPTABLE PRODUCTS

- .1 Adhesive anchor bolts: Hilti, HVA adhesive anchors; CIA 7000 Gel Epoxy by Covert Operations.
- .2 Expansion anchor bolts: Hilti, HSL heavy duty anchors.

2.2 DESIGN CRITERIA

- .1 Design bolt sizing and spacing to BCBC; CSA/CAN3-S16.1; CAN3-A23.3 and Section 11 00 00.
- .2 Design anchor bolts with due regard for edge distances, bolt spacing and available embedment depth.
- .3 All anchor bolts to be cast-in-place. No substitution will be permitted unless approved by Engineer and equipment manufacturer.

2.3 MATERIALS

- .1 Select anchor bolt material according to exposure conditions:
 - .1 External applications or areas exposed to outside air: Stainless steel to AISI Type 316.
 - .2 Internal applications: Stainless steel to AISI Type 304.
 - .3 Permanently or intermittently submerged: stainless steel to AISI Type 316.
 - .4 Anchor bolts securing proprietary equipment: in accordance with the requirements of Section 11 00 00.
- .2 Nuts and washers to be of same material and of equal or greater strength than bolts. Tapered washers to be provided where mating surface not square with nut.

3. EXECUTION

3.1 GENERAL

- .1 Anchor bolt holes in support frames not to exceed bolt diameter by more than 25 percent, up to a limiting maximum oversizing of 12 mm.
- .2 Minimum anchor bolt diameter 12 mm.

- .3 Do not use adhesive anchors in overhead applications.
- .4 Adhesive and expansion anchor bolt locations to be reviewed by Engineer prior to use or installation.
- .5 Field work, including cutting and threading, will not be permitted on galvanized items. Protect dissimilar metals from galvanic corrosion by means of pressure tapes, coatings or isolators. Grout anchor bolts with non-shrink grout, where specified, in accordance with manufacturer's recommendations.
- .6 Provide equipment anchor bolts with sleeves to allow fine adjustment in place. Sleeves must not reduce the capacity of the anchor bolt.

3.2 INSTALLATION

.1 Cast-in-Place Anchor Bolts

- .1 Cast-in-place anchor bolts to be accurately placed and securely held in position with a template prior to and during concrete placement. Install anchor bolts complete with washers and sleeves where specified. Protect bolt threads with grease and attach nuts.

.2 Adhesive and Expansion Anchor Bolts

- .1 Limit use to locations where exposure to the following on an intermittent or continuous basis is extremely unlikely:
 - .1 Acid concentrations greater than 10 percent.
 - .2 Chlorine gas.
 - .3 Machine or diesel oils.
 - .4 Fire.
 - .5 Concrete or rod temperatures above 48°C.
- .2 Adhesive anchor to be threaded or deformed for full length of embedment. Holes to be free of rust, scale, grease and oils. Embedment length as specified or to manufacturers recommendations.
- .3 Install anchor bolts in strict accordance with manufacturer's specifications and recommendations including maximum hole diameter.
- .4 Holes to have rough surfaces, such as can be achieved using a rotary percussion drill. Locate reinforcement using non-destructive method prior to drilling.
- .5 Blow clean holes with compressed air to remove dust and standing water prior to installation.

- .6 Leave adhesive anchors undisturbed and unloaded for the entire curing period. Replace anchors which have been disturbed or loaded during the adhesive curing period at Contractor's expense. Concrete temperature (not air temperature) to be compatible with manufacturer's curing requirements.
- .7 Anchor sizing requires a minimum factor of safety of 4 to 1 (allowable load vs actual load).
- .8 Expansion anchor bolts to be free of rust, scale, grease and oils.

End of Section 05 50 10

1. GENERAL

1.1 DESCRIPTION

- .1 This section specifies the required upgrades to the pump station, which includes the supply, installation, testing and commissioning of new components within the wet well and within a new valve chamber, including the discharge piping and valves included on the contract drawings. This section is to be read in conjunction with the contract drawings and it is the contractor's responsibility to ensure the supply and installation of all items specified in both the contract specifications and contract drawings.
- .2 The Contractor is responsible for the supply and installation of the submersible pumps and also the commissioning of the entire pump station. Upgrades to the wet well, including new penetrations through the FRP wet well walls, installation of a new ladder, installation of new piping, and installation of the pumps is to be completed by the pump supplier (Xylem) and their FRP supplier (Barski Industries). No modifications to the existing wet well may be completed by any contractor other than Barski Industries.
- .3 A temporary sewage bypass pumping system is to be designed, installed and operated by the Contractor for the full duration of the installation works. All efforts should be made to reduce the duration of the bypass system by coordinating the construction and installation of the equipment with procurement lead-times. Refer to Section 01 50 00.
- .4 Coordinate all electrical connections and control equipment with Division 16 and the contract drawings.
- .5 As part of upgrading works for existing lift station the following decommissioning works are to be completed in coordination with installation of the new system.
 - .1 The existing pumps within the pump station will be disconnected, removed, cleaned and made available for City salvage.
 - .2 The existing discharge piping and valves will be removed, cleaned, and made available for City salvage.
 - .3 The intermediate platform will be removed and wet well cleaned and sanitized in advance of all FRP work and installations inside the wet well. The wet well must be kept dry, and any leaks reported to the Engineer in advance of the installation works.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - .1 ANSI/AWWA C500-[09], Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
 - .2 ANSI/AWWA C504-[10], Rubber-Seated Butterfly Valves.

- .3 ANSI/AWWA C508-[09], Swing-Check Valves for Waterworks Service, 2 inch (50 mm) through 24 inch (600 mm) NPS.
- .2 ASTM International (ASTM)
 - .1 ASTM C 478M-[11], Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
 - .2 ASTM A48, Grey Iron Castings.
 - .3 ASTM A108, Steel Bars, Carbon Cold-Finishes, Standard Quality.
 - .4 ASTM A276, Stainless Steel and Heat Resisting Steel Bars and Shapes.
 - .5 ASTM A532, Abrasion Resistant Cast Iron.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-NC-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
 - .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.
 - .4 LEED Canada-EB: O M-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.
- .4 CSA Group (CSA)
 - .1 CAN/CSA-A257 Series-[09], Standards for Concrete Pipe.
 - .2 CSA B70-[06], Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 Canadian Standards Association, CSA C22.1, Canadian Electrical Code (CEC), Safety Standard for Electrical Safety Installations.

1.3 SCHEDULING

- .1 Schedule work to minimize interruptions to existing services.
- .2 Maintain existing sewage flows during construction.

1.4 SUBMITTALS FOR REVIEW

- .1 Contractor is to review submittals prior to submission to the Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of the Work and the Contract Documents. Submittals not stamped, signed, dated and identified as to the specific project by the Contractor will be returned without being reviewed and shall be considered rejected.
- .2 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .3 Provide the following information in one complete submittal in accordance with Section 01 33 00:
 - .1 Provide manufacturer's data sheets for performance criteria, physical size, weights, finish and limitations.
 - .2 Pump performance curves developed for specified operating conditions indicating relationship between speed, capacity, head, horsepower, and efficiency; indicate the rated operating points on the curve.
 - .3 Shop drawings including plan view, sectional views of wet well and all equipment and wet well arrangement to conform with the contract drawings.
 - .4 Shop drawings for all valves identified on the contract drawings. If the valves are contained in an external valve vault, provide complete design details of the valve chamber configuration, including piping. Provide plan view, sectional views of valve vault, to conform with the contract drawings.
 - .5 Conduct factory testing on all pumps and provide pump performance curves and reports to the engineer. Factory tests are to be performed in accordance with the Hydraulic Institute test standard ANSI/HI 14.6 and to an acceptance grade of 1U.
 - .6 Operation and Maintenance Data: Provide an operation and maintenance manual for the complete pump station package, control system and genset. Include complete description of operation together with general arrangement and detailed drawings, wiring diagrams for power and control schematics, parts catalogues with complete list of repair and replacement parts with section drawings illustrating the connections and identifying numbers.

1.5 SUBMITTALS FOR INFORMATION ONLY

- .1 In addition to the submittal specified in this section, provide the following in one complete submittal in accordance with Section 01 33 00.
 - .1 Parts list complete with a list of recommended spare parts.

1.6 SERVICE CONDITIONS

- .1 Select and design submersible pumps specifically for continuous and intermittent duty pumping of raw sewage
- .2 The fluid temperature is expected to range from 5°C to 30°C.

1.7 UNIT RESPONSIBILITY

- .1 Assign unit responsibility, to the submersible pump manufacturer for installing the submersible pump and wet well components which includes (but not limited to) the pump, cable, discharge elbow, anchor bolts, lifting chain, guide rails, sump access cover and other appurtenances.

2. PRODUCTS

2.1 DESCRIPTION

- .1 Modifications to FRP wet well.
 - .1 Acceptable manufacturers/Contractors: Barski Industries/Flygt (Xylem Canada)
- .2 Valve Chamber
 - .1 Refer to contract drawings for specifications.
- .3 Valves (external to wet well)
 - .1 Provide all valves external to the wet well in coordination with the contract drawings.
 - .2 Refer to detailed valve specification sheets in this section for performance criteria and approved products:

BALL VALVES (10mm – 65mm)						
TYPE OF VALVE	SYMBOL	TYPE OF COMMODITY	OPERATING LIMITS		DESIGN LIMITS	
			PRESSURE (kPag)	TEMP. (°C)	PRESSURE (kPag)	TEMP. (°C)
Ball Valve	BV02	Raw Sewage	1000	5 to 30	1400	50
VALVE MATERIALS			VALVE DESCRIPTION			
ITEM		MATERIAL	Reference Document			
Body		Stainless Steel	Size Range		10 mm to 65 mm (Note 2 and 3)	
Ball		Stainless Steel (304)	Rating		CWP 1400 kPag	
Seats		PTFE or RTFE	Body/Valve Ends		Female Threaded	
Shaft		Stainless Steel (304 or 316) (Note 1)	Pattern		Compact, Full Port	
			Operator		Manual Lever	
			Actuator			

1. Colour to be confirmed by the Engineer and the City (applied by Contractor).
2. Including Backflush Kit.
3. Fusion Bonded Epoxy coating on all valves, interior and exterior. Specification to AWWA C550 and ANSI/ NSF Standard 61.3.

AIR VALVES						
TYPE OF VALVE	SYMBOL	TYPE OF COMMODITY				
Combination Air and Vacuum Release Valve	ARV01	Raw Sewage				
VALVE MATERIALS						
ITEM		MATERIAL	STANDARD			
Body		Stainless Steel Grade 316L	AWWA C512			
Connection size		50mm NPT threaded				
NOTES						
1 Air Release valve to be suitable for sanitary wastewater applications.						

2. Provide connection and isolation as per standard detail drawings. 3. Provide backflushing kit with valve			
ACCEPTABLE PRODUCTS			
DeZurik APCO ASU Combination Air Valve			

.4 Pipes

- .1 Provide all process piping in coordination with the contract drawings.
- .2 Refer to process fluids and pipe materials in this section.

Process Commodity Abbreviation	Process Commodity	Pipe Material
RSW (Valve Chamber)	Raw Sanitary Wastewater	Stainless Steel, Grade 316L, Schedule 10S
RSW (Wet well)	Raw Sanitary Wastewater	FRP Duplex Piping
DR	Process Drain	PVC

- .3 Refer to detailed pipe specification sheets in this section.

RSW

GENERAL					
PROCESS FLUID	SYMBOL	MAXIMUM CONDITIONS		TEST CONDITIONS	
		PRESSURE (kPa)	TEMP. (°C)	PRESSURE (kPa)	DURATION (Min.)
Raw Sanitary Wastewater	RSW	1000	30	1400	120
PIPE					
LOCATION	SIZE (mm)	MATERIAL	RATING	MATERIAL SPECIFICATIONS	REMARKS
Tunnels, Pumphouses, and Buildings	≥75	Stainless Steel, Grade 316L,	Schedule 10S	ASTM A312	
Exposed, Aboveground	≥75	Stainless Steel, Grade 316L,	Schedule 10S	ASTM A312	
Underground	≥75	Stainless Steel, Grade 316L,	Schedule 10S	ASTM A312	
Below Structures	≥75	Stainless Steel, Grade 316L,	Schedule 10S	ASTM A312	
Submerged	≥75	Stainless Steel, Grade 316L,	Schedule 10S	ASTM A312	
JOINTS					
LOCATION	SIZE (mm)	TYPE	RATING	SPECIFICATIONS	REMARKS
Pumphouses, and	≥75	Grooved Joint Victaulic 77	Same as Pipe	AWWA C606	

Buildings		standard weight Flange Adaptors to be Dresser Style 128			
Underground	≥75	Grooved Joint Victaulic 77 standard weight Flange Adaptors to be Dresser Style 128	Same as Pipe	AWWA C606	
Submerged	≥75	Grooved Joint Victaulic 77 standard weight Flange Adaptors to be Dresser Style 128	Same as Pipe	AWWA C606	
FITTINGS AND APPURTENANCES					
ITEM	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
Flanges, FF or RF	≥75	Stainless Steel, Grade 316L,	Class 150	Material: ASTM A182 Dimensions: ANSI B16.5	
Ell - Long Radius, Tees, Reducers, Reducing Outlets, Laterals	≥75	Stainless Steel, Grade 316L,	Same as Pipe	ASTM A403/Dimensions: ANSI B16.9	
3 Piece Ell	400 - 600	Stainless Steel, Grade 316L,	Same as Pipe	Material: Same as Pipe Dimensions: AWWA C208	
Plug	≥75	Stainless Steel, Grade 316L,	Class 150 Blind Flange	Material: ASTM A182 Dimensions: ANSI B16.5	
Cap, Grooved	≥75	Stainless Steel, Grade 316L,	Class 150	ASTM A234 AWWA C606	
Flange Adaptors	≥75	Same as Pipe	Same as Pipe	Flange: ANSI B16.5	
Flanged Gaskets		Bl. Neoprene			
Grooved Joint Gaskets	≥75	Coupling Manuf. Std.		AWWA C606	
NOTES					
1. All pipeline fitting and couplings to adhere to same specification as pipe.					

DR

GENERAL					
PROCESS FLUID	SYMBOL	MAXIMUM CONDITIONS		TEST CONDITIONS	
		PRESSURE (kPa)	TEMP. (°C)	PRESSURE (kPa)	DURATION (Min.)
Process Drainage	DR	275	20	1200	120
PIPE					
LOCATION	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
Underground	All	PVC	Sch 80	ASTM D1785, CSA 137.3	
JOINTS					
LOCATION	SIZE (mm)	TYPE	MAXIMUM SPACING	SPECIFICATIONS	REMARKS

Tunnels, Pumphouses, and Buildings	10 - 65 ≥75	Threaded Couplings, Malleable Iron Unions Butt Weld Grooved Joint	N/A 12m N/A 12 m	ASTM A197 ANSI B16.3, Class 300 AWWA C606	
Exposed, Aboveground	10 - 65 ≥75	Threaded Couplings, Malleable Iron Unions Butt Weld Grooved Joint	N/A 12 m N/A 12 m	ASTM A197 ANSI B16.3, Class 300 AWWA C606	
Underground		Solvent Weld	N/A	ASTM D2467, D2564	
Below Structures	10 - 65 ≥75	Threaded Couplings, Malleable Iron Unions Butt Weld	N/A 12 m N/A	ASTM A197 ANSI B16.3, Class 300	
FITTINGS AND APPURTENANCES					
ITEM	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
Flanges, FF or RF	All	Stainless Steel, Grade 316L,	Class 150	Material: ASTM A181, Gr.1 Dimensions: ANSI B16.5	
ELL - Short Radius ELL - Long Radius, Tees, Reducers, Reducing Outlets, Laterals	All	Stainless Steel, Grade 316L,	Same as Pipe Same as Pipe Same as Pipe	Material: ASTM A181, WPB Dimensions: ANSI B16.9 Material: Same as Pipe Material: ASTM A536	
3 piece ELL	400 - 550	Same as Pipe	Same as Pipe	Material: Same as Pipe Dimensions: AWWA C208	
4 Pce ELL, Tees, Reducers, Crosses, Laterals	≥600	Same as Pipe	Same as Pipe	Material: Same as Pipe Dimensions: AWWA C208	
Plug	All	Same as Pipe	Class 150 Blind Flange Same as Pipe	Material: ASTM A182 Dimensions: ANSI B16.5	
Flanged Adaptors	All	Same as Pipe	Same as Pipe	Flange: ANSI B16.5	
Flange Gaskets	75 - 250 300 - 450	Bl. Neoprene Bl. Neoprene	1.6 mm thick 3.2 mm thick	-	
Grooved Joint Gaskets	All			AWWA C606	
NOTES					
1. This includes process waste drainage from dry wells and valve chambers to wet well.					

2.2 PROTECTIVE COATINGS

- .1 Shop prime all equipment.

Fusion Bonded Epoxy coating on all valves, interior and exterior specified. Specification to AWWA C550 and ANSI/ NSF Standard 61.

3. EXECUTION

3.1 INSTALLATION

- .1 Install and initiate operation of each submersible pump and appurtenances in accordance with the Manufacturer's written instructions.
- .2 Make equipment installation and connections by skilled millwrights to the best standard.

- .3 Carry out work to produce a neat, accurate, secure, functional installation.
- .4 Install anchor bolts and concrete bases in advance of equipment installation, in accordance with manufacturer's instructions.
- .5 Arrange for the equipment manufacturer's technical representative to confirm the alignments are correct. Torque anchor bolts to manufacturer's specification.
- .6 Equipment and installation including as follows:
 - .1 Temporary sheet piling.
 - .2 Excavation.
 - .3 Connection of power to control panel as indicated.
 - .4 Connections to discharge piping and force mains.
- .7 Supply and installation of packaged sewage lift station in accordance with manufacturer's recommendations.

3.2 MANUFACTURER'S REPRESENTATIVE

- .1 Arrange for a technically qualified Manufacturer's Representative to attend the installation work, certify correct installation, train operating and maintenance staff and undertake the testing of the system for sufficient periods, to ensure the equipment is installed, operated, and maintained in accordance with the Manufacturer's recommended procedures.
- .2 The Contractor will be responsible for coordinating and conducting the commissioning of the entire pump station upgrade, which will include coordination with the pump manufacturer's representative as it pertains to the execution of the pump station as a system.
- .3 The minimum periods of site attendance of one (1) day on each trip. A "day" is defined as eight (8) working hours on site.

3.3 PERFORMANCE TESTING AND COMMISSIONING

- .1 The Contractor is responsible for conducting performance testing of the pump station, under actual operating conditions.
- .2 After installation, test each submersible pump to demonstrate compliance with operating requirements as specified in Section 01 81 00.
- .3 Commission pumping units in accordance with Section 01 81 00.
- .4 Confirm the pump station is operating satisfactorily and within all specified parameters. The following data is to be tested and reported:
 - .1 Pump flows;

- .2 Motor
- .3 Discharge pressures;
- .4 Discharge Flows
- .5 Liquid levels in wet well;
- .6 VFD speeds to obtain required flows;
- .5 Performance test to be completed to:
 - .1 The satisfaction of the Engineer.
 - .2 The satisfaction of the Vendor to ensure that warranty requirements are achieved.
- .6 Prepare a report including all filed performance testing data and submit to the Engineer within 14 days of testing.

3.4 FINAL INSPECTION

- .1 Final inspection will be made by the Engineer only after the General Contractor has advised in writing that equipment installation is in order and the system can be operated.
- .2 The Engineer will request that the equipment be operated to demonstrate that it will perform as specified.
- .3 The Engineer will advise the General Contractor in writing of any deficiencies.
- .4 Correct the deficiencies and advise the Engineer of their correction. Should the deficiencies be of a sufficiently serious nature to require the work to be re-inspected, the cost of the inspection shall be borne by the General Contractor.
- .5 Prior to handover to the City, the Contractor shall perform a final cleaning of the entire lift station works.

END OF SECTION

**Sewage Pump Station SA-11, SA-12, and
SA-16**

New Westminster, B.C.

**Electrical Specifications
Issued for Tender (260128)**

**Watanabe Engineering Ltd.
Project #2868 and #3107**

1. General

- .1 Section 16010 refers to those portions of the work that are unique to electrical systems. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.
- .2 Ensure all completed work is free of short circuits and unspecified grounds and operates properly to the satisfaction of the Engineer.
- .3 Check electrical equipment supplied by the Owner for continuity and conformance to drawings and report any discrepancies to Owner in writing.
- .4 The Contractor will be responsible for the safekeeping of all Owner supplied material and equipment at the jobsite and shall provide adequate storage facilities protected from the environment.
- .5 Inspect, test, megger, clean, adjust and calibrate equipment and services as required to provide a working installation prior to energizing as specified by the Engineer or manufacturer, to the approval of the Engineer.
- .6 Complete all works in a neat and tidy fashion satisfactory to the Engineer.
- .7 Advise Owner immediately of any design deficiencies or discrepancies.
- .8 All electrical work shall be performed by an Electrical Contractor currently licensed under Technical Safety BC.
- .9 Prior to commencing construction the Contractor shall name at least one (1) Field Safety Representative whose qualifications shall comply with Technical Safety BC, who shall be responsible for the project.
- .10 Place "Hold" tags on all electrical and control systems, tagging out power to the panels and racks, as required to protect the work from damage which could result from premature use.
- .11 A Workers Compensation Board Form 30 M 33 must be completed prior to working in the vicinity of overhead powerlines
- .12 The electrical drawings and specifications are based on the use of Xylem-brand, model pumps:

SA-11 #NP3102 6.5 hp, 17 FLA @ 208VAC, 3-phase

SA-12 #NP3085 3.0 hp, 10 FLA @ 208VAC, 3-phase

SA-16 #NP3153 20.0hp, 58 FLA @ 208VAC, 3-phase

Contact the electrical engineer immediately if the actual sewage pumps utilized are a different make, model number or operating characteristics as the electrical requirements may be subject to change. Failure to contact the electrical engineer will result in the

contractor being held responsible for all costs associated with any required changes.

- .13 The Contractor shall familiarize himself with all building plans including those of all subtrades, and arrange his equipment with due regard to all architectural, structural and mechanical fixtures. The architectural, structural and mechanical plans shall be consulted for final locations of walls, doors, equipment, etc.
- .14 The plans show approximate locations of outlets and apparatus but the right is reserved to make such changes in locations as may be necessary to meet the exigencies of construction in any way. No extra will be allowed for such changes to any piece of electrical equipment or apparatus unless the distance moved exceeds 3 metres.
- .15 Allowance has been made in the design for the size and number of conductors and embedded conduits which the Corporation considers adequate for serving the various drives and equipment. These conductors and conduits are based on available data pertaining to a particular design of equipment. If the Contractor provides equipment which differs in connection requirements from the equipment shown, the Corporation acceptance of the substitution shall not relieve the Contractor of his obligation to provide the necessary diagrams, services, materials and connections to the equipment as part of the work.
- .16 The sewage wet well, valve chamber, the kiosk fan compartment and associated interconnecting conduit and ducting are classified as Zone 2, Group IIB & IIA, explosive gas atmosphere electrically hazardous areas. All equipment and wiring within these areas shall be in accordance with the applicable requirements of the B.C. Electrical Safety Act and applicable codes.

2. Scope of Work

- .1 The Contractor shall supply all wiring and equipment necessary to complete properly operating systems as specified herein and as shown on the drawings, unless otherwise indicated. All materials, labour, tools and appliances necessary for the work shall be furnished by the Contractor.
- .2 The determination and delineation of responsibilities for equipment supply and installation between the general contractor, mechanical contractor, electrical contractor and other contractors shall be the responsibility of the general contractor.
- .3 The electrical work shall include, but shall not be limited to:

Sewage Lift Station SA-11:

- .1 Locate and intercept existing 78mm RPVC utility service conduit from electrical kiosk. Extend to new electrical kiosk complete with new conductors.
- .2 Locate and intercept existing RPVC conduits from generator to electrical kiosk. Extend to new electrical kiosk complete with new conductors.

- .3 Supply and install a weatherproof electrical kiosk, including but not limited to:
 - Concrete mounting pad with kiosk anchor hardware for seismic restraint
 - Wet well ventilation fan rated for a Class 1, Zone 2, Group IIB & IIA hazardous area
 - Junction boxes with terminals in fan compartment rated for a Class 1, Zone 2, Group IIB & IIA hazardous area
 - Kiosk door switches
 - Folding laptop shelf
 - Alarm strobe

- .4 Supply and install all electrical distribution equipment and associated cables, conduit and wiring within the kiosk as shown on the drawings, including but not limited to:
 - Utility pullbox
 - Main circuit breaker
 - Utility meter socket
 - Automatic transfer switch
 - VFD reactor panel including:
 - Line reactors
 - dV/dt filters
 - Current transmitters
 - Terminal blocks
 - Cooling fans
 - Air intake grill & filter
 - Thermostat
 - Phase loss relay
 - VFDs
 - VFD wiring kit
 - 120/208V panelboard and circuit breakers
 - Surge protective device
 - Uninterruptible power supply (UPS)

- .5 Supply and install underground conduits, cables and wiring including trenching, bedding material, warning tape and backfill.

- .6 Supply and install the pump control panel as shown on the drawings, including but not limited to:
 - Enclosure
 - Programmable logic controller (PLC) complete with I/O modules and interconnecting cables
 - Operator display panel
 - Ethernet switch
 - Ethernet radio (relocated from existing control panel)
 - Coaxial cable lightning protector
 - Coaxial patch cable

- Ethernet patch cables
 - 24 VDC power supply
 - Ultrasonic level controller, door-mounted display & data cable
 - Control & timing relays
 - Pump overtemperature & seal leak relays
 - Digital timing relay
 - Intrinsically-safe barrier relay
 - Pushbuttons, indicating lights, selector switches, potentiometers
 - Elapsed time meters
 - Cooling fan, air intake grille & filter, thermostat
 - 5-15R receptacle for power to UPS
 - 3#12 SOW cable & 5-15P plug for power from UPS
 - Lamacoid nameplates
 - Circuit breakers
 - Terminal blocks
 - Wire duct & wiring
- .7 Supply and install field instruments, process control equipment and associated cables, conduit and wiring, including but not limited to the following:
- **Stainless steel “Kellums” grips for pump cables.**
 - Ultrasonic level transducer with submergence shield, stilling well, stilling well cap & stainless steel or marine-grade aluminum mounting hardware.
 - Float switch with stainless steel or marine-grade aluminum mounting bracket, adjustable cord grip fittings.
 - SCADA antenna, mounting brackets, coaxial cable and mast with weatherhead.
- .8 Supply and install kiosk electric unit heaters with integral thermostats.
- .9 Supply and install kiosk ventilation fan, air inlet filter & grille, and thermostats.
- .10 Supply and install wet well ventilation fan, starter (c/w overload), current sensing relay and controls.
- .11 Supply and install lighting fixtures and lamps.
- .12 Supply and install all branch circuit cables, conduit and wiring for power, heating, ventilating and lighting, including wall switches, receptacles, cover plates, selector switches, pushbuttons, etc.
- .13 Supply and install grounding system, as specified herein, and as shown on the drawings.
- .14 Disconnect and remove the existing electrical kiosk and concrete pad. **Consult with City of New Westminster to determine which equipment they wish to retain (eg. RTU, SCADA antenna, etc.). Remove and deliver that equipment to the City of New Westminster Works Yard.** Dispose of the remainder offsite.

Sewage Lift Station SA-12:

- .1 Locate and intercept existing 78mm RPVC utility service conduit from electrical kiosk. Extend to new electrical kiosk complete with new conductors.
- .2 Locate and intercept existing RPVC conduits from generator to electrical kiosk. Extend to new electrical kiosk complete with new conductors.
- .3 Supply and install a weatherproof electrical kiosk, including but not limited to:
 - Concrete mounting pad with kiosk anchor hardware for seismic restraint
 - Wet well ventilation fan rated for a Class 1, Zone 2, Group IIB & IIA hazardous area
 - Junction box with terminals in fan compartment rated for a Class 1, Zone 2, Group IIB & IIA hazardous area
 - Kiosk door switches
 - Folding laptop shelf
 - Alarm strobe
- .4 Supply and install all electrical distribution equipment and associated cables, conduit and wiring within the kiosk as shown on the drawings, including but not limited to:
 - Utility pullbox
 - Main circuit breaker
 - Utility meter socket
 - Automatic transfer switch
 - VFD reactor panel including:
 - Line reactors
 - dV/dt filters
 - Current transmitters
 - Terminal blocks
 - Cooling fans
 - Air intake grill & filter
 - Thermostat
 - Phase loss relay
 - VFDs
 - VFD wiring kit
 - 120/208V panelboard and circuit breakers
 - Surge protective device
 - Uninterruptible power supply (UPS)
- .5 Supply and install underground conduits, cables and wiring including trenching, bedding material, warning tape and backfill.
- .6 Supply and install the pump control panel as shown on the drawings, including but not limited to:

- Enclosure
 - Programmable logic controller (PLC) complete with I/O modules and interconnecting cables
 - Operator display panel
 - Ethernet switch
 - Ethernet radio (relocated from existing control panel)
 - Coaxial cable lightning protector
 - Coaxial patch cable
 - Ethernet patch cables
 - 24 VDC power supply
 - Ultrasonic level controller, door-mounted display & data cable
 - Control & timing relays
 - Pump overtemperature & seal leak relays
 - Digital timing relay
 - Intrinsically-safe barrier relay
 - Pushbuttons, indicating lights, selector switches, potentiometers
 - Elapsed time meters
 - Cooling fan, air intake grille & filter, thermostat
 - 5-15R receptacle for power to UPS
 - 3#12 SOW cable & 5-15P plug for power from UPS
 - Lamacoid nameplates
 - Circuit breakers
 - Terminal blocks
 - Wire duct & wiring
- .7 Supply and install field instruments, process control equipment and associated cables, conduit and wiring, including but not limited to the following:
- **Stainless steel “Kellums” grips for pump cables.**
 - Ultrasonic level transducer with submergence shield, stilling well, stilling well cap & stainless steel or marine-grade aluminum mounting hardware.
 - Float switch with stainless steel or marine-grade aluminum mounting bracket, adjustable cord grip fittings.
 - SCADA antenna, mounting brackets, coaxial cable, pole with weatherhead and concrete base
- .8 Supply and install kiosk electric unit heaters with integral thermostats.
- .9 Supply and install kiosk ventilation fan, air inlet filter & grille, and thermostats.
- .10 Supply and install wet well ventilation fan, starter, current sensing relay and controls.
- .11 Supply and install lighting fixtures and lamps.

- .12 Supply and install all branch circuit cables, conduit and wiring for power, heating, ventilating and lighting, including wall switches, receptacles, cover plates, selector switches, pushbuttons, etc.
- .13 Supply and install grounding system, as specified herein, and as shown on the drawings.
- .14 Disconnect and remove the existing electrical kiosk and concrete pad. **Consult with City of New Westminster to determine which equipment they wish to retain (eg. RTU, SCADA antenna, etc.). Remove and deliver that equipment to the City of New Westminster Works Yard.** Dispose of the remainder offsite.

Sewage Lift Station SA-16:

- .1 Coordinate with the City of New Westminster to change the existing 480V 3-phase utility service to a 120/208V 3-phase service. Supply and install new utility service conduit and conductors to the new electrical kiosk.
- .2 Supply and install a RPVC service conduit, wiring, service conductors, and weatherhead for 1-phase street light service connection from the existing 3-phase service pole located in the alley to the onsite service pole (to be removed). The contractor shall locate and tie into the existing streetlight service conduit and extend the new unspliced service conductors to the existing streetlight service base. City of New Westminster forces shall complete the final connection at the service pole.
- .3 Supply and install a weatherproof electrical kiosk, including but not limited to:
 - Concrete mounting pad with kiosk anchor hardware for seismic restraint
 - Wet well ventilation fan rated for a Class 1, Zone 2, Group IIB & IIA hazardous area
 - Junction box with terminals in fan compartment rated for a Class 1, Zone 2, Group IIB & IIA hazardous area
 - Kiosk door switches
 - Folding laptop shelf
 - Alarm strobe
- .4 Supply and install a standby diesel genset complete with weatherproof enclosure, including but not limited to:
 - Concrete mounting pad with kiosk anchor hardware for seismic restraint
 - Automatic transfer switch for mounting in electrical kiosk
- .5 Supply and install all electrical distribution equipment and associated cables, conduit and wiring within the kiosk as shown on the drawings, including but not limited to:
 - Utility pullbox
 - Main circuit breaker

- Utility meter socket
 - Automatic transfer switch
 - VFD reactor panel including:
 - Line reactors
 - dV/dt filters
 - Current transmitters
 - Terminal blocks
 - Cooling fans
 - Air intake grill & filter
 - Thermostat
 - Phase loss relay
 - VFDs
 - 120/208V panelboard and circuit breakers
 - Surge protective device
 - Uninterruptible power supply (UPS)
- .6 Supply and install underground conduits, cables and wiring including trenching, bedding material, warning tape and backfill.
- .7 Supply and install the pump control panel as shown on the drawings, including but not limited to:
- Enclosure
 - Programmable logic controller (PLC) complete with I/O modules and interconnecting cables
 - Operator display panel
 - Ethernet switch
 - Ethernet radio (relocated from existing control panel)
 - Coaxial cable lightning protector
 - Coaxial patch cable
 - Ethernet patch cables
 - 24 VDC power supply
 - Ultrasonic level controller, door-mounted display & data cable
 - Control & timing relays
 - Digital timing relay
 - Pump overtemperature & seal leak relays
 - Intrinsically-safe barrier relay
 - Pushbuttons, indicating lights, selector switches, potentiometers
 - Elapsed time meters
 - Cooling fan, air intake grille & filter, thermostat
 - 5-15R receptacle for power to UPS
 - 3#12 SOW cable & 5-15P plug for power from UPS
 - Lamacoid nameplates
 - Circuit breakers
 - Terminal blocks
 - Wire duct & wiring

- .8 Supply and install field instruments, process control equipment and associated cables, conduit and wiring, including but not limited to the following:
 - **Stainless steel “Kellums” grips for pump cables.**
 - Ultrasonic level transducer with submergence shield, stilling well, stilling well cap & stainless steel or marine-grade aluminum mounting hardware.
 - Float switch with stainless steel or marine-grade aluminum mounting bracket, adjustable cord grip fittings.
 - SCADA antenna, mounting brackets, coaxial cable and mast with weatherhead.
 - Flow sensor and transmitter complete with grounding rings.
- .9 Supply and install kiosk electric unit heaters with integral thermostats.
- .10 Supply and install kiosk ventilation fan, air inlet filter & grille, and thermostats.
- .11 Supply and install wet well ventilation fan, starter, current sensing relay and controls.
- .12 Supply and install lighting fixtures and lamps.
- .13 Supply and install all branch circuit cables, conduit and wiring for power, heating, ventilating and lighting, including wall switches, receptacles, cover plates, selector switches, pushbuttons, etc.
- .14 Supply and install grounding system, as specified herein, and as shown on the drawings.
- .15 Disconnect and remove the existing electrical kiosk and concrete pad. **Consult with City of New Westminster to determine which equipment they wish to retain (eg. RTU, SCADA antenna, etc.). Remove and deliver that equipment to the City of New Westminster Works Yard.** Dispose of the remainder offsite.

3. Work by Others

- .1 PLC programming, operator interface programming, SCADA radio configuration, and SCADA central station programming will be performed the Owner’s representative.

4. Codes and Standards

- .1 Perform complete installation in accordance with the latest version of the BC Electrical Safety Act, the Canadian Electrical Code and any local bylaws or rules regulating the installation of electrical equipment.
- .2 Install overhead and underground systems in accordance with CSA C22.3 No. 1-M87 and CSA C22.3 No. 7-94 except where specified otherwise.

5. Care, Operation and Start-up

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

6. Permits, Fees and Inspection

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Engineer will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .4 Notify Engineer of changes required by Electrical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to Engineer.

7. Materials and Equipment

- .1 Supply equipment exactly as indicated by the drawings and specifications. Other materials may be substituted by the Contractor provided only that such substitutions have been approved by the Engineer prior to installation.
- .2 All equipment and materials shall be new and shall bear a certification mark (CSA, ULc, ETL, etc.) that is acceptable to the BC Safety Authority.
- .3 Factory-assemble control panels and component assemblies. Finished control panels and component assemblies shall bear a certification mark (CSA, ULc, ETL, etc.) that is acceptable to the BC Safety Authority.
- .4 Shop drawings shall be submitted for the following (at minimum):
 - **SA-16:** Standby generator
 - Electrical kiosk & equipment within
 - Control panel
 - Any equipment being proposed for “Approved Equal”.

- .5 When submitting shop drawings, the Contractor shall notify the Engineer in writing of changes made therein from the electrical drawings and specifications.
- .6 Shop drawings returned marked "Revise and Resubmit for Review" shall be appropriately corrected and resubmitted within 10 days.
- .7 **The review of shop drawings by the Engineer is for the sole purpose of ascertaining conformance with the general design concept, but no approval is given or responsibility assumed by the Engineer for the detailed design inherent in the shop drawings or for corrections of dimensions or details or conformity to specifications, which remain the responsibility of the Contractor and the Supplier.**

8. Record Drawings

- .1 The Contractor shall keep an accurate record of all field changes and modifications on a clean set of drawings as required, using accepted drafting techniques.
- .2 At the completion of the job, return these corrected drawings to the Engineer.

9. Operations and Maintenance (O&M) Manuals

- .1 The Contractor shall furnish the Corporation with three complete bound sets of instructions, covering the proper method of maintaining and operating all the systems included in this contract.
- .2 The manuals shall also include all shop drawings, catalogue numbers of all electrical equipment installed and manufacturer's parts lists.
- .3 The Contractor shall include manufacturer's O&M manuals, drawings and installation leaflets for every piece of electrical/instrumentation equipment.
- .4 **O&M manuals shall be organized as follows:**
 - .1 **O&M literature shall be provided in hardcover, 3-ring binders. The binders shall be clearly labelled with the project name, location, completion date, and key participants' names and contact information (general contractor, electrical contractor, civil engineer, electrical engineer, etc.), and binder number.**
 - .2 **A Table of Contents shall be provided at the front of the first binder. The Table of Contents shall be organized and sorted by specifications section number, item number, and equipment make/model number. (Example: *Section 16825, Item 2.18, DC Power Supplies – Sola “SDN” series. Cat. #SDN2.5-24-100.*)**
 - .3 **The O&M literature for each item shall be separated by a divider page and**

item title page. The item title page shall contain the same information as listed in the Table of Contents. (Example: *Section 16825, Item 2.18, DC Power Supplies – Sola “SDN” series. Cat. #SDN2.5-24-100.*)

.4 The type of O&M literature provided for each item shall be as follows:

- a) **Printed cutsheets and installation/safety instructions:** Simple equipment that requires no configuration or adjustment. The intent is that the owner shall have sufficient information to identify the equipment’s make, model number & key characteristics. (Examples: *light fixtures, pushbuttons, panelboards*).
- b) **Printed cutsheets, installation/safety instructions, and configuration/adjustment instructions:** More complex equipment that requires configuration or adjustment. The intent is that the owner shall have sufficient information to identify the equipment’s make, model number & key characteristics, and perform configuration or adjustment. (Examples: *ultrasonic level controllers, uninterruptible power supplies, flow transmitters*).
- c) **Printed cutsheets and installation/safety instructions, and PDF files of configuration/adjustment/programming instructions:** Highly complex equipment that requires configuration, adjustment or programming (Examples: *variable frequency drives, programmable logic controllers, operator interfaces*). The configuration/adjustment/programming instructions for this equipment are typically very lengthy (ie. several hundred pages) and are therefore impractical for inclusion in the O&M manuals in printed form. The PDF files for these instructions shall be provided on a USB memory stick, inserted in a pouch at the front of the first O&M binder. The USB memory stick shall be clearly labelled, and a note shall be added to the Table of Contents and the associated section title pages to “*See USB memory stick at the front of binder #1 for more information*”.

.5 Printed cutsheets shall have the equipment’s specific model number clearly identified. The model number shall be highlighted, outlined, marked with an arrow, or otherwise suitably identified. The intent is to make it simple for the owner to determine which specific model has been installed for this project. Where multiple models have been used, all model numbers shall be identified.

10. Voltage Ratings

.1 Operating voltages to CAN3-C235-83.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

11. Finishes

- .1 Shop finish metal enclosure surfaces inside and outside by application of 2.0-3.0 mils of zinc-rich primer powder coat, followed by 3.0-4.0 mils of powder top coat. The finish shall be free of thickness variations, poor adhesion, "orange peel", blistering, pinholes, craters, powder puffs, drips, color variations, clouding or grainy/wavy flow. Primer coat shall be Tiger Drylac #69/90350 or equal. Top coat shall be Tiger Drylac – Series 38 or equal.
 - .1 Outdoor electrical equipment shall be RAL #6005 "Moss green" (excluding generator)
 - .2 Indoor switchgear and distribution enclosures shall be ANSI #61 grey.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original finish.
- .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

12. Equipment Identification

- .1 Identify electrical equipment with nameplates as follows: Lamacoid 3 mm thick plastic engraving sheet, white face, black core, mechanically attached with self tapping screws. See drawings for details.
- .2 Wording on nameplates to be as shown on drawings.
- .3 Identification to be English.
- .4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .5 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .6 Terminal cabinets and pull boxes: indicate system and voltage.
- .7 Transformers: indicate capacity, primary and secondary voltages.

13. Wiring Identification

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

wiring.

- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1, CSA C22.2 No. 286 Industrial Control Panels and Assemblies
- .4 Use colour coded wires in communication cables, matched throughout system.

14. Wiring Terminations

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

15. Manufacturers and CSA Labels

- .1 Visible and legible after equipment is installed.

16. Warning Signs

- .1 As specified and to meet requirements of the BC Electrical Safety Act, the Electrical Inspection Department and the Engineer.
- .2 Decal signs, minimum size 175 x 250 mm.

17. Mounting Heights

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

18. Load Balance

- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

19. Conduit and Cable Installation

- .1 Install conduit and sleeves prior to pouring of concrete and shall extend 150mm above finished concrete

20. Field Quality Control

- .1 Conduct tests of the following equipment:
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Process control and instrumentation systems.
 - .6 Antenna and coaxial cable VSWR.
- .2 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument and record.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument and record.
- .3 Check resistance to ground before energizing.
- .4 Carry out tests in presence of Engineer.
- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit test results for Engineer's review.

21. Coordination of Protective Devices

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

22. Storage of Electrical Equipment

- .1 All equipment shall be adequately protected from damage and from dust, dampness or any other injurious substance during delivery to the site, while stored at the site and after construction. Equipment stored in unheated or open areas on the site shall be covered and provided with thermostatically controlled heaters of sufficient size to keep the temperature of the equipment above the dew point. Control panels and other electrical equipment shall not be installed until the room in which they are to be installed is completely free of any dust, dirt, dampness, construction debris or any other contaminants that might affect the future operation of the electrical equipment.

- .2 Storage areas shall be made accessible to the Corporation at any time for determining the condition of the storage.

23. Spare Parts

- .1 The contractor shall supply, at minimum, the following spare parts:
- .1 Control circuit fuses (3 of each size and ampacity)

***** END *****

PART 1 – GENERAL**1.1 Related Work**

- .1 Excavation and backfilling: Section 02223 Excavating, Trenching and Backfilling

PART 2 – PRODUCTS**2.1 Markers**

- .1 150 mm wide polyethylene warning tape marked “Warning - Buried Electric Line”.

PART 3 – EXECUTION**3.1 Cable Installation in Ducts**

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple conductors in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables properly terminated, seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

3.2 Markers

- .1 Mark cable every 150 m along cable duct runs and changes in direction.
- .2 Where markers are removed to permit installation of additional cables, reinstall existing markers.

3.3 Field Quality Control

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements.
- .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 1000 V 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 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.
- .7 Provide Engineer with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

***** END *****

PART 1 – GENERAL**1.1 Related Work**

- .1 Excavation and backfilling: Section 02223 Excavating, Trenching and Backfilling

1.2 References

- .1 Canadian Standards Association (CSA) - CSA C22.2 No. 211.1, Rigid Types EBI and DB2/ES2 PVC Conduit.
- .2 Canadian Standards Association (CSA) - CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit

PART 2 – PRODUCTS**2.1 PVC Conduits and Fittings – Rigid PVC and DB2**

- .1 Rigid PVC conduit for direct burial: with expanded flange ends, with minimum wall thickness at any point of 2.8 mm. Nominal length: 3 m plus or minus 12 mm.
- .2 Rigid PVC reducers, bell end fittings, plugs, caps, adaptors as required to make complete installation.
- .3 Rigid PVC 90 deg. and 45 deg. bends as required.
- .4 Rigid PVC 5 deg. angle couplings as required.
- .5 DB2 PVC conduit, orange colour for direct burial or concrete encasement: DB2 PVC conduit shall be used for future fibre-optic cables only. Size and quantity as shown on drawings.
- .6 DB2 PVC reducers, bell end fittings, plugs, caps, adaptors as required to make complete installation.
- .7 DB2 PVC conduit bends shall be long-sweep type only (minimum 36" radius).
- .8 Expansion joints as required.

2.2 Solvent Weld Compound

- .1 Solvent weld compound for PVC conduit joints.

2.3 Cable Pulling Equipment

- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.4 Markers

- .1 150 mm wide polyethylene warning tape marked "Warning - Buried Electric Line".

PART 3 – EXECUTION**3.1 Installation**

- .1 Install conduit in accordance with manufacturer's instructions.
- .2 Clean inside of conduits before laying.
- .3 Ensure full, even support every 1.5 m throughout conduit length.
- .4 Slope conduits with 1 to 400 minimum slope.
- .5 During construction, cap ends of conduits to prevent entrance of foreign materials.
- .6 Pull stiff bristle brush through each conduit immediately before pulling-in cables.
- .7 In each conduit install pull rope continuous throughout each conduit run with 3 m spare rope at each end.
- .8 Install markers as required.
- .9 Where a conduit leaves a warm room and enters a cooler atmosphere, it shall be sealed so as to prevent breathing and subsequent condensation, and shall be done in such a manner that condensate will not be trapped at the seal.

***** END *****

PART 1 – GENERAL**1.1 Location of Conduit**

- .1 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.

PART 2 – PRODUCTS**2.1 Conduits**

- .1 Rigid galvanized steel threaded conduit.
- .2 Electrical metallic tubing (EMT) with couplings.
- .3 Rigid PVC conduit.

2.2 Conduit Fastenings

- .1 One hole steel straps to secure surface conduits 50mm and smaller. Two hole steel straps for conduits larger than 50mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.0m maximum spacing.
- .4 6mm diameter threaded rods to support suspended channels.

2.3 Conduit Fittings

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90 degree bends are required for 25mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.4 Fish Cord

- .1 Polypropylene.

PART 3 - EXECUTION**3.1 Installation**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Surface mount conduits except where noted otherwise.
- .3 Use rigid galvanized steel threaded conduit except where specified otherwise.
- .4 Use electrical metallic tubing (EMT) only where not subject to mechanical injury.
- .5 Use rigid PVC conduit underground.
- .6 Minimum conduit size for lighting and power circuits: 19mm.
- .7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .8 Mechanically bend steel conduit over 19mm dia.
- .9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .10 Install fish cord in empty conduits.
- .11 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.
- .12 Dry conduits out before installing wire.

3.2 Surface Conduits

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75mm parallel to steam or hot water lines with minimum of 25mm at crossovers.

3.3 Concealed Conduits

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.4 Conduits in Cast-in-place Concrete

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Where conduits pass through waterproof membrane provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.5 Conduits in Cast-in-place Slabs on Grade

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Where conduits pass through waterproof membrane provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.6 Conduits Underground

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

***** END *****

PART 1 – GENERAL**1.1 References**

- .1 CSA C22.2 No. 38, Thermoset-Insulated Wires and Cables
- .2 CSA C22.2 No. 0.3, Test Methods for Electrical Wires and Cables.
- .3 TIA/EIA-568-C.1 (General Requirements)
- .4 TIA/EIA-568-C.2 (Balanced Twisted-pair Cables)
- .5 TIA/EIA-568-C.3 (Fiber-optic Cables)
- .6 TIA/EIA-568-C.4 (Coaxial Cables)
- .7 BICSI "Telecommunications Distribution Methods Manual (TDMM), 12th edition"

PART 2 – PRODUCTS**2.1 Power Wiring (600V-rated) - Type RW90 (indoors and outdoors)**

- .1 Equipment characteristics:
 - .1 Stranded copper conductors (solid copper conductors will not be accepted)
 - .2 Minimum size #12 AWG (larger as indicated on drawings)
 - .3 600V low-temperature, cross-linked, polyethylene insulation rated RW90, suitable for wet or dry locations
 - .4 Maximum 90C conductor temperature
 - .5 Minimum -40C installation temperature
 - .6 Insulation colors shall be as follows:
 - a) 1-phase AC (2 or 3 wire): Black (phase L1), Red (phase L2), White (neutral)
 - b) 3-phase AC: Red (phase A), Black (phase B), Blue (phase C), White (neutral)
 - c) DC: Blue (positive), Yellow (negative)
 - d) Bond: Green

2.2 Controls Wiring - Type RW90 (external to control panels & MCCs)

- .1 Equipment characteristics:
 - .1 Stranded copper conductors (solid copper conductors will not be accepted)
 - .2 Minimum size #14 AWG (unless otherwise indicated on drawings)
 - .3 600V low-temperature, cross-linked, polyethylene insulation rated RW90, suitable for wet or dry locations
 - .4 Maximum 90C conductor temperature
 - .5 Minimum -40C installation temperature
 - .6 Insulation colors shall be as follows:
 - a) DC: Blue (positive), Yellow (negative)
 - b) AC: Black (line), White (neutral)
 - e) Bond: Green

2.3 Controls Wiring - Type TEW (within control panels & MCCs)

- .1 Equipment characteristics:
 - .1 Stranded, flexible copper conductors (mimimum 26 strands)
 - .2 Minimum size #16 AWG (where protected via maximum 10A fuse or circuit breaker), otherwise minimum size #14 AWG.
 - .3 600V thermoplastic insulation type TEW, suitable for dry locations
 - .4 Maximum 105C conductor temperature
 - .5 Insulation colors shall be as follows:
 - a) DC: Blue (positive), Yellow (negative)
 - b) AC: Black (line), Red (switched), White (neutral)
 - c) Bond: Green or Green with yellow stripe

2.4 Analog Signal Cables (indoors and within control panels & MCCs)

- .1 Equipment characteristics:
 - .1 Stranded, tinned copper conductors with 600V PVC insulation
 - .2 #18 AWG (7 x #24 stranding) twisted pairs or triads with individual foil shielding & polyester isolation tape
 - .3 Overall foil shielding (100% coverage)
 - .4 #18 AWG stranded tinned copper drain wire, rip cord and outer black PVC jacket.
 - .5 Minimum -25C installation temperature
 - .6 Insulation colors shall be as follows:
 - a) Pairs: White (positive), Black (negative)
 - b) Triads: White (positive), Red (signal), Black (negative)
- .2 Acceptable Products:
 - .1 1 pair: Belden #22417 or equal
 - .2 2 pairs: Belden #22405 or equal
 - .3 4 pairs: Belden #22404 or equal
 - .4 8 pairs: Belden #22404 or equal
 - .5 12 pairs: Belden #22421 or equal
 - .6 1 triad: Belden #22442 or equal
 - .7 2 triads: Belden #22443 or equal
 - .8 4 triads: Belden #22444 or equal
 - .9 8 triads: Belden #22445 or equal

2.5 Ethernet Cable (outdoors and underground in conduit)

- .1 Equipment characteristics:
 - .1 Type CMXT, CAT6 (500 Mhz) rated, compatible with 1000BaseT (and slower) networks
 - .2 8 x 23 AWG stranded copper conductors, arranged in 4 unshielded twisted pairs
 - .3 Tinned copper drain wire, rip cord

- .4 Overall waterblock tape, foil shielding, polyethylene tape, and outer black jacket.
- .5 93.8 Ω /km resistance @ 20°C, 56 nF/km mutual capacitance, 100 Ω characteristic impedance from 1 to 400 Mhz.
- .6 Suitable for wet locations, in conduit or direct-burial.

2.6 Ethernet Patch Cables (within control panels & MCCs)

- .1 Equipment characteristics:
 - .1 CAT6 (600 Mhz) rated, compatible with 1000BaseT (and slower) networks
 - .2 8 x 23 AWG solid copper conductors, arranged in 4 twisted pairs
 - .3 Straight-through (non-crossover) wiring (except where noted otherwise)
 - .4 RJ45 male connectors with molded boots

2.7 RS-485 Serial Data Communications Cable (within control panels & MCCs, indoors, outdoors, underground in conduit)

- .1 Equipment characteristics:
 - .1 2 pair #22 AWG cable for RS-485 communications
 - .2 7 x 30 AWG stranded tinned copper conductors with foam high density polyethylene insulation rated 300V.
 - .3 Tinned copper drain wire
 - .4 Overall foil shielding (100%), tinned copper braid (65%), outer UV-resistant PVC jacket.
 - .5 48.2 Ω /km resistance @ 20°C, 36 nF/km mutual capacitance, 120 Ω characteristic impedance.
 - .6 -20°C to +60°C operating temperature range
- .2 Acceptable Products:
 - .1 Belden #3107A
 - .2 Approved equal

PART 3 - EXECUTION

3.1 Installation of Power Wiring

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 16111.
 - .2 In underground ducts in accordance with Section 16106.

3.2 Installation of Controls Wiring

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 16111.
 - .2 In underground ducts in accordance with Section 16106.

- .2 Label both ends of wiring with permanent, indelible wire markers. Wire number shall equal terminal number, except where noted otherwise. See drawings for details.

3.3 Installation of Analog Signal Cables

- .1 Install cables as follows:
 - .1 In conduit systems in accordance with Section 16111.
 - .2 In underground ducts in accordance with Section 16106.
- .2 Ground signal cable shields at Controller end only as shown on drawings.
- .3 Label both ends of wiring with permanent wire markers. Wire number shall equal terminal number, except where noted otherwise. See drawings for details.

3.4 Installation of Teck Cables

- .1 Label both ends of wiring (for control circuits) with permanent, indelible wire markers. Wire number shall equal terminal number, except where noted otherwise. See drawings for details.
- .2 Fastenings:
 - .1 One-hole steel straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables at minimum 1.0m centers.
 - .3 Minimum 6mm diameter threaded rods to support suspended channels.
- .3 Connectors:
 - .1 Watertight, approved for Teck cable.
 - .2 Explosion-proof in hazardous areas.

***** END *****

PART 1 – GENERAL

Not used.

PART 2 – PRODUCTS**2.1 Splitters**

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 Junction Boxes - Indoors

- .1 Welded steel construction with screw-on flat covers for surface mounting.

2.3 Junction Boxes – Weatherproof (aluminum)

- .1 EEMAC3, welded aluminum construction with hinged, gasketed covers and padlock hasp. Suitable for surface mounting.

2.4 Junction Boxes – Weatherproof (stainless steel)

- .1 EEMAC3, welded stainless steel construction with hinged, gasketed covers and padlock hasp. Suitable for surface mounting.

2.5 Junction Boxes – Weatherproof (RPVC)

- .1 EEMAC3, RPVC construction with gasketed cover and brass screws. Suitable for surface mounting.

2.6 Junction Boxes – Zone 1 and Zone 2 Hazardous Locations

- .1 IP66, compression-molded fiberglass construction with one-piece gasketed covers held via Type 316 stainless steel screws. Suitable for surface mounting.

- .2 Ex e IIC Gb enclosure rating. Marked and rated for use in Zone 1 and Zone 2 hazardous locations when installed with terminal blocks and/or approved Zone 1 and Zone 2 devices.
- .3 Complete with optional 1.5mm thick, pre-plated steel, internal mounting panel.
Hoffman “ZONEX” series or approved equal.

2.7 Pull Boxes – Outdoors at Grade for Underground Conduit Runs

- .1 Precast concrete, 2-sections deep as follows:
 - Top section 580mm long x 405mm wide x 305mm deep.
 - Bottom section 580mm long x 405mm wide x 305mm deep with conduit knockouts.
 - Steel checkerplate cover marked “ELEC”, with bonding stud on underside.Armtec “#B837” series or approved equal.

PART 3 - EXECUTION

3.1 Splitter Installation

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 Indoor Junction, Pull Boxes and Cabinets Installation

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2m above finished floor.
- .3 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30m of conduit run between pull boxes.

3.3 Outdoor Pull Boxes Installation

- .1 Pull box lids shall be bonded.
- .2 Pull boxes shall be installed over freely-draining crushed aggregate (25mm minus) and supported by four 12” x 6” concrete pavers (one beneath each side of the junction box).
- .3 Pull boxes shall be stacked two sections deep, such that the bottom of the pullbox is

minimum 600mm below finished grade. Pull box lids shall flush with finished grade.

***** END *****

PART 1 – GENERAL**1.1 References**

- .1 CSA C22.1 Canadian Electrical Code, Part 1.

PART 2 – 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.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 Sheet Steel Outlet Boxes

- .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 102 mm square or octagonal outlet boxes for lighting fixture outlets.

2.3 Conduit Boxes

- .1 Cast FS or FD ferrous alloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches, receptacles, and all process power and control circuits.

2.4 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.

- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 Installation

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

***** END *****

PART 1 – GENERAL

Not used.

PART 2 – PRODUCTS**2.1 Switches - Standard Type**

- .1 Manually-operated, general purpose, 15A, 120VAC switches with following features:

- .1 Brass terminal screws approved for up to No. 10 AWG wire.
- .2 Silver cadmium oxide contacts.
- .3 Thermoset base and face.
- .4 Urea insulating safety barrier
- .5 Nylon toggle, white colour.
- .6 ½ hp rated at 120 VAC.
- .7 1-way or 3-way as indicated on drawings

Acceptable materials:

- .1 Eaton “Arrow Hart” Industrial Grade, #AH1201W (single-pole), #AH1203W (3-way)
 - .2 Or equal.
- .2 Other switches with ampacity and voltage as indicated.
- .3 Switches of one manufacturer throughout project.

2.2 Receptacles

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

- .1 One-piece grounding system including integral self-grounding strap.
- .2 White, full-face, wraparound design molded from high-impact, chemical-resistant nylon.
- .3 Suitable for No. 10 AWG for back and side wiring.
- .4 Break-off links for use as split receptacles.
- .5 Eight back wired entrances, four side wiring screws.
- .6 Triple wipe brass line contacts and double wipe brass grounding contacts.

Acceptable materials:

- .1 Eaton “Arrow Hart” Industrial Grade, #AH5262W
 - .2 Or equal.
- .2 Duplex ground fault circuit interrupter (GFCI) receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:

- .1 Conforms to all CSA requirements for Class A GFCI receptacles.
- .2 Tamper and weather resistant
- .3 Periodic, self-testing with automatic de-energization and red indicator light if faulty.
- .4 Line-load miswiring protection. Will not provide power downstream when wired incorrectly.
- .5 Face and base made of impact-resistant, thermoplastic material.
- .6 White-color face.
- .7 Integral "Test" & "Reset" buttons.
- .8 Triple wipe brass line contacts.

Acceptable materials:

- .1 Eaton "Arrow Hart" Specification Grade, #TWRSGF15W
 - .2 Or equal.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

2.3 Cover Plates

- .1 Cover plates for wiring devices.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, vertically brushed, 1 mm thick cover plates, for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted cast type conduit boxes.
- .6 Weatherproof, deep-style, "While-in-Use" hinged polycarbonate cover, complete with padlock tab, mounting plate & gasket for outdoor receptacles and others as indicated.
Acceptable materials: Hubbell #RW57xxx or equal.

PART 3 - 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 specified in Section 16010 - Electrical General Requirements or as indicated.
 - .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 specified in Section 16010 – Electrical General Requirements or as indicated.
 - .3 Test all receptacles for proper wiring and test GFCI receptacles for proper tripping operation.
 - .3 Cover plates:
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

***** END *****

PART 1 – GENERAL**1.1 References**

- .1 CSA C22.2 No.65-93 - Wire Connectors.

PART 2 – PRODUCTS**2.1 Materials**

- .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

PART 3 - EXECUTION**3.1 Installation**

- .1 Remove insulation carefully from ends of conductors and:
- .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.

***** END *****

PART 1 – GENERAL**1.1 Related Work**

- .1 Concrete pads: See specifications by civil engineer.

PART 2 – PRODUCTS**2.1 Electrical Kiosk**

- .1 The kiosk shall be suitably sized to provide room for all components housed within. The dimensions shown on the drawings are approximate only. Final kiosk dimensions shall be determined by the manufacturer prior to fabrication.
- .2 EEMAC 3R construction with rain gutter all around.
- .3 Exterior panels shall be fabricated from **#5052 marine-grade aluminum**. Interior panels shall be fabricated from galvanized steel or #5052 marine-grade aluminum.
- .4 Interior mounting pans shall be removable and suitable for drilling and tapping in order to mount internal components.
- .5 Doors shall be marine-grade aluminum, fully-gasketed, 3-point latching with padlocking means and shall have bullet-style hinges with lower grease fittings. The padlocking means for the power compartment shall accommodate the installation of the Owners padlock and B.C. Hydro's padlock. The power compartment shall be made accessible via the removal of either of these padlocks.
- .6 The kiosk shall be sufficiently braced and supported to form a rigid, free-standing structure and shall be equipped with lifting lugs.
- .7 The entire kiosk enclosure shall be capable of withstanding maximum impact force of 86 MN/m² area without rupture of material.
- .8 The exterior walls and ceiling shall be fully-insulated with high-density polystyrene board with foil facing. "Soft" polystyrene batting or styrofoam board will not be accepted. All insulation joints and exposed edges shall be neatly covered with foil tape. Insulation shall be mechanically fastened to the interior enclosure walls with aluminium domed push-on caps (with mounting studs) as available from Crossroads C&I Distributors (604-421-1221).
- .9 The metal base of the kiosk shall raise the bottom of the doors at least 50mm above the concrete pad.
- .10 **Doors shall have pneumatic stays with steel aircraft cable travel limiters.**

-
- .11 Controls and meters shall be at a level suitable for operation from ground elevation (ie. at eye level)
 - .12 The kiosk shall be sweep-blasted with aluminium oxide or glass bead media, covered with 2.0-3.0 mils of zinc-free powder primer coat, followed by 3.0-4.0 mils of powder top coat. The finish shall be free of thickness variations, poor adhesion, "orange peel", blistering, pinholes, craters, powder puffs, drips, color variations, clouding or grainy/wavy flow. The kiosk exterior shall be RAL #6005 "Moss Green" color. The interior mounting pans shall be white color. Primer coat shall be Tiger Drylac #69-70000 or equal. Top coat shall be Tiger Drylac – Series 38 or equal.
 - .13 All switches, panelboards, control panels and equipment shall be identified with engraved 3-ply lamacoid nameplates, white with black lettering.
 - .14 **The kiosk shall be supplied complete with a butyl rubber sealant contact gasket, ConSeal #CS-202, for installation between the concrete pad and kiosk.** The sealant shall be placed under the perimeter of the kiosk where it meets the concrete slab. The base of the fan compartment shall also have sealant under the inside dividing wall to prevent the leakage of wet well vapours into the other compartments. Installation procedures shall be according to the manufacturer guidelines.
 - .15 All wiring between the fan compartment and the electrical & controls compartments shall be run via rigid steel conduit with EYS seals. Seals are to be installed in accordance with BC Electrical Safety Act. Specific instructions for resealing the EYS seals shall be included in the O&M manual. Insofar as possible, the seals shall be positioned to facilitate the future removal and replacement of cables.
 - .16 There shall not be any control or power wiring junction boxes in the sewage wet well. Any splices in control or power cables shall be made at clearly-labelled terminal blocks (rated for Class 1, Zone 2 operation) within the junction box located in the kiosk fan compartment.
 - .17 The wet well ventilation fan shall be housed within a separate compartment. The fan compartment shall be continuously welded and shall contain sufficient air inlet louvers to provide adequate air flow to the lift station without causing excessive air velocities or noise via the louvers during fan operation. All louver openings shall be covered with bug screens. The combined area of the louver openings shall be a minimum of 150% of the cross-sectional area of the ventilation duct to the wet well. (minimum 42.2 square inches for 6" duct; minimum 75.4 square inches for 8" duct; minimum 117.8 square inches for 10" duct)
 - .18 The wet well ventilation fan shall be arranged to draw fresh air from the inlet louvers at the top of the fan compartment and shall pressurize the wet well via the air duct running from the fan compartment the wet well. The fan motor shall be approved for use in a Class 1, Zone 2 environment. The fan blades shall be non-sparking and shall be guarded against accidental personnel contact via a mechanical barrier. The wet well ventilation fan shall be as listed in Specifications Section 16870. The size and type of the air duct

shall be as shown on the drawings.

PART 3 - EXECUTION**3.1 Installation**

- .1 Mount equipment in kiosk. Configure and test all equipment prior to shipment to site.
- .2 Mount kiosk on concrete pad. The kiosk shall be seismically-anchored to the concrete pad in accordance with the civil engineer's instructions.

3.2 Testing

- .1 Configure and test all equipment prior to shipment to site.

***** END *****

PART 1 – GENERAL**1.1 Related Work**

- .1 Fastenings and supports: Section 01601 - Material and Equipment

PART 2 – PRODUCTS**2.1 General**

- .1 Products as required.

PART 3 – EXECUTION**3.1 Installation**

- .1 The contractor shall ensure that all electrical equipment is seismically restrained in accordance with the requirements of the following:
- Division 3 of these specifications
 - Division B, Part 4, Section 4.1.8, “Earthquake Load and Effects” of the British Columbia Building Code
 - “Seismic Restraint Standards Manual” published by the Electrical Contractors Association of British Columbia
- .2 **The contractor shall retain a professional structural engineer registered in the Province of British Columbia to specify and inspect the seismic anchoring for the electrical kiosks and standby diesel generator. Upon project completion, provide a signed and sealed Schedule S-B from the structural engineer, confirming that the seismic anchoring has been completed to his/her specifications.**
- .3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .5 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .6 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .7 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

***** END *****

PART 1 – GENERAL**1.1 Section Includes**

- .1 **SA-16:** Engine Generator
- .2 **SA-16:** Day Tank
- .3 **SA-11, SA-12, & SA-16:** Automatic Transfer Switch

1.2 References

- .1 CSA C22.2 No. 100 – Motors and Generators
- .2 NEMA MG-1 – Motors and Generators
- .3 CSA C22.2 No. 178 - Automatic Transfer Switches
- .4 Canadian Electrical Code and BC Amendments.

1.3 Description

- .1 Work specified in this Section includes the new diesel engine-driven generator, complete with auxiliary equipment for use as an emergency and standby source of power.
- .2 The equipment manufacturer(s) and the authorized supplier shall have complete responsibility for the performance of the engine-generator set and its accessories. Set shall be new, unused, latest production model, factory assembled and tested prior to delivery to job site.
- .3 Provide all necessary controls and accessories to make a complete operating system.
- .4 Generator set consists of:
 - a) Diesel engine
 - b) Alternator
 - c) Alternator control panel
 - d) Battery charger and battery
 - e) Exhaust system c/w silencer
 - f) Structural steel mounting base
 - g) Integral fuel tank
 - h) Outdoor weather proof and sound attenuated enclosure
 - i) Remote-mounted automatic transfer switch
- .5 Set designed to operate unattended in an exterior location

1.4 Shop Drawings

.1 Submit shop drawings as follows:

- a) Engine: make and model, with performance curves
- b) Alternator: make and model
- c) Voltage regulator: make, model and type
- d) Battery: make, type and capacity
- e) Battery charger: make, type and model
- f) Alternator control panel: make and type of meters and controls
- g) Governor type and model
- h) Dimensioned drawing showing complete generating set mounted on steel base, including exhaust system and total weight
- i) Continuous full load output of set at 0.80 power factor lagging
- j) Description of set operation including:
 - Automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit reaches rated voltage and frequency
 - Manual starting
 - Automatic shut down on: overcranking, overspeed, high engine temperature, low lube oil pressure and alternator overvoltage
 - Alarms and indication lights
- k) Automatic transfer switch
- l) **NOTE: Shop drawings shall include detailed requirements for seismic restraint anchoring to the concrete mounting pad based on National Building Code of Canada seismic classification Zone 4.**

1.5 Operation and Maintenance Data

- .1 Supplier shall furnish 3 set(s) of operating maintenance and parts manuals for equipment furnished.
- .2 Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, manual bypass switch, battery charger, battery, fuel system, exhaust system and accessories, to permit effective operation, maintenance and repair.
- .3 Technical data:
 - a) Illustrated parts lists with parts catalogue numbers
 - b) Schematic diagram of electrical controls
 - c) Flow diagrams for:
 - Fuel system
 - Lubricating oil
 - Cooling system
 - d) Certified copy of factory test results
 - e) Fault current magnitude and duration

1.6 Quality Control

.1 Factory test generator set including engine, alternator, control panels and accessories. Factory test shall include running generator set for four hours at 100% rated load.

.2 Tests:

- a) Manual and automatic starting of set
- b) Single-step load pickup
- c) Transient and steady-state governing
- d) Safety shutdown device testing and alarm testing
- e) Voltage regulation
- f) Rated power & maximum power

1.7 Warranty

.1 Provide a written warranty, stating that the generating set and automatic transfer switch are guaranteed against defects in material and workmanship for a period of 2 years (24 months) or 1500 operating hours (for genset), whichever occurs first, from the date the unit is placed into service.

1.8 Quality And Experience

.1 All material and parts of the generator set shall be new and unused. Each component shall be of current manufacture from a firm regularly engaged in the production of such equipment for 25 years. The entire generator set must be CSA approved or UL/CSA component labelled in U.S.A. Supplier must have in house Quality Assurance equal to ISO9002 and CSA CAN3-Z299.3.

.2 Acceptable manufacturers:

- **Cummins**
- **Alternates may be considered after tender award, but acceptance not guaranteed. Bidder carries alternate prices at their own discretion.**

PART 2 – PRODUCTS

2.1 Engine-Generators – General

.1 The unit shall be standby duty with a minimum capacity of 50 kW at a power factor of 0.80.

.2 Operating Conditions - Generator set capable of producing rated output under site conditions which are at an altitude of 50 feet above sea level and a maximum air ambient temperature of 40C.)

The load to be serviced by this generator set consists of 7 kW resistive or non-inductive load plus 2 x 20hp motors. With the resistive load already running, the motors shall be started as shown in the following table:

Motor Sequence	Starting Method	Ramp Time	Running Amps
1. Lead pump	Variable Frequency Drive	3 seconds	58
2. Lag pump	Variable Frequency Drive	3 seconds	58

- .3 The generator shall pick up its load and stabilize +/- 2% of rated frequency within 15 seconds after loss of normal power source.
- .4 Engine-generator shall start either manually or automatically on closure of a remote relay at the transfer switch. Restoration of normal power source will be automatic, but engine shall continue to run its cool down cycle as programmed in the generator control panel. Programming of the duration for the cool down cycle shall be as per manufacturer's recommendation.

2.2 Engine

- .1 Diesel Engine: Certified engine horsepower curves shall be submitted showing the manufacturer's approval of the engine rating for standby application. The rated net horsepower of the engine at the generator synchronous speed, with all accessories attached, shall not be less than that required to produce the 50 kW specified.
- .2 Prime Mover: Full diesel 4 cycle, synchronous speed 1800 r/min. Suitable for operation on Grade No. 2 diesel fuel with a minimum Cetane number of 40.
- .3 Cooling System:
- a) Fan air and water-cooled: Unit mounted radiator, water pump, thermostat, radiator duct flange and with pressure cooling by engine driven blower fan.
 - b) Engine manufacturer's recommended anti-freeze solution to provide protection to - 40°C.
 - c) Block heater: Engine jacket coolant heater, or block heater, thermostatically controlled 120 Volt operation of sufficient size to maintain the engine @ 120F. The heater shall electrically disconnect upon engine start, if required to prevent element damage.
- .4 Fuel System: Fuel transfer pump with hand primer, fuel filters, fuel rack solenoid energized when engine running.
- .5 Air Cleaner: element for heavy-duty application.
- .6 Governor: precision type electrical - electronic.
- .7 Lubrication System:

- a) Pressure lubricated by engine driven pump
- b) Lube oil filter and oil cooler
- c) Engine sump drain valve.

.8 Starting System:

- a) Automatic Controls: Fully automatic engine-generator set start-stop controls shall be provided. The engine shall start and stop immediately upon closing and opening of the starting contact in the automatic transfer switch, or upon closing and opening of the manual "Run" selector switch at the generator control panel. These controls shall provide engine shutdown on low lubricating oil pressure, excessive engine temperature, overspeed, and overcrank, and one auxiliary contact for activating accessories.
- b) Starting Motor: A direct current electric starting system with a positive engagement drive, 12 or 24V DC.
- c) Cranking limiter to provide 3 cranking periods of 10 second duration, each separated by 10 second rest.
- d) 12 or 24 V storage battery with sufficient capacity to crank engine for 60 seconds of continuous cranking.
- e) Battery Charger: Constant voltage, solid state, two stage from trickle charge at standby to boost charge after use. Capable of recharging a completely discharged battery to 80% of capacity with 4 hours and to full capacity in less than 12 hours. Automatic boost. Equipped with dc voltmeter, dc ammeter, and on-off switch.
Battery charger "fault" contact pre-wired to engine controller and included in engine controller's common alarm signal.
- f) Battery Cables: Extra flexible, multi-strand copper insulated conductors, with copper ring tongue type terminals for engine, battery type cable clamps for battery. Size as recommended by engine manufacturer.

2.3 Generator

- .1 Generator: Conform to CSA C22.2 No. 100 and to NEMA MG-1
- .2 Rating: 50kW minimum, 120/208 volt, 3 phase, 4 wire, 60 hertz at 0.80 power factor. Generator shall be sized such that voltage dip shall not exceed 25% on application of largest motor load listed in Item 2.1.2 above while other loads are running.
- .3 Type: Synchronous revolving field type, brushless, single bearing, drip-proof ventilated enclosure, and rotor shall have amortisseur windings.
- .4 Voltage Regulator:
 - a) **Solid state, RMS-sensing type (not peak sensing)**
 - b) Regulation +/- 3% no load to full load
 - c) Steady state regulation +/- 1%

- .5 Exciter:
- a) Permanent magnet generator (PMG) or AREP (auxiliary windings) type. Suitable for use with non-linear loads such as variable-frequency drives, etc.
- .6 Output at 40°C ambient:
- a) 100% full load continuously
- .7 Generator shall be capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit.

2.4 Control Panel

- .1 The control panel shall be totally enclosed and mounted at the alternator.
- .2 Instruments:
- a) Digital LCD Display to display the following:
- AC voltage, frequency and amperage
 - Battery voltage
 - Hour meter
 - Fuel level
 - Lube oil pressure
 - Coolant temperature
 - **Support for Modbus TCP/IP protocol (slave). Generator operating status to be readable by a Modbus TCP/IP master device.**
- .3 Controls:
- a) Engine emergency stop button
- b) Program selector switch labelled: Run - Off – Auto
- Run Position: Engine starts but transfer switch and other remote controls will not operate automatically
 - Off Position: Engine shall not start even though the remote start contacts close. Reset of any fault shall also be accomplished by putting the switch to the OFF position.
 - Auto Position: Normal operation of transfer switch on failure of normal power, retransfer on return of normal voltage and shuts down engine.
- c) Voltage control rheostat to be screwdriver adjusted type with locking nut.
- .4 Alarms and Engine Shutdowns:
- a) Automatic engine shut-down, alarm and indication of the following conditions:
- Engine overcrank
 - Engine overspeed

- Engine high temperature
 - Engine low lube oil pressure
- b) Automatic alarm and indication of the following conditions:
- Low battery voltage
 - Low coolant temperature
 - Low fuel level
 - Low coolant level
 - Control switch not in Auto
 - Fuel tank leakage
- c) The following other controls shall be provided:
- Alarm horn with silencer switch
 - **The controller shall include Form-C dry output contacts rated 1A @ 120VAC to separately indicate the following conditions:**
 - **"Generator Running"**
 - **"Generator Trouble"**
 - **"Generator Not in Auto"**
 - **"Generator Failure"**
 - **The controller shall include 4-20mA analog outputs for the following conditions:**
 - **Fuel level**

2.5 Main Circuit Breaker

- .1 CSA-approved circuit breaker (thermal-magnetic trip) shall be supplied. Size to suit alternator output rating and fault interrupting capacity. The circuit breaker shall be capable of carrying the generator's full load ampacity on a continuous basis. Therefore, if the circuit breaker size is less than 125% of generator's full load ampacity, a 100%-rated circuit breaker shall be provided. Otherwise, an 80%-rated circuit breaker will be acceptable.

The circuit breaker size shall not exceed 200A.

- .2 Unit mounted in an approved EEMAC 1 enclosure.
- .3 **The circuit breaker shall be equipped with an auxiliary contact wired to the generator controller to indicate a breaker-tripped condition. A tripped circuit breaker shall create a "Generator Trouble" alarm per Item 2.4.4 c) above.**

2.6 Structural Steel Mounting Base

- .1 Structural steel frame shall support engine, generator and radiator with vibration isolators between engine, generator and base

- .2 The generator set shall be bolted solidly to the concrete pad.
- .3 The mounting base shall contain the fuel tank

2.7 Exhaust System

- .1 Heavy duty exhaust silencer with condensate drain, plug and flanged couplings. Fittings and accessories as required.
- .2 Flexible connections between exhaust silencer and generator.
- .3 Maximum allowable sound level: See Section 2.9 below.

2.8 Diesel Fuel Oil Tank

- .1 Tank shall be double walled, located below the mounting base of the generator, **with leakage detection sensor installed in the interwall cavity and wired back to the generator control panel as an alarm condition.**
- .2 Tank shall be constructed of painted mild steel
- .3 Tank shall be sized for 24 hours minimum run time at 100% load
- .4 Tank shall be complete with all-necessary tank opening, fittings, pipe and accessories for filling, venting, draining and gauging including alarms for low fuel level and leak from main tank into secondary tank.
- .5 Fuel oil supply and return lines between the tank and the engine shall be provided c/w a float type liquid level gauge.

2.9 Outdoor Weatherproof Enclosure

- .1 Outdoor steel weatherproof enclosure to protect the entire generator set. The enclosure shall be weatherproof, vandalproof and provide sound attenuation.
- .2 Enclosure shall allow for necessary combustion and cooling air required for the generator set.
- .3 Enclosure shall have lockable hinged side access doors to allow maintenance access to the engine/generator and lockable hinged rear door to provide access to the control panel. Doors shall have locking handles (common key) with 316 stainless steel hinges. Lift-out panels are not acceptable.
- .4 Enclosure sheet metal shall be heavy gauge 14G (minimum) sheet steel, corrosion protected, primed and painted with manufacturer's standard colour.

- .5 Enclosure openings shall be provided with vermin-resistant screens.
- .6 Air silencers shall be provided at the radiator air discharge (if required) to reduce the noise level to 65 dBA at 7.0 meters in all directions from the generator air discharge louvers with full load applied.
- .7 Exhaust mufflers shall be provided to reduce noise level to 65 dBA at 7.0 meters in all directions from the exhaust pipe discharge location with full load applied.
- .8 Each of the enclosure doors and lift-out panels shall be monitored via a limit switch to detect door opening. The limit switches shall be pre-wired in series (normally-closed contacts, opens if door opened) with 2#14 Teck cable and terminated at clearly-identified terminal blocks in the generator control panel. Limit switches shall be Cutler-Hammer "Non Plug-In Style", cat. #10316H620 or approved equal.

2.10 Genset Accessories

- .1 Silencers - Silencers shall be supplied at the air intake and discharge as required to reduce sound levels to those specified in Section 2.9 above. Exhaust mufflers are to reduce sound levels to the same limits.
- .2 All accessories needed for the proper operation of the generating set shall be furnished. These shall include a silencing muffler, flexible exhaust connection, starting batteries, battery cables, battery rack, and operation and maintenance manuals.

2.11 Automatic Transfer Switch

- .1 The automatic transfer switch (ATS) shall be 120/208VAC, 3-pole, solid neutral and shall be capable of carrying rated ampacity on a continuous basis (100% rated). The transfer switch shall be suitable use on all types of loads without derating. The following ampacity ratings are:
 - SA-11: 100A**
 - SA-12: 100A**
 - SA-16: 200A**
- .2 The ATS shall be CSA-approved (or equivalent).
- .3 The ATS shall be housed in an EEMAC1 enclosure.
- .4 The ATS shall automatically transfer the load to the standby power source when the line voltage falls below 70% of normal. Load transfer shall be open-transition ("break before make"), with neutral-position delay to ensure adequate voltage decay to prevent out-of-phase transfers or retransfers.

- .5 The ATS shall be equipped with an internally-accessible operating handle for manual operation.
- .6 The ATS shall be electrically operated and mechanically held in both normal and emergency positions so that it shall not be possible for load circuits to be connected to normal and emergency sources simultaneously, regardless of whether switch is electrically or manually operated.
- .7 The ATS shall be equipped with power switching units that do not incorporate overcurrent protection. Upstream overcurrent protection will be provided external to the ATS.
- .8 The ATS shall be suitable for wall-mounting.
- .9 The ATS shall be equipped with a controller that incorporates the following:
 - a) 128 x 64 graphical LCD display for monitoring & programming
 - b) Display of 3-phase utility/generator voltages, system frequency and timer countdown operation
 - c) "Load on Utility" and "Load on Generator" indication
 - d) Utility and generator source available indication
 - e) 3-phase voltage sensing on utility and generator sources
 - f) Under/over-frequency sensing
 - g) Engine start delay timer (adjustable 0-6 seconds)
 - h) Engine cooldown delay timer (adjustable 0-60 minutes)
 - i) Neutral position delay timer (adjustable 0-5 minutes)
 - j) Utility return delay timer (adjustable 0-60 minutes)
 - k) Engine start contact (Form C dry contact, 5A resistive, 30VDC)
 - l) Automatic exercise timer
 - m) Two auxiliary output contacts (Form C dry contacts, 10A resistive, 240VAC). One for ATS connected to Utility and one for ATS connected to generator.
 - m) Utility power failure simulation test
- .10 Acceptable Products:
 - .1 Asco Power Technologies "300" Series c/w Advanced Function Software Bundle 11BE
 - SA-11:** Cat. #J-3ADTS-A-3-150-C-GX-C-11BE
 - SA-12:** Cat. #J-3ADTS-A-3-150-C-GX-C-11BE
 - SA-16:** Cat. #J-3ADTS-A-3-200-C-GX-C-11BE
 - .2 Approved equal

3.0 PART 3 - EXECUTION

3.1 Testing and Commissioning

-
- .1 Perform tests on the generator and automatic transfer switch as follows after locating genset on pad.
- a) An installation check, start-up and full load test shall be performed by the manufacturer's local representative in accordance with the manufacturer's recommended procedures.
 - b) Notify consultant 5 working days in advance of test date
 - c) Provide sufficient diesel fuel to permit all required on-site tests to be undertaken and refill tank prior to turnover of generator to Owner.
 - d) In addition, demonstrate with pumping station load connected:
 - Unit start, transfer to load, retransfer to normal power, unit shut down, on "Automatic" control.
 - Unit start and shut down on "Manual" control
 - Operation of manual bypass switch (if applicable)
 - Operation of automatic alarms and shut down devices
 - e) Run unit at full load on a resistive load bank for minimum period of 4 hours to show load carrying ability, stability of voltage and frequency, and satisfactory performance of engine ventilation system to provide adequate engine cooling.
 - f) At end of test run check battery voltage to demonstrate battery charger has returned battery to fully charged state.
 - g) Check accessories, such as block heater, etc.
 - h) Program and test status output relays ("Running", "Trouble", "Not in Auto", "Failure").
 - i) Provide full test report to the Engineer on completion.

***** END *****

PART 1 – GENERAL**1.1 Co-ordination with Power Supply Authority**

- .1 Co-ordinate and meet requirements of power supply authority. Ensure availability of power when required.

PART 2 – PRODUCTS**2.1 Materials**

- .1 Underground ducts: to Section 16107 - Direct Buried Underground Cable Ducts, rigid type, size as indicated.
- .2 Rigid steel galvanized conduit and fittings: to Section 16111 - Conduits, Conduit Fastenings and Conduit Fittings.
- .3 Conductors: copper, type RW90, to Section 16122 – Wires and Cables 0-1000V, size and number of conductors as indicated.
- .4 Meter socket: as specified on the drawings and to the approval of supply authority.

PART 3 – EXECUTION**3.1 Installation**

- .1 Install cables in trenches and in ducts conduit in accordance with Section 16106 - Installation of Cables in Trenches and in Ducts.
- .2 Allow adequate conductor length for connection to supply by power supply authority.
- .3 Install meter socket and conduit.
- .4 Allow adequate conductor length for connection to service equipment.
- .5 Make grounding connections in accordance with Section 16450 - Grounding - Secondary.
- .6 Provide suitable drainage in service conduit prior to point of building entry. Seal service conduit with suitable compound to prevent entry of moisture or gases.

3.2 Field Quality Control

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements.
- .2 Perform additional tests if required by authority having jurisdiction.

***** END *****

PART 1 – GENERAL

Not Used

PART 2 – PRODUCTS**2.1 Equipment****2.1.1 Utility Meter Base:****SA-11: 100A****SA-12: 100A****SA-16: 200A**

- .1 Meter base shall comply with BC Hydro requirements (or power supply authority having jurisdiction)
 - .2 Equipment characteristics:
 - .1 System voltage, ampacity, phases: As shown on drawings.
 - .2 For underground or overhead services.
 - .3 EEMAC3 steel enclosure
 - .4 CSA-approved for copper or aluminum conductors.
 - .5 Tunnel-type line, load and neutral lugs
 - .3 Acceptable Products:
 - .1 Cutler-Hammer “Heavy Duty” series
(agent/distributor: Eaton-Yale Ltd.)
 - .2 Or approved equal
- 2.1.2 Enclosed Circuit Breaker: to Section 16477 - Moulded Case Circuit Breakers, rating as indicated.
- 2.1.3 Panelboard: to Section 16471 - Panelboards Breaker Type, rating as indicated.

PART 3 – EXECUTION**3.1 Installation**

- .1 Install service equipment
- .2 Connect to incoming service.
- .3 Connect to outgoing load circuits.

- .4 Make grounding connections in accordance with Section 16450 – Grounding - Secondary.
- .5 Make provision for power supply authority's metering.

***** END *****

PART 1 – GENERAL**1.1 Shop Drawings and Product Data**

- .1 Submit shop drawings and product data in accordance with Section 16010 – Electrical General Requirements.

PART 2 - PRODUCTS**2.1 Equipment**

- .1 Surge protective device shall comply with ANSI/IEEE C62.41 Category “C” requirements

Surge protective device shall be tested and listed to UL 1449 3rd Edition – UL Standard for Safety for Surge Protective Devices

Surge protective device shall be tested and listed to UL 1283– UL Standard for Electromagnetic Interference Filters

- .2 Arrester characteristics:
 - .1 System voltage, phases, wiring: As shown on drawings.
 - .2 MOV-based with fuse or thermal protection for each MOV.
 - .3 Minimum 100kA per phase peak surge current capacity
 - .4 Minimum 20kA nominal discharge current rating
 - .5 200 kAIC short circuit current rating.
 - .6 L-N, L-G, N-G, L-L protection modes (for 3-phase wye-connected systems)
 - .7 EEMAC 1 surface-mount enclosure with front-mounted display unit.
 - .8 LED status indicator for each phase and N-G protection mode
 - .9 Audible alarm with silence button
 - .10 1 NO / 1 NC dry relay alarm output contacts rated 1A @ 125 VAC
 - .11 EMI/RFI filtering with -30dB attenuation from 100 kHz to 100 MHz.
 - .12 10-year warranty
 - .13 CSA approved
- .3 Acceptable Products:
 - .1 Cutler-Hammer “SPD series” – Standard model
(agent/distributor: Eaton-Yale Ltd.)
 - .2 Or approved equal

PART 3 – EXECUTION

3.1 Installation

- .1 Install surge protective device and connect to secondary bus and ground bus.
- .2 Keep lead lengths to an absolute minimum.

***** END *****

PART 1 – GENERAL**1.1 References**

- .1 C22.2 No. 0.4-M1982 (R1993) Bonding and Grounding of Electrical Equipment (Protective Grounding).
- .2 C22.2 No. 41-M1987 (R1993) Grounding and Bonding Equipment

PART 2 – PRODUCTS**2.1 Equipment**

- .1 Rod electrodes: copper clad steel 19 mm diameter by 3.0 m long complete with inspection well unless noted otherwise on drawings.
- .2 Grounding conductors: bare stranded copper, soft annealed, size as indicated on drawings.
- .3 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 Bonding jumpers, straps.
 - .4 Pressure wire connectors.
- .4 Acceptable Products:
 - .1 Burndy “Hyground” series (agents/distributors: Nedco, Gough Electric)
 - .2 Approved equal
- .5 An inspection well (electrode box) shall be installed for each ground rod to facilitate post-installation inspections and testing. Inspection wells shall be cast iron, 10” diameter, 18” depth, with removable cast iron **lid marked “Ground Rod”**.

Acceptable Products:

- .1 Dobney Foundry Ltd. #MR-8 valve box with non-locking lid
 - .2 Approved equal
- .6 A grounding pad shall be installed, if shown on the drawings. The grounding pad shall be 760 min long x 76 mm wide x 6.35 mm thick copper mounted on the wall with a 25.4 mm air space using insulated spacers between the pad and the wall. The ground pad shall be drilled and tapped, as required, for various bonding.

PART 3 – EXECUTION**3.1 Installation - General**

- .1 Install complete permanent, continuous grounding and bonding system including, electrodes, conductors, connectors, accessories in accordance with the requirements Section 10 of the Canadian Electrical Code and B.C. Amendments.
- .2 Install artificial grounding electrodes and cabling as shown on the drawings and as specified herein.
- .3 Metal water supply and discharge piping shall be utilized to form part of the system grounding electrode. A suitably-sized grounding conductor shall be run from both the suction and discharge pipes to the main building ground pad.
- .4 Steel reinforcing bars installed in the foundation and floor slab concrete shall be utilized to form part of the system grounding electrode (ufer ground). Suitable grounding connectors and cable shall be used to interconnect the steel reinforcing bars. A suitably-sized grounding conductor shall be run to the main building ground pad.
- .5 Make buried connections, and connections to electrodes, using inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .6 Use mechanical connectors for bonding connections to equipment provided with lugs.
- .7 Soldered joints not permitted.
- .8 Install bond 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 separate bond conductor to outdoor lighting standards.
- .10 Make bonding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .11 Where non-metallic conduit, flexible conduit, power cable or portable cable is called for, a bond conductor shall be installed with the power conductors.
- .12 Metal wastewater piping shall be bonded to the system grounding conductor with a #6 AWG copper conductor.
- .13 All motor branch circuits shall include a separate copper grounding conductor sized in accordance with the overcurrent protection in the circuit and Table 16 of the Canadian Electrical Code.
- .14 In addition, all non-current-carrying metal parts of electrical apparatus shall be bonded to the grounding system.

3.2 Electrodes

- .1 Install rod electrodes and make grounding connections.
- .2 Bond separate, multiple electrodes together.

3.3 Equipment Bonding

- .1 Install bonding 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.

3.4 Field Quality Control

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation. Report measured ground resistance to the Engineer and, if required, install additional ground rods and cables to reduce ground resistance.
- .2 Perform tests before energizing electrical system.

***** END *****

PART 1 – GENERAL**1.1 Shop Drawings**

- .1 Submit shop drawings and product data in accordance with Section 16010 – Electrical General Requirements.

PART 2 – PRODUCTS**2.1 Panelboards**

- .1 Use panelboards of one manufacturer throughout project.
- .2 Equipment Characteristics:
 - .1 250V panelboards: bus and breakers rated for 10,000A symmetrical interrupting capacity unless shown otherwise on drawings.
 - .2 600V panelboards: bus and breakers rated for symmetrical interrupting capacity as shown on drawings.
 - .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
 - .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
 - .5 Two keys for each panelboard and key panelboards alike.
 - .6 Copper bus with neutral of same ampere rating as mains.
 - .7 Mains: suitable for bolt-on breakers. Plug-in breakers are not acceptable.
 - .8 Trim with concealed front bolts and hinges.
 - .9 Trim and door finish: baked grey enamel.
- .3 Acceptable Products:
 - .1 Cutler Hammer “Pow-R-Line 1a” and “Pow-R-Line 2a” series (agent/distributor: Eaton-Yale Ltd.)
 - .2 Square D “NQ” and “NF” series (agent/distributor: Nedco)
 - .3 Approved equal

2.2 Breakers

- .1 Breakers: to Section 16477 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards, except as indicated otherwise.
- .3 Main breaker: 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 Section 16010 - Electrical General Requirements.
- .2 Nameplate for each panelboard engraved as indicated.
- .3 Complete circuit directory with typewritten legend showing name of each circuit.

PART 3 – 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 Section 16010 - Electrical General Requirements or as indicated.
- .3 Connect loads to circuits.
- .4 Connect neutral conductors to common neutral bus.

***** END *****

PART 1 – GENERAL**1.1 References**

- .1 CSA C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

1.2 Shop Drawings

- .1 Submit shop drawings and product data in accordance with Section 16010 – Electrical General Requirements.

PART 2 – PRODUCTS**2.1 Circuit Breaker - Main Service Entrance (80%-rated)**

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- .2 Rated to carry 80% of nameplate current on a continuous basis, and 100% of nameplate current for short periods of time.
- .3 Trip-free mechanism.
- .4 All poles mechanically interconnected to prevent single-phasing.
- .5 Voltage, ampacity and interrupting capacity as shown on the drawings.
- .6 Complete with solid neutral kit.
- .7 CSA approved for use as service entrance equipment.
- .8 Front-operated and capable of being padlocked in either the ON or OFF position.
- .9 EEMAC1 general purpose enclosure finished in light grey (ASA-61) baked enamel (where needed).
- .10 Non-interchangeable trip unit.
- .11 Acceptable Products:
 - .1 Eaton Cutler-Hammer - Series "C"
 - .2 Approved equal

2.2 Circuit Breaker - Branch Circuit (80%-rated)

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- .2 Rated to carry 80% of nameplate current on a continuous basis, and 100% of nameplate current for short periods of time.
- .3 Trip-free mechanism.
- .4 All poles mechanically interconnected to prevent single-phasing.
- .5 Voltage, ampacity and interrupting capacity as shown on the drawings.
- .6 Front-operated and capable of being padlocked in either the ON or OFF position.
- .7 EEMAC1 general purpose enclosure finished in light grey (ASA-61) baked enamel (where needed).
- .8 Non-interchangeable trip unit.
- .9 Acceptable Products:
 - .1 Eaton Cutler-Hammer - Series "C"
 - .2 Approved equal

2.3 Circuit Breakers – in Panelboards & Loadcenters

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.
- .2 Common-trip breakers: with single handle for multi-pole applications
- .3 Trip-free mechanism.
- .4 Voltage, ampacity and interrupting capacity as shown on the drawings.
- .5 GFCI circuit breakers shall have the following additional features:
 - .1 Class A (6 mA) ground fault trip
 - .2 Visible trip indicator
- .6 Acceptable Products:
 - .1 Cutler-Hammer "Quicklag" series
 - .2 Approved equal

PART 3 – EXECUTION

3.1 Installation

- .1 Install circuit breakers as indicated.

***** END *****

PART 1 – GENERAL**1.1 References**

- .1 ANSI C82.4-1985, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.

1.2 Shop Drawings and Product Data

- .1 Submit shop drawings and product data in accordance with Section 16010 – Electrical General Requirements.

PART 2 – PRODUCTS**2.1 Kiosk Power and Controls Compartment Luminaires (LED, 48” length)**

- .1 Equipment characteristics:
 - .1 32W, low-profile LED strip luminaire with snap-on, frosted diffuse lens
 - .2 4000K CCT, 80 CRI LED lamps, L70 = 100,000+ hours, 3000 lumens
 - .3 High gloss, baked white enamel finish
 - .4 General purpose, indoor use, damp-location rated
 - .5 Ceiling or wall-mounting
 - .6 Nominal dimensions: 1220 mm long x 53 mm wide x 37 mm high
 - .7 -20°C to 30°C ambient temperature range
 - .8 Multi-voltage driver with 0-10 VDC dimming input
 - .9 CSA certified
- .2 Acceptable Products:
 - .1 Lithonia “Z” series, #ZL1N-L46-3000LM-FST-MVOLT-40K-80CRI-WH
 - .2 Approved equal

PART 3 – EXECUTION**3.1 Installation**

- .1 Locate kiosk luminaires to provide best possible illumination of equipment within.

***** END *****

PART 1 – GENERAL**1.1 Shop Drawings**

- .1 Submit shop drawings and product data in accordance with Section 16010 – Electrical General Requirements.
- .2 Include schematic, wiring, interconnection diagrams.

PART 2 – PRODUCTS**2.1 General**

- .1 For each type of controls and instrumentation equipment, use products of one manufacturer throughout project.
- .2 Note that some of the controls and instrumentation equipment listed below may not be utilized for this project. The contractor shall refer to the drawings to identify which equipment is required.

2.2 Alarm Strobes – Outdoors (LED type)

- .1 Equipment Characteristics:
 - .1 Heavy duty, NEMA 4X, surface mount
 - .2 120VAC operation, 0.11A
 - .3 LED lamp, 148,000 hours L70 lifespan
 - .4 Steady or 65 FPM flashing operation
 - .5 Fibreglass-reinforced, thermoplastic polyester resin base
 - .6 Red lens, double-fresnel type, shatter-resistant polycarbonate
 - .7 -35°C to +66°C operating temperature range
 - .8 Complete with optional wall-mounting bracket and outlet box
 - .9 cUL listed
- .2 Acceptable Products:
 - .1 GE Security (ex-Edwards) “105XBRM” series.
(agent/distributor: GE Security Canada (519) 376-2430)
Strobe cat. #105XBRMR120A
Mounting bracket cat. #105BM
Outlet box cat. #105BX
 - .2 Approved equal

2.3 Current Transmitters

- .1 Equipment Characteristics:
 - .1 Integrated donut-style current transformer and 4-20mA signal transducer
 - .2 15-30 VDC loop powered
 - .3 Selectable range from 0-10/20/50 Amps; 3x range continuous maximum input
 - .4 True RMS current measurement
 - .5 600VAC insulated conductors
 - .6 DIN rail mountable
 - .6 cUL Listed
- .2 Acceptable Products:
 - .1 Greystone "CS-675" series, cat. #CS675-R1
 - .2 Approved equal

2.4 DC Power Supplies (24 VDC @ 5.0 A)

- .1 Equipment Characteristics:
 - .1 120 VAC input
 - .2 5.0 A, 24 VDC adjustable output, +/- 2% regulation, <50mV peak-peak ripple
 - .3 Switching type, capable of parallel operation
 - .4 Protected against output short circuit, overload, open-circuit, input overvoltage
 - .5 "On" LED indicator
 - .6 35mm DIN rail mounting
- .2 Acceptable Products:
 - .1 Sola "SDN" series. Cat. #SDN5-24-100C
(agent/distributor: K.M Roberts & Associates Ltd. (604) 882-8488)
 - .2 Phoenix Contact "TRIO" series. Cat. #TRIO-PS/1AC/24DC/5
(agent/distributor: Phoenix Contact Ltd. (800) 890-2820)
 - .3 Approved equal

2.5 Enclosures – Wall-Mounted Single Door Control Panel without Disconnect Switch

- .1 Equipment Characteristics:
 - .1 Height & width as shown on drawings. Minimum 10" depth (greater, if required)
 - .2 Single door with quarter-turn latches, interior data pockets
 - .3 Full size interior backpan
 - .4 EEMAC12, 14 gauge, steel body & doors with welded seams
 - .5 ANSI61 grey exterior, white enamel interior
 - .6 With optional wall-mounting foot kit
 - .7 With optional door stop kit
- .2 Acceptable Products:
 - .1 Hoffman "Concept - Bulletin CW1" series (agents/distributors: Elec-Tech Sales Ltd. (604) 278-3044)
 - .2 Approved equal

2.6 Ethernet Network Switch (5 ports)

- .1 Equipment Characteristics:
 - .1 5-port, industrial-grade Ethernet switch
 - .2 10/100 Mbps, auto-sensing
 - .3 Half or full-duplex operation
 - .4 10-30VDC @ 300 mA power input
 - .5 Metal housing with 35mm DIN rail mount
 - .6 LEDs for power, activity, link/data rate
 - .7 Shielded, copper RJ45 connectors
- .2 Acceptable Products:
 - .1 N-Tron cat. #105TX
(agent/distributor: Westburne Electric Supply Ltd. (604) 270-0450)

2.7 Ethernet/AC Power Hub

- .1 Equipment Characteristics:
 - .1 RJ45 ethernet passthrough
 - .2 5-15R 120VAC receptacle
 - .3 Panel mounted metal housing
 - .4 CSA approved
- .2 Acceptable Products:
 - .1 Weidmuller cat. #7940000235
 - .2 Approved equal

2.8 Flow Transmitter - Magnetic (Remote (2-piece) Style)

- .1 Equipment Characteristics:
 - .1 Magnetic flow transmitter
 - .2 Remote version: separate flow sensor and transmitter.
 - .3 120VAC operation
 - .4 4-20mA, 2-wire output, 700 ohms loop impedance capacity
 - .5 Open-collector pulse output, 30VDC @ 250mA, passive, isolated
 - .6 2-line, illuminated display of process and configuration information. Handheld remote programmer.
 - .7 Sensor with polyurethane liner for water & wastewater applications
 - .8 **Sensor with factory-attached & factory-potted cables, IP68-rated for continuous submergence at <3.0m (sensor option 'CB').**
 - .9 **Sensor and cable CSA-certified for use in a Zone 2 or Class 1, Division 2 hazardous area.**
 - .10 Operating pressure, flow range, sensor diameter and flange type to be as specified by civil engineer. Confirm with civil engineer prior to purchase.
 - .11 Cast aluminum EEMAC4X (IP67) transmitter housing c/w ½" NPT cable entries.

- .12 Repeatability: +/- 0.2% of rate
- .13 Ambient temperature range: -20°C to +60°C
- .14 **Include optional grounding rings (2) for flow sensor flanges.**

.2 Acceptable Products:

- .1 **Endress & Hauser “Promag W400” series**
(agent/distributor: Endress & Hauser Canada Ltd. (604) 925-7600)

2.9 Harmonic Filters – Output dV/dt Type

.1 Equipment Characteristics:

- .1 3-phase harmonic output filter
- .2 Open reactor type
- .3 Maximum peak motor voltage is 150% of DC bus voltage at 1000'
- .4 Minimum 0.1uS rise time
- .5 Maximum 1.7% insertion voltage loss @ 60 Hz
- .6 100% continuous RMS current rating, 150% overload for 1 minute, 200% overload for 10 seconds
- .7 3 year warranty
- .8 cUL listed

.2 Acceptable Products:

SA-11 dV/dt Filter Unit: MTE “dV Sentry” series

- .1 #DVSP0022E
(agents/distributors: Canadian Electro-Drives (604) 468-8711)
- .2 Approved Equal

SA-12 dV/dt Filter Unit: MTE “dV Sentry” series

- .1 #DVSP0012E
(agents/distributors: Canadian Electro-Drives (604) 468-8711)
- .2 Approved Equal

SA-16 dV/dt Filter Unit: MTE “dV Sentry” series

- .1 #DVSP0065E
(agents/distributors: Canadian Electro-Drives (604) 468-8711)
- .2 Approved equal

2.10 Harmonic Filters – Input Line Reactor Type

.1 Equipment Characteristics:

- .1 3-phase series reactors
- .2 Epoxy-impregnated windings, 3000V RMS dielectric strength
- .3 Limits dV/dt to within NEMA MG1 Part 31 requirements
- .4 Open reactor type
- .5 Impedance (3%, 5%, etc.) as shown on drawings. 100% of rated impedance at 100% to 150% current. Minimum 50% of rated impedance at 350% current

- .6 150% service factor
 - .7 200% overload for 30 minutes, 300% overload for 1 minute
 - .8 Class N (200°C) insulation, with maximum 135°C temperature rise
 - .9 Maximum 20 kHz switching frequency
 - .10 CSA-approved
- .2 Acceptable Products:
- SA-11 Line Reactor Unit:** MTE “RL” series
- .1 #RL-03501
(agents/distributors: Canadian Electro-Drives (604) 468-8711)
 - .2 Approved Equal
- SA-12 Line Reactor Unit:** MTE “RL” series
- .1 #RL-01801
(agents/distributors: Canadian Electro-Drives (604) 468-8711)
 - .2 Approved Equal
- SA-16 Line Reactor Unit:** MTE “RL” series
- .1 #RL-08001
(agents/distributors: Canadian Electro-Drives (604) 468-8711)
 - .2 Approved equal

2.11 Indicating Lights

- .1 Equipment Characteristics:
 - .1 120 VAC operation
 - .2 LED lamps
 - .3 Fits 30.5mm cutout
 - .4 EEMAC 4 & 13 (IP65) rating
 - .5 Lens color and nameplate as shown on drawings
 - .6 Push-to-test type (if indicated on drawings)
- .2 Acceptable Products:
 - .1 Allen-Bradley “Bulletin 800T” series (agent/distributor: Westburne)
 - .2 Idec “TWTD” series (agent/distributor: Idec Canada Limited)
 - .3 Siemens “Class 52 Heavy Duty Watertight/Oiltight” series (agent/distributor: EB Horsman & Son)
 - .4 Approved Equal

2.12 Interface Converters – Modbus TCP/RTU to EtherNet/IP

- .1 Equipment Characteristics:
 - .1 Converts Modbus TCP/RTU (or ASCII) to EtherNET/IP
 - .2 Ethernet RJ45 10/100 Mbps, auto negotiation connector for Ethernet/IP and Modbus TCP
 - .3 Serial D-SUB 9 plug for Modbus RTU

- .4 10.8 V DC ... 30 V DC input power @ maximum 60mA (@24VDC)
- .5 LED status indicator
- .2 Acceptable Products:
 - .1 Phoenix Contact # GW EIP/MODBUS 1E/1DB9 (1062540)
(agent/distributor: Phoenix Contact Ltd. (800) 890-2820)
 - .2 Approved equal

2.13 Level Controllers & Ultrasonic Level Transmitters (Sitrans LT500 series)

- .1 Equipment Characteristics:
 - .1 Ultrasonic type c/w transducer head
 - .2 0.1% resolution, +/- 0.25% repeatability
 - .3 Built-in pumping control algorithms
 - .4 LCD status display
 - .5 4 SPST & 2 SPDT output relays
 - .6 4-20mA process signal input and output
 - .7 120 VAC operation
 - .8 Panel or wall mount EEMAC4 enclosure as shown on drawings
 - .9 Transducer – 15m range, 6° beam angle, cable length to suit, **approved for use in Class 1, Zone 1 hazardous locations – complete with submergence shield**
- .2 Acceptable Products:
 - .1 Siemens (agent/distributor: EB Horsman & Son)
 - Controller: “Sitrans 500” series, # 7ML6023-1AC20-1AA3. Contractor to verify that part number suggested meets the specifications
 - Transducer: “Echomax XPS-15” series, #7ML1118-0-0-?-A-4 (where ? denotes cable length)
 - Submergence Shield: #7ML1830-1BJ
 - Handheld Programmer: #AE36563512

2.14 Level Switches

- .1 Equipment Characteristics:
 - .1 Mercury-free, mechanical float switch
 - .2 SPDT contacts
 - .3 Polypropylene casing
 - .4 Complete with cable (length to suit)
- .2 Acceptable Products:
 - .1 ITT Flygt cat. #ENM-10
(agent/distributor: ITT Flygt (604) 941-6664)
 - .2 Approved equal

2.15 Limit Switches – Kiosk Doors Intrusion Detection

- .1 Equipment Characteristics:
 - .1 Top-push style
 - .2 Field-adjustable, pushbutton operator
 - .3 NEMA 1, 4 & 13, zinc die-cast enclosure
 - .4 Form-C output contacts
- .2 Acceptable Products:
 - .1 Cutler-Hammer “Non Plug-In Style”, cat. #10316H620
(agent/distributor: Eaton-Yale Ltd. (604) 273-5949)
 - .2 Approved equal

2.16 Meters - Elapsed Time

- .1 Equipment Characteristics:
 - .1 120 VAC power input
 - .2 Electro-mechanical type
 - .3 0.01 hours resolution, 0 – 99999.99 hours range
 - .4 Non-resettable
 - .5 48mm x 48mm housing, flush panel mount
 - .6 Operation indication
 - .7 CSA-approved
- .2 Acceptable Products:
 - .1 Intermatic Grasslin #UWZ48E-120U
(agent/distributor: EB Horsman & Son (604) 596-7111)
 - .2 Veeder-Root “7795” series, #779516-201
 - .3 Approved equal

2.17 Motor Starters – Single-phase Manual Type

- .1 Equipment Characteristics:
 - .1 120/240 VAC, 1 phase, 1 pole, 1 hp manual starter
 - .2 Complete with Type 1 enclosure with pilot light
 - .3 Heater element sized to motor FLA
- .2 Acceptable Products:
 - .1 Cutler-Hammer “MS” series cat #MST01SN1P complete with #MSHXXXXA
heater (replace XXX with appropriate model for motor FLA)
(agent/distributor: Eaton-Yale Ltd. (604) 273-5949)
 - .2 Approved equal

2.18 Operator Interface Unit

- .1 Equipment Characteristics:
 - .1 800 x 600 pixels, 10 inch, color LCD display with LED backlight
 - .2 Resistive analog touch screen
 - .3 256 MB on-board flash memory
 - .4 24 VDC power input
 - .5 Ethernet communications
- .1 Acceptable Products:
 - .1 Allen-Bradley “Panelview 800”, cat. #2711R-T10T
(agent/distributor: Westburne Electric Supply Ltd. (604) 270-0450)

2.19 Potentiometers

- .1 Equipment Characteristics:
 - .1 Resistance and power rating as noted on drawings
 - .2 Linear taper with 270 degree rotational sweep
 - .3 Vibration-resistant
 - .4 Fits 30.5mm cutout
 - .5 EEMAC 4 & 13 (IP65) rating
- .2 Acceptable Products:
 - .1 Allen-Bradley “Bulletin 800T” series (agent/distributor: Westburne)
 - .2 Approved equal

2.20 Programmable Logic Controller

- .1 Allen-Bradley “CompactLogix” series. Specific components shall be as follows:
 - .1 CPU Module: L30ER. Model #1769-L30ER
 - 2 GB SD Memory card. Model #1784-SD2
 - 1 MB user memory
 - 1 USB programming port
 - 2 x 10/100 Ethernet/IP port
 - Up to 8 local I/O expansion modules & 16 ethernet nodes
 - .2 Power Supply: 4A@5VDC, 2A@24VDC. Model #1769-PA4
 - .3 AC Input Modules: 16 points, 120 VAC. Model #1769-IA16
 - .4 Relay Output Modules: 16 points, 8/common. Model #1769-OW16
 - .5 Isolated Relay Output Modules: 8 points. Model #1769-OW8I
 - .6 Analog Input Modules: 4 channel, individually isolated, differential current/voltage. Model #1769-IF4I
 - .7 Analog Output Modules: 4 channel, individually isolated, 0/4-20mA current. Model #1769-OF4CI
 - .8 End Caps: Communications bus terminators (as needed). Model #1769-ECR (right) & #1769-ECL (left)

2.21 Pushbuttons

- .1 Equipment Characteristics:
 - .1 1 normally open, 1 normally closed, momentary contacts
 - .2 Fits 30.5mm cutout
 - .3 Red flush head (or other color as shown on drawings)
 - .4 EEMAC 4 & 13 rating
 - .5 Nameplate as shown on drawings
- .2 Acceptable Products:
 - .1 Allen-Bradley “Bulletin 800T” series. Cat. # 800T-A6A
(agent/distributor: Westburne)
 - .2 Idec “TWTD” series (agent/distributor: Idec Canada Limited)
 - .3 Siemens “Class 52 Heavy Duty Watertight/Oiltight” series (agent/distributor: EB Horsman & Son)
 - .4 Approved equal

2.22 Relays - AC Control

- .1 Equipment Characteristics:
 - .1 General-purpose, enclosed type with unsealed housing
 - .2 120VAC or 240VAC coil, as shown on drawings
 - .3 4 pole, double-throw contacts (4PDT)
 - .4 LED operation indicator
 - .5 Push-to-test button
 - .6 Plug-in style with matching front-connecting socket for 35mm symmetrical DIN mounting track
- .2 Acceptable Products:
 - .1 Idec “RU” series (agent/distributor: Gescan (604) 214-6162)
 - Relay cat. #RU4S-A110 (120VAC coil)
 - Relay cat. #RU4S-A220 (240VAC coil)
 - Socket cat. #SY4S-05
 - .2 Omron “MY” series (agent/distributor: Omron Canada Inc. (604) 522-8855)
 - Relay cat. #MY4IN-AC120 (120VAC coil)
 - Relay cat. #MY4IN-AC240 (240VAC coil)
 - Socket cat. #PYF14A-E
 - .3 Approved equal

2.23 Relays – Current Sensing (AC & DC)

- .1 Equipment Characteristics:
 - .1 AC & DC current-sensing relay with 0.05 - 15A measuring range
 - .2 SPDT output relay, rated 3A resistive @ 240VAC
 - .3 Adjustable 0.05 - 10A trip setting with adjustable 0.05 - 5A hysteresis
 - .4 0.1 - 20 seconds adjustable trip and restart delays
 - .5 User-selectable overcurrent, undercurrent or out-of-band trip

- .6 LED fault indicator
 - .7 24 - 120 VAC/VDC operating voltage
 - .8 35mm DIN-rail mount
- .2 Acceptable Products:
- .1 Siemens “3UG” series. Cat. #3UG4622-1AW30
(agent/distributor: EB Horsman & Son)
 - .2 Approved equal

2.24 Relays - DC Control

- .1 Equipment Characteristics:
- .1 General-purpose, enclosed type with unsealed housing
 - .2 24VDC coil
 - .3 4 pole, double-throw contacts (4PDT)
 - .4 LED operation indicator
 - .5 Push-to-test button
 - .6 Plug-in style with matching front-connecting socket for 35mm symmetrical DIN mounting track
- .2 Acceptable Products:
- .1 Idec “RU” series (agent/distributor: Gescan (604) 214-6162)
Relay cat. #RU4S-D24
Socket cat. #SY4S-05
 - .2 Omron “MY” series (agent/distributor: Omron Canada Inc. (604) 522-8855)
Relay cat. #MY4IN-DC24
Socket cat. #PYF14A-E
 - .3 Approved equal

2.25 Relays - AC Timing (On-delay, One-shot or Repeat-cycle type)

- .1 Equipment Characteristics:
- .1 Solid-state, enclosed type
 - .2 120VAC coil
 - .3 Double pole, double-throw output contacts (DPDT)
 - .4 0.05 sec. – 180 hrs. adjustable on-delay via labelled dial
 - .5 LED operation indicators
 - .6 Track-mount socket for 35mm symmetrical DIN mounting track
- .2 Acceptable Products:
- .1 Idec “GT3A” series (agent/distributor: Gescan (604) 214-6162)
Relay cat. #GT3A-3AF20
Socket cat. #SR2P-05
 - .2 Omron “H3CR” series (agent/distributor: Omron Canada Inc. (604) 522-8855)
Relay cat. #H3CR-A8-AC100-240
Socket cat. #P2CF-08

2.26 Relays - AC Timing (True Off-delay type - up to 10 minutes)

- .1 Equipment Characteristics:
 - .1 Enclosed type
 - .2 120VAC coil
 - .3 Double pole, double-throw output contacts (DPDT)
 - .4 0.1 - 600 seconds adjustable delay via labelled dial
 - .5 Power indicator
 - .6 Track-mount, 8-pin socket for 35mm symmetrical DIN mounting track
- .2 Acceptable Products:
 - .1 Idec "GT3F" series (agent/distributor: Gescan (604) 214-6162)
 - Relay cat. #GT3F-2AF20
 - Socket cat. #SR2P-05
 - .2 Omron "H3CR" series (agent/distributor: Omron Canada Inc. (604) 522-8855)
 - Relay cat. #H3CR-H8L-100-120AC-M
 - Socket cat. #P2CF-08

2.27 Relays – PLC Watchdog Digital Timing (AC or DC)

- .1 Equipment Characteristics:
 - .1 Backlit display
 - .2 24V AC/DC Power supply
 - .3 Double pole, double-throw output contacts (DPDT)
 - .4 0.05 sec. – 180 hrs. adjustable on-delay via labelled dial
 - .5 Track-mount socket for 35mm symmetrical DIN mounting track
 - .6 Watchdog function
- .2 Acceptable Products:
 - .1 Finder "84" series SMARTimer 16A
 - .2 Approved equal

2.28 Relays – Intrinsically Safe (20-250 VAC or 20-125 VDC input power)

- .1 Equipment Characteristics:
 - .1 Renders switches or sensors safe for operation in explosion-hazard areas.
 - .2 20-250V AC or 20-125 VDC input power
 - .3 2 x 2A, 250VAC, SPST relay output configurable for normal or inverse operation
 - .4 LED status indicators
 - .5 CSA-approved
 - .6 Two input channel
- .2 Acceptable Products:
 - .1 Turck "Interface Modul" series, cat. # IM1-22EX-R (two-channel version)

- (agent/distributor: Chartwell Electronics Inc. 1-877-513-7769)
- .2 Approved equal

2.29 Relays - Phase Loss

- .1 Equipment Characteristics:
- .1 3 phase, 3 wire direct input, voltage to suit
 - .2 SPDT output relay, rated 10A resistive @ 240 VAC
 - .3 Protection against overvoltage, undervoltage, unbalanced voltage, phase loss, phase reversal, short cycling
 - .4 Adjustable nominal line voltage
 - .5 Overvoltage trip at 109 – 113% of selected line voltage.
 - .6 Undervoltage trip at 88 – 92% of selected line voltage.
 - .7 2 - 10% adjustable voltage unbalance trip
 - .8 1 - 30 seconds adjustable trip delay
 - .9 0.6 - 300 seconds adjustable restart delay
 - .10 LED status indicator
 - .11 cUL listed
- .2 Acceptable Products:
- .1 Littelfuse “DLMU” series.
model #DLMUBRAAA (200 – 480 VAC)
 - .2 Approved equal

2.30 Relays – Pump Seal Leakage & Overtemperature (for Xylem-brand pumps)

- .1 Equipment Characteristics:
- .1 Detects seal leakage & overtemperature for one pump
 - .2 120 VAC input power c/w yellow indicating lamp
 - .3 Separate 8A, 250 VAC, SPDT output relays for seal leakage & overtemperature c/w indicating red lamps
 - .4 5-second time-delayed operation on seal leakage output relay
 - .5 12 VDC sensor voltage
 - .6 External reset input
 - .7 Flush, panel-mount enclosure
- .2 Acceptable Products:
- .1 ITT Flygt “MiniCAS II”
(agent/distributor: ITT Flygt (604) 941-6664)

2.31 SCADA Antenna (902-928 Mhz) (Directional – Medium Gain)

- .1 Equipment Characteristics:
- .1 Directional yagi antenna
 - .2 890-960 Mhz. frequency range

- .3 70 Mhz bandwidth @ $\leq 2:1$ VSWR
 - .4 10 dBd gain, 20 dB front-to-back ratio
 - .5 54° horizontal beamwidth, 45° vertical beamwidth (when vertically polarized)
 - .6 7-elements, open-style, 30" long
 - .7 N-male connector
 - .8 50 Ω impedance, 125W power rating
 - .9 Aluminum construction, 360-degree welded elements, black anodized finish
- .1 Acceptable Products:
- .1 Larsen cat. #YA5900W

2.32 SCADA Coaxial Cable (from radio to lightning protector)

- .1 Equipment Characteristics:
- .1 Construction: Bare copper center conductor, low-loss closed-cell polyethylene foam dielectric, aluminum laminated tape bonded to dielectric, tinned copper overbraid, black UV-protected polyethylene outer jacket.
 - .2 Attenuation: 8.7 dB/100' @ 700 Mhz, 9.9 dB/100' @ 900 Mhz, 15.0 dB/100' @ 2000 Mhz.
 - .3 0.195" outer diameter
 - .4 50 Ω impedance
- .2 Acceptable Products:
- .1 Times Microwave Systems, type LMR-200 with connectors to suit radio and lightning protector.
 - .2 Approved equal

2.33 SCADA Coaxial Cable (from lightning protector to antenna)

- .1 Equipment Characteristics:
- .1 Construction: Copperclad aluminum center conductor, low-loss closed-cell polyethylene foam dielectric, aluminum laminated tape bonded to dielectric, tinned copper overbraid, black UV-protected polyethylene outer jacket.
 - .2 Attenuation: 3.4 dB/100' @ 700 Mhz, 3.9 dB/100' @ 900 Mhz, 6.0 dB/100' @ 2000 Mhz.
 - .3 0.405" outer diameter
 - .4 50 Ω impedance
- .2 Acceptable Products:
- .1 Times Microwave Systems, type LMR-400 with connectors to suit lightning protector and antenna.
 - .2 Approved equal

2.34 SCADA Coaxial Cable Surge Protector (up to 1.0 Ghz)

- .1 Equipment Characteristics:
 - .1 125-1000 Mhz frequency range
 - .2 $\leq 1.1:1$ VSWR over frequency range
 - .3 ≤ 0.1 dB insertion loss
 - .4 600 VDC turn-on voltage
 - .5 N-female connectors
 - .6 50Ω impedance
- .2 Acceptable Products:
 - .1 Polyphaser cat. #IS-B50LN-C2
 - .2 Approved equal

2.35 SCADA Coaxial Cable Weatherproofing Kit

- .1 Equipment Characteristics:
 - .1 Provides moisture and debris seal for coaxial cable connections
 - .2 -18 to +105 deg C operating range
 - .3 Includes butyl mastic tape and vinyl electrical tapes
- .2 Acceptable Products:
 - .1 3M Scotch "Wireless Weatherproofing Kit" #WK-101
 - .2 Approved equal

2.36 Selector Switches

- .1 Equipment Characteristics:
 - .1 2 or 3 position as shown on drawings
 - .2 1 normally open, 1 normally closed, maintained contacts
 - .3 Fits 30.5mm cutout
 - .4 Standard knob operator
 - .5 EEMAC 4 & 13 rating
 - .6 Nameplate as shown on drawings
- .2 Acceptable Products:
 - .1 Allen-Bradley "Bulletin 800T" series. Cat. #800T-H2A or #800T-J2A (agent/distributor: Westburne)
 - .2 Idec "TWTD" series (agent/distributor: Idec Canada Limited)
 - .3 Siemens "Class 52 Heavy Duty Watertight/Oiltight" series (agent/distributor: EB Horsman & Son)
 - .4 Approved equal

2.37 Terminal Blocks - Regular

- .1 Equipment Characteristics:

- .1 Minimum 600V, 32A rating
 - .2 Modular
 - .3 Polyamide or “Wemid” material
 - .4 Zinc-plated, hardened steel clamping body with 4mm sq. cross section
 - .5 35mm DIN symmetrical rail mounting
- .2 Acceptable Products:
- .1 Weidmuller “W” series. Type #WDU4
(Elec Tech Sales Ltd. (604) 278-3044)
 - .2 Wieland “WK” series. Type #WK4/U
(agent/distributor: Wieland Canada (905) 829-8414)
 - .3 Approved equal

2.38 Terminal Blocks – Circuit Breaker Type

- .1 Equipment Characteristics:
- .1 Up to 63A trip @ 600VAC or 50 VDC
 - .2 1, 2 or 3-pole, trip setting as shown on drawings
 - .3 Thermal-magnetic type with trip handle
 - .4 **10kA interrupting capacity**
 - .5 35mm DIN symmetrical rail mounting
 - .6 UL489 listed
- .2 Acceptable Products:
- .1 Cutler-Hammer “xEffect FAZ” series
(agent/distributor: Eaton-Yale Ltd. (604) 273-5949)
 - .2 Weidmuller “91H” or “9926” series.
(Elec Tech Sales Ltd. (604) 278-3044)
 - .3 ABB “S200” series
(agent/distributor: ABB Inc. (604) 434-2454)
 - .4 Approved equal

2.39 Uninterruptible Power Supply (UPS) – 1500VA

- .1 Equipment Characteristics:
- .1 True online type (continuous rectification & inversion)
 - .2 80-140 VAC, 50-60 hz input
 - .3 120 VAC, 900 watt, 1500 VA, 60hz sinewave output, $\pm 3\%$
 - .4 6 minutes backup time at full load, 18 minutes at half load
 - .5 **Complete with optional relay output card with contacts rated 3A @ 250VAC for “Inverter Bypass”, “Battery Low”, “Backup” & “Fault” conditions**
- .2 Acceptable Products:
- .1 Liebert “GXT5” series, cat. #GXT5-1500LVRT2UXL with #IS-RELAY relay contact output card
(agent/distributor: E.B. Horsman. (888) 467-7626)

- .2 Approved equal

2.40 Variable Frequency Drives (SA-11, SA-12, & SA-16)

- .1 Equipment Characteristics:
 - .1 208VAC, 3-phase, 3-wire 60 hz. input, 208VAC, 3-phase, 3-wire output
 - .2 Input & output current shall be rated to deliver the **service factor ampacity** (not the full-load ampacity) of the motor on a continuous basis, see below:
 - SA-11:** 6.5 hp motor, 17 full-load amps, 19.5 service-factor amps
 - SA-12:** 3.0 hp motor, 10 full-load amps, 11.5 service-factor amps
 - SA-16:** 20.0 hp motor, 58 full-load amps, 66.7 service-factor amps
 - .3 Overload capacity 120% for 60 seconds
 - .4 Capable of uninterrupted operation during momentary 25% input voltage dips
 - .5 Automatic restart following undervoltage or overvoltage trips
 - .6 Internal, adjustable motor overload protection
 - .7 Analog 4-20mA isolated input for speed reference
 - .8 Discrete inputs for “Run” and “Fault Reset” commands
 - .9 Dry-contact outputs to indicate “Running” and “Fault” conditions
 - .10 3% input line reactors
 - .11 dV/dt output filters
 - .12 Front-mounted digital operator interface unit
- .2 Acceptable Products:
 - SA-11 VFD Unit:** Mitsubishi "D700" series
 - .1 VFD: #FR-D720-238-NA with NEMA 1 Kit: CK-87
 - SA-12 VFD Unit:** Mitsubishi "D700" series
 - .1 VFD: # FR-D720-165-NA with NEMA 1 Kit: CK-43-S
 - SA-16 VFD Unit:** Mitsubishi “FR-F800” Series
 - .1 VFD: #FR-F820-00770

Consult with VFD suppliers to confirm required model numbers for VFDs and NEMA 1 Wiring Kit prior to ordering

2.41 Wire Gutters

- .1 Equipment Characteristics:
 - .1 Size as shown on drawings
 - .2 Slotted with snap-on cover
 - .3 Light grey PVC material
- .2 Acceptable Products:
 - .1 Panduit “Type E” with “Type C” cover
(agent/distributor: Panduit Canada (604) 424-7344)
 - .2 Wieland type “DNG”
(agent/distributor: Wieland Canada (905) 829-8414)

.3 Approved equal

PART 3 – EXECUTION

3.1 Installation

- .1 Install pushbutton stations, control and relay panels, control and instrumentation devices and interconnect as shown on drawings.
- .2 Install all equipment in exact accordance with manufacturer's instructions.

3.2 Field Quality Control

- .1 **Upon completion of control panel and kiosk fabrication, but prior to shipment to site, the fabrication shop shall notify the Engineer in writing. The Engineer will perform inspection and testing of the panels at the fabrication shop. Demonstrate proper operation of all controls and instrumentation equipment to Engineer and correct all identified deficiencies prior to shipment to site. Fabrication shops located outside of the B.C. Lower Mainland (Vancouver to Chilliwack) shall directly reimburse the Engineer for travel time to & from the shop (less 2 hours) and all related travel expenses.**
- .2 Configure, calibrate and test all controls and instrumentation equipment.
- .3 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at a time and check out operation of section.
- .4 Upon completion of sectional test, undertake group testing.
- .5 Check out complete system for operational sequencing.

***** END *****

PART 1 – GENERAL**1.1 Operation and Maintenance Data**

- .1 Provide operation and maintenance data for electric heating and cooling equipment for incorporation into manual specified in Section 16010 – Electrical General Requirements.

PART 2 – PRODUCTS**2.1 Heating Equipment & Controls:****2.1.1 Unit Heaters (for Outdoor Electrical Kiosks - Hardwired Type)**

- .1 Equipment Characteristics:
 - .1 1000W, 120 VAC fan-forced electric heater
 - .2 Built-in high-heat limit protection with automatic reset
 - .3 Tubular finned heating element.
 - .4 20 gauge steel cabinet
 - .5 Vertical or horizontal mounting position
 - .6 White, epoxy/polyester powdercoat finish
 - .7 Required options: - Built-in, user-adjustable thermostat
 - Surface mounting box
- .2 Acceptable Products:
 - .1 Ouellet “OVS” series
 - #OVSU1002 (heater)
 - #OVS-BS (surface mounting box)
 - #OVS-TB6 (thermostat)(agent/distributor: Eecol Electric)
 - .2 Stelpro “Pulsair RWF” series
 - #RWF1001W (heater)
 - #RWFSAW (surface mounting box)
 - #RWFT1W (thermostat)
 - .3 Approved equal

2.2 Ventilation Equipment & Controls:**2.2.1 Ventilation Fans (Inside Outdoor Electrical Kiosks - For Sewage Wet Wells Ventilation)**

- .1 Equipment Characteristics:
 - .1 12” diameter, shaft-mounted, axial fan for Class 1, Division 1 & 2 hazardous areas
 - .2 Performance: 1199 CFM @ 0” WC, 849 CFM @ 0.25” WC, 618 CFM @

- 0.50" WC
- .3 115 VAC, 3-phase, 0.5 hp, explosion-proof motor with internal thermal protection
- .4 Spark-resistant aluminum fan blades
- .5 Epoxy powdercoated steel mounting chassis
- .6 Provide protective screening top and bottom (finger-safe)
- .2 Acceptable Products:
 - .1 Ruffneck "EFX" series, model #EFX-12-A-2A
 - .2 Approved equal

2.2.2 Ventilation Fans (for Outdoor Electrical Kiosk Interiors – Not for Sewage Wet Wells)

- .1 Equipment Characteristics:
 - .1 Boxed fan c/w removable & washable filter
 - .2 ABS-FR grill
 - .3 120 VAC operation
 - .4 Draws air into enclosure
 - .5 Separate grill & filter for exhaust
 - .6 Rain hoods for fan and exhaust grill/filter
 - .7 Capacity to suit kiosk size and equipment heat dissipation requirements
- .2 Acceptable Products:
 - .1 Ventilation Fan & Filter: Hammond "PF" series.
Exhaust Grill & Filter: Hammond "PFA" series.
Rain Hoods: Hammond "RH" series.
(agent/distributor: Vanco Agencies Ltd. (604) 531-1235)
 - .2 Approved equal

2.2.3 Ventilation Fans (for Control Panels)

- .1 Equipment Characteristics:
 - .1 Fan c/w grill & removable/washable filter
 - .2 120 VAC operation
 - .3 105 CFM free-air delivery
 - .4 Draws air into enclosure
 - .5 Louvered, ABS intake grill with integral gasket
 - .6 Separate grill & filter for exhaust
 - .7 Capacity to suit panel size and equipment heat dissipation requirements
- .2 Acceptable Products:
 - .1 Hammond "PF" series.
(agent/distributor: Vanco Agencies Ltd. (604) 531-1235)
 - .2 Approved equal

2.2.4 Ventilation Thermostats (for Outdoor Electrical Kiosks)

- .1 Equipment Characteristics:
 - .1 SPST snap-action contact with 3 FLA capacity at 240 V, 6 FLA capacity at 120 V (inductive)
 - .2 User-adjustable temperature setting range: 4 to 32 deg C (40 to 90 deg F)
 - .3 Suitable for cooling control (contact closure on rising temperature)
 - .4 Adjustable high/low range stops
 - .5 Built-in thermometer. Range: 10 to 32 deg C (50 to 90 deg F)
 - .6 Vertically-oriented faceplate with Celsius temperature scales
- .2 Acceptable Products:
 - .1 Johnson Controls cat. #T26J (thermostat), #PLT333-5R (faceplate) (agent/distributor: Johnson Controls (604) 438-3434)
 - .2 TPI Corporation cat. #ETD9STS
 - .3 Approved equal

2.2.5 Ventilation Thermostats (within Control Panels)

- .1 Equipment Characteristics:
 - .1 Bi-metallic element with 15A capacity at 120 V (resistive)
 - .2 Suitable for cooling control (contact closure on rising temperature)
 - .3 User-adjustable temperature setting range: -1 - 60 deg C (30 - 140 deg F)
 - .4 Scaled in degrees celsius
- .2 Acceptable Products:
 - .1 Hammond Manufacturing cat. #SKT011419NO-C
 - .2 Approved equal

PART 3 – EXECUTION**3.1 Installation**

- .1 Mount kiosk unit heater(s) on the removable backpan in the kiosk compartment as indicated.
- .2 Mount thermostats as indicated.
- .3 Make power and control connections.

3.2 Field Quality Control

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements.

- .2 Test cut-out protection when air movement is obstructed.
- .3 Test fan delay switch to assure dissipation of heat after element shut down.
- .4 Test unit cut-off when fan motor overload protection has operated.
- .5 Ensure that heaters and controls operate correctly.

***** END *****

1. CNW Pruning Standards (2021)

1.1. General

City of New Westminster Urban Forest team inspects periodically trees growing on city land for structural defects and clearance. The inspection is set by a pruning cycle, which is determined by the management type assigned to each tree. Pruning systems used for those trees are mainly clearance and structure. Structural pruning consist in pruning to correct structural defects or to improve structure over time. Clearance pruning follows a framework determining minimum clearance to maintain over various infrastructures and features. A tree prescription including tree species (genus, species, cultivar) size (height, spread diameter, dbh), age and condition is reviewed by the Acting Superintendent of Urban Forestry (SUF) or their delegates prior to undertaking work. By default, all city trees are to be pruned using a natural pruning system (i.e. maintain its natural shape) and focus in retaining internal canopy while achieving Pruning Objectives. Alternate pruning systems may be considered upon approval from the SUF.

Only ISA Certified Arborists® with at least 3 years' experience in tree pruning, climbing and aerial lift operation may prune city-owned trees. In addition, all pruning cuts are to comply with ANSI A300 Part 1 (2017). Should the work deemed to be within power lines limits of approach, an additional certification as a utility specialist will be required and coordination with New Westminster Electrical will be required and possibly issuance of an Assurance of non-Re-close Permit (ARP).

1.2. Pruning Prescription Components

- 1.2.1. Location (civic address, location in relation to the property, position, and map)*
- 1.2.2. Genus, species and cultivar (if cultivar known)*
- 1.2.3. Size (DBH, Height, Spread Diameter or radius)*
- 1.2.4. Condition (Structural and Health)*
- 1.2.5. Site Condition*
- 1.2.6. Pruning system (i.e. natural, topiary, pollard, etc.) – Natural pruning system is the standard for city-owned trees – only in exceptional situation other systems may be prescribed by the SUF;*
- 1.2.7. Pruning Objective (i.e. clearance (CLR), structure improvement (STR), risk mitigation, etc.)*
- 1.2.8. Types of pruning cuts allowed (branch removal cut, reduction cut, heading cuts) – heading cuts prescriptions on city trees shall be justified with sound rationales;*
- 1.2.9. Size of the cuts (maximum diameter of 10cm unless sound rationale is provided);*
- 1.2.10. Amount of live canopy removal required; live canopy removed to be minimum required to achieve pruning objective*
- 1.2.11. Pruning cycle – The pruning prescription specifies the assigned pruning cycle assigned to individual tree. Below are the guideline used to determine pruning cycles:*
 - I. Any tree under New Westminster Electrical power line clearance regime (Street/NWE, Park/NWE, and Private/NWE – 4 years)
 - II. Mature – 7-12 years
 - III. Semi-mature 5-7 years

- IV. Young – 3-5 years
- V. Crown restoration – 3-5 years

1.3. Pruning Objective Details

1.3.1. Acceptable Type and size of Cuts

- I. Only removal cut or reduction cut as define in ANSI A300 Part 1 are acceptable on city-owned trees and strongly recommended on privately owned trees;
- II. Size of the cut should not be greater than 10cm in diameter

1.3.2. Minimum Clearance requirements (CLR):

Clearance pruning shall account for the seasonal weight of leaf, flower, and fruit and annual growth of the tree for approximate duration the pruning cycle (see Section 1.2.10 above). Annual growth is determined with assessing intermodal spacing up to 3 years. Leaf/flower/fruit is species specific. Below are the minimum standards for clearance pruning – Clearance specified on prescription for specific tree overrides the list below

- I. Service drop line, fence, communication line: 0.3m
- II. Buildings: 1.5m
- III. Secondary power lines: 1m
- IV. Lawns, boulevards and Sidewalks (boulevard): 2.5m
- V. Private yards, multi-use pathways and primary power lines: 3.0m
- VI. Roadways parking, driveway: 4m
- VII. Sightline for street signs, traffic lights, and public notices
- VIII. Clearance of light cone to maximize street lighting.
- IX. Safety line of sight over passive landscape is approximately 1.5m above lawn for coniferous species and 2.5m for deciduous species.

1.3.3. Structure (STR):

- I. Structural pruning always involve an aerial inspection (AI) for imminent defect that pose risk to public safety and infrastructures
- II. Establish or maintain a single leader on excurrent trees and dominant system on decurrent trees.
- III. Crossing and rubbing branches: Select one of the branch to removed or reduced by prioritizing retention of branches on dominant system, better attachment, better structure, internal canopy retention, and better meet other pruning objectives (i.e. CLR, RISK, etc.).
- IV. Over-extended with poor taper branches to be reduced by 15% unless prescribed otherwise.
- V. Remove circling and girdling roots to a maximum root loss of 15% per pruning cycle.
- VI. Columnar Tree Form (Note: reduction cut to be made to the better lateral that will conform with the natural form of the tree:
 - a) Reduce splaying branches;
 - b) Reduce spindly branches that may splay within the pruning cycle;

1.3.4. Deadwood (RDW):

- I. Remove to a maximum diameter of 2.5cm. Small deadwood to be retained for wildlife use – finer deadwood removal may be prescribed based on risk tolerance (i.e. daycares, playgrounds, etc.)
- II. Deadwood is removed as a risk mitigation measure only. Decision to remove deadwood is assessed based on the likelihood of failure to impact targets within the pruning cycle timeframe as per TRAQ methodology and ANSI A300 part 9

1.3.5. Power Line Training (PLT)

- I. Use of directional pruning methods (removal and reduction cuts) to encourage tree growth away from power lines and their limit of approach. PLT is preferably done before the tree grows within LOA

1.3.6. Crown Restoration (RST)

- I. Crown restoration is to be a phased approach to restore the tree natural form following disturbance (i.e. inappropriate pruning, storm damage, etc.) in a succession of short pruning cycle.
- II. Maximum live canopy removal is 20%
- III. New permanent branches are to be selected to meet CLR and STR objectives.