Village of Lions Bay

Harvey Tank Replacement Project

Contract Documents
Issued for Tender

Volume 1 of 3
Specifications

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Project Number:
60546407

Date:
September 2018

Village of Lions Bay

Harvey Tank Replacement Project

AECOM Canada Ltd. 330 – 3292 Production Way
Burnaby, British Columbia
September 2018

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DIVISION 0 – FRONT END DOCUMENTS

1. GENERAL

1.1 Tenders

.1 Sealed tenders clearly marked as to contents, will be received for:

"THE VILLAGE OF LIONS BAY
HARVEY TANK REPLACEMENT PROJECT"

(the "**Project**")

Tenders must be addressed to Andreea Irimia, Civil Engineer (the "**Engineer**") and received at the AECOM Canada Ltd., on the Fourth Floor of Suite 330-3292 Production Way, Burnaby, BC V2A 4R4 not later than **3:00 p.m., local time** on

Friday, November 2, 2018

(the "**Tender Closing Time**").

The Tender Closing Time will be determined according to the time displayed on the clock on the computer at the Reception Desk at the Office of AECOM Canada Ltd. In the event of a discrepancy between the time shown on that clock, and accurate local time, the time shown on the clock on the computer at the Office of AECOM Canada Ltd. Reception Desk will govern. Tenders will be opened privately after the Tender Closing Time.

1.2 Tender Form

.1 Tenders must be completed in permanent ink or typed and submitted on the official Tender Form, which will be part of the Contract. Tenders are to be offered on the basis that the Tenderer whose Tender is accepted shall enter into a written agreement with the Owner pursuant to the provisions of the current edition of the Canadian Construction Documents Committee (CCDC) 2 – Stipulated Price Contract as amended in accordance with these Instructions (the "**CCDC**"). Article A-4, Contract Price, and Article A-5, Payment, of the Contract are amended by the Tender Form which is included as a part of this Tender package and the General Conditions of the Contract are amended by the Supplementary General Conditions, Section 00 73 00, which are included as a part of this Tender package. Unless otherwise indicated, words and phrases in these Instructions shall have the same meaning as defined in paragraph 1.2.2 of these Instructions and the CCDC and related Contract Documents.

.2 Each Tender shall include the following original documents (photocopies of original documents are not acceptable):

.1 Tender Form;

.2 Agreement to Bond;

.3 Bid Bond;

.4 Schedule of Quantities and Prices (Section 00 41 05);

.5 Tender Price Breakdown (Section 00 41 00);

.6 Statements "B", "D", and "G";

.7 Preliminary Construction Schedule showing all major work items, including those outlined in Section 01 12 16;

.8 Documentation demonstrating the Tenderer's experience in successful completion of at least five (5) water retaining concrete structures in the last fifteen (15) years;

.9 Labour and Equipment Rate Table;

.10 Signed acknowledgement.

.3 Only the completed Tender Form and the other completed documents referred to in Section 1.2.2 of these Instructions are to be submitted by the Tenderer; however, the Tenderer accepts and acknowledges by the submission of a Tender that the Tenderer has read and understood all of the requirements of these Instructions and the Contract Documents referred to in Article A-3 of, the CCDC (collectively, the "**Contract Documents**").

.4 The Tenderer shall fill in all blank spaces, item prices, lump sums and other information in the Tender Form, the Tender Price Breakdown and the Schedule of Quantities and Prices, and the other Tender documents to be submitted.

.5 Tenders must be submitted in a sealed envelope, to be supplied by the Tenderer. The envelope should be marked clearly with the Contract Title, **THE VILLAGE OF LIONS BAY HARVEY TANK REPLACEMENT PROJECT**, Contract Number, No. 60546407, and the Name of the Tenderer.

.6 Tenders submitted by E-mail or facsimile, or by any manner other than as specifically required by Section 1.2.5 of these Instructions, will not be considered.

1.3 Tender Deposit

.1 Each Tender shall include a tender deposit in the form of a Bid Bond payable to The Village of Lions Bay (the "**Owner**") in the amount of 10% of the greatest Tender price shown in Section 1.1.3 of the Tender Form (the "**Tender Deposit**").

.2 Bid Bonds shall be submitted on CCDC Form 220 and shall remain valid for a period of ninety (90) days following the Tender Closing Time.

.3 Tender Deposits shall be returned to unsuccessful Tenderers after a reasonable time for the consideration and award of the Contract has elapsed.

.4 The Tender Deposit of the successful Tenderer shall be exchanged for the Performance Bond and the Labour and Material Payment Bond each in the amount of 50% of the Contract Price covering the performance of all work under the Contract (the "**Work**"), following the award of the Contract.

.5 Should the successful Tenderer fail to enter into a Contract with the Owner or fail to produce the required Performance Bond and the Labour and Material Payment Bond within 2 weeks

of the date the Owner's acceptance of the Tender is communicated to the successful Tenderer through issuance of a Notice of Award, then the award of Contract may be cancelled by the Owner and the Tender Deposit will be forfeited to the Owner.

1.4 Signature Required on Tender Form

.1 The Tender Form must be signed as follows:

.1 If the Tender is submitted by a corporation under a corporate seal, the full name of the corporation must be included together with the full name and signature of an authorized signatory of the corporation;

.2 If the Tender is submitted by a corporation without a corporate seal, the full name of the corporation must be included together with the full names and signatures of the authorized signatories of the corporation;

.3 If the Tender is submitted by a Partnership or Joint Venture, the name of the Partnership or Joint Venture and the name and personal signature of each partner and joint venture must be included together with the signature of a witness. A partner or joint venture that is a corporation shall execute the Tender Form in the manner required by Section 1.4.1 or Section 1.4.2 of these Instructions.

.2 A person signing on behalf of a corporation is deemed to warrant that they have the authority to bind the corporation.

.3 No photocopies of signatures are acceptable and all signatures must be in original handwriting.

1.5 Disqualification of Tenders

.1 Under no circumstances will Tenders be considered which:

.1 Are received after the Tender Closing Time;

.2 Are not accompanied by a Tender Deposit in the form and the amount specified; or

.3 Are not signed in accordance with these Instructions to Tenderers.

.2 Tenderers shall not contact or attempt to contact any representative of The Village of Lions Bay (except for the Engineer, and then only as expressly permitted under these Instructions to Tenderers) and any attempt by the Tenderer or by an officer, employee or agent of the Tenderer to contact an officer, employee or elected member of The Village of Lions Bay in connection with the submission or award of this Tender may be grounds for disqualification of the Tender.

.3 The Owner may, in its absolute discretion, reject a Tender submitted by a Tenderer, if the Tenderer, or any officer or director of the Tenderer is or has been engaged either directly or indirectly through another corporation in a legal action against the Owner, its elected or appointed officers and employees in relation to any other contract for works or services within five years of the date of this Call for Tenders.

1.6 Informal or Unbalanced Tenders

.1 Tenders which are incomplete, conditional, illegible or obscure or that contain additions not called for, reservations, erasures, alterations, or irregularities of any kind, may be rejected as informal.

.2 Tenders that contain prices which appear to be so unbalanced as likely to affect adversely the interests of the Owner may be rejected.

.3 The Owner reserves the right to waive informalities at its discretion.

1.7 Subsequent Withdrawal or Modifications of a Tender

.1 A Tenderer who has already submitted a Tender may submit a further sealed Tender at any time before the official Tender Closing Time. The last Tender received shall supersede and invalidate all Tenders previously submitted by the Tenderer.

.2 A Tender may be withdrawn by the Tenderer by written notice delivered to the Owner prior to the time fixed for Tender closing.

.3 The onus is on the Tenderer to ensure the Owner's timely receipt of Tender modifications. The Owner makes no assurances regarding the availability of fax communication lines or equipment. To be considered, fax transmissions of Tender modifications must be received in full prior to the Tender Closing Time.

.4 A Tender may be modified by a letter of facsimile in accordance with the following:

.1 Modifications to a submitted Tender will be permitted only if received on the Tenderer's letterhead and if signed by the same persons who signed the Tender.

.2 A Tender modification shall state the amount to be added to or deducted from the items in the Tenderer's Schedule of Quantities and Prices, but shall not state the unit price that is to be added to or deducted from.

.3 Tender modifications sent by fax transmission must be sent to the Engineer at AECOM Canada Ltd. – Attn: Andreea Irimia at fax number 604.294.8597.

1.8 Tender Validity

.1 The Tender shall constitute an irrevocable offer by the Tenderer, open for acceptance by the Owner for a period of 90 days following the Tender Closing Time, after which time, if not accepted, the Tender shall be null and void.

.2 It is understood that errors in the Tender, whether accidental, caused by negligence of the Tenderer or otherwise shall not confer any additional rights of withdrawal upon the Tenderer.

1.9 Omissions / Discrepancies

.1 Should a Tenderer find discrepancies in, or omissions from the Drawings, Specifications or other Tender documents, or should the Tenderer be in doubt as to their meaning, the

Tenderer should notify the Engineer who may send a written instruction to all Tenderers. Verbal answers are only binding when confirmed by written addenda.

.2 Should the Tenderer not agree that the materials and methods specified, or designated on the Drawings, will meet the requirements of the Project, the Tenderer shall notify the Engineer in writing, stating the Tenderer's reason for objection, and may submit a suggested alternative. In such an event, the Engineer may choose to issue an Addendum.

1.10 Errors and Omissions on Tender Form

.1 Wherever in a Tender the amount tendered for an item does not agree with the product of the estimated quantity and the tendered unit price, the unit price shall govern and the amount of the total Tender price shall be corrected accordingly.

.2 If a Tenderer has omitted to enter a price for an item of work set out in the Tender Form, the Tenderer shall, unless specifically stated otherwise in the Tender, be deemed to have allowed elsewhere in the Tender Form for the cost of performing the said item of work. Unless otherwise agreed to by the Owner, no increase shall be made in the total Tender price on account of such omission and the Tenderer shall be deemed to have tendered for the entirety of the scope of work set out in the Tender Form.

1.11 Availability of Drawings, Specifications and Addenda

.1 The official Tender Document complete with Drawings, Specifications and any Addenda will be available on the BC Bid website (bcbid.giv.bc.ca). Documents will be available for download after **6:00 p.m. on Friday, September 21, 2018.**

1.12 Qualification of Tenderers

.1 The Owner reserves the right to reject any Tender if the evidence submitted by or investigation of such Tenderer fails to satisfy the Owner that such Tenderer is properly qualified to carry out the obligations of the Contract and to complete the Work as contemplated therein.

1.13 Proof of Ability

.1 In order to aid the Owner in determining the ability of each Tenderer to complete the Work, the Tenderer shall complete the following Statement sheets which are included in the Tender package:

.1 Statement "B" – Tenderer's Senior Supervisory Staff: Giving a list of the Tenderer's senior supervisory staff with a summary of the experience of each. In addition, include staff and experience for major Subcontractors.

.2 Statement "D" – Subcontractors and Suppliers: Giving the name and address of each proposed sub-contractor used in making up its Tender, where that Subcontractor is responsible for more than 2.5 percent of the Work or as noted in Statement "D", and shall state the portion of the Work allotted to each. Only one sub-contractor shall be named for each part of the Work to be sub-contracted without previous written approval by the Owner. Where these items are to be undertaken by the Tenderer's own forces, note that in the statement.

.3 Statement "G" – Schedule of the Alternatives: If the Tenderer desires to propose alternatives to listed products or indicated designs, alternatives can be proposed for the consideration of the Owner. The Owner will only assess alternatives proposed by the successful Tenderer after the Base Tender evaluation, in accordance with Section 1.15 herein. To enable the assessment of these alternatives, provide the following information:

.1 Name of alternative product or design.

.2 Description of proposed product or design. Supplement the space available with descriptive literature and design information.

.3 Cost savings or additional costs associated with the adoption of this alternative.

.2 The Tenderer may be required to furnish additional statements covering other matters including financial resources and convictions or orders imposed under health and safety or environmental legislation.

.3 The Work shall be completed by the successful Tenderer in accordance with the information submitted in the Contract Documents, as accepted by the Owner. Personnel, equipment, or products listed in the Contract Documents cannot be changed subsequently without the written permission from the Engineer and only at the discretion of the Owner.

1.14 Evaluation of Tenders

.1 Tenders will be evaluated based on the following criteria:

.1 Qualifications and related experience of the Tenderer and senior personnel and Subcontractors to be assigned to this Project;

.2 Performance of the Tenderer and Subcontractors on similar projects, including, without limitation, the Tenderer's history with respect to quality of work, scheduling, changes in the Work and force account work;

.3 The Tenderer's compliance and ability to comply with all statutes, regulations, bylaws and other enactments affecting the Tenderer's work;

.4 The price submitted by the Tenderer on the Tender Form to the Owner for having the Work completed in accordance with the Drawings and Specifications;

.5 The conformity of the Tender to the requirements set forth in these Instructions to Tenderers; and,

.6 The Tenderer's construction schedule including but not limited to compliance and ability to comply with any time requirements or stipulations provided for in the Contract.

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

.3 The evaluation process will be conducted at the discretion of the Owner, and the Owner may consider and apply the results of that evaluation in a manner that the Owner considers is to its best advantage and, without limiting the generality of the foregoing, the price to complete the Work is not the only or primary criterion to be used by the Owner in awarding the Contract.

.4 The Owner reserves the right, at its discretion, to negotiate with any Tenderer that the Owner believes has the most advantageous Tender, or with any other Tenderer or Tenderers concurrently. In no event will the Owner be required to offer any modified terms to another Tenderer prior to entering into a Contract with the successful Tenderer and the Owner shall incur no liability to any other Tenderer as a result of such negotiations or modifications.

1.15 Optional Items

.1 Where called for, the Tenderer must submit prices for all optional items shown in the places provided in the Tender Price Breakdown which will be undertaken and included in the Work at the election of the Owner (the "**Optional Items**"). Such Tender prices shall not include any general overhead costs, or other costs, or profit, not directly related to the Optional Items.

.2 The Owner may accept any of the Optional Items in any order or combination, including all or none. The Owner may include solely from the total Tender price for base bid shown in the Tender Form and Tender Price Breakdown (the "**Base Bid Tender Price**"), without considering any Optional Item(s), or Optional Item(s) will be considered in determining the acceptance of the Tender. Optional Items are open for acceptance by the Owner for the same period of time as the Base Bid Tender Price.

.3 Acceptance of any Optional Item will not affect the Contract completion time, unless specifically indicated as an increase or decrease in time, in number of days, on account of a particular Optional Item.

1.16 Alternatives

.1 No alternatives or equals to the specified products will be considered by the Owner during the Tender evaluation process. Tenderers shall base their Tender price upon the products and the Drawings and Specifications specified by the Owner in the Tender documents only.

.2 The Tenderer may submit with its Tender the suggested alternatives to those articles specified. Such submissions shall be made on Statement "G", included herein, and shall show the name of the article specified, the name and description of the suggested Alternative, and the total revision to the Tender price that would result if the equivalent were accepted.

.3 The Owner will only assess alternatives proposed by the successful Tenderer after consideration and evaluation of the Tenders, and alternatives proposed by the successful Tenderer will be incorporated into the Contract at the Owner's discretion.

1.17 Agreement to Bond

.1 Every Tender shall be accompanied by an "Agreement to Bond" in the form attached to the Tender Form, and shall be executed under corporate seal by a surety company lawfully

doing business in the Province of British Columbia from which the Tenderer proposes to obtain the required bonds prescribed in the Contract.

1.18 Goods and Services Tax

.1 The tendered unit prices shall not include the Goods and Services Tax. This amount shall be shown separately on the Tender Form and on invoices submitted by the Contractor.

1.19 Taxes and Duties

.1 The Tenderer shall include sales tax in accordance with current sales tax legislation taking into account any changes that have been made known by the Government and that will occur during the life of the Contract.

.2 If sales taxes are increased or decreased, or other amendments are made in the legislation during the course of the Contract that alter tax amounts carried in the Contract Price, an adjustment will be made accordingly to the total Contract Price.

.3 The Contractor shall keep records and invoices of accounts subject to Goods and Services Tax and provincial sales tax for the purpose of establishing taxes paid and for substantiation in the event of changes to the tax legislation during the course of the Contract.

.4 The Tenderer shall contact the sales tax authorities and determine what the applicable taxes are and the procedures for tax exemption and/or refunding and include related administrative costs in the Tender.

1.20 Prime Contractor

.1 The Owner shall assign prime contractor responsibility to the Contractor as defined by WorkSafe BC OH&S Regulations and in the British Columbia *Workers Compensation Act*.

.2 The Contractor shall be solely responsible for the development, implementation and maintenance of a safety program and all its components within the area of work, including operating areas of the existing plant that involves work under the Contract. The purpose of the program is to ensure the safety of all persons and to safely coordinate all activities on the Place of the Work. This requirement shall apply continuously, and not be limited to normal working hours.

.3 The Contractor shall post a copy of the notice of Project in prominent locations at the Place of the Work to ensure that all other employers know that, as prime contractor, it has responsibility for coordinating the Work activities related to occupational health and safety matter of all contractors.

1.21 Examination of Place of the Work

.1 Tenderers may visit the Place of the Work to satisfy themselves by personal examination as to the local conditions to be encountered during the construction and conduct of the Work. Each Tenderer shall make their own estimate of the surface facilities, sub-surface conditions and difficulties to be encountered. A Tenderer is not to claim at any time after submission of its Tender that there was any misunderstanding of the terms and conditions of the Contract

relating to site conditions at the Place of the Work. Arrangements for examination of the Place of the Work are to be made by contacting the Engineer.

.2 The Tenderer, prior to the Tender Closing Time, may make additional examinations of the soil and subsurface conditions at the Place of the Work, as the Tenderer may deem necessary to satisfy itself as to the conditions that may be encountered during construction. A Tenderer wishing to make such additional examinations must first contact the Engineer to make arrangements, and any additional examinations shall be carried out in accordance with any terms and conditions for access to the Place of the Work as communicated by the Engineer.

1.22 Soils Investigation Reports

.1 A copy of the Geotechnical Assessment Report (November 2017) for the Project is included in Appendix A of the Contract Documents.

.2 The soils investigation reports record properties of the soils and recommendations for the design of foundations and is prepared primarily for the use of the Engineer. The recommendations given shall not be construed as a requirement of the Contract unless so stated in the Contract Documents.

1.23 Questions During Tender Period

.1 No oral interpretations shall be made to any Tenderers as to the meaning of any of the Contract Documents or to modify any of the provisions of the Contract Documents. All inquiries shall be in writing and directed to:

AECOM
Fourth Floor, Suite 330 - 3292 Production Way
Burnaby, B.C. V5A 4R4
Phone: 604-444-6400
Fax: 604-294-8597
Attention: Andreea Irimia (andreea.irimia@aecom.com)

(the "**Engineer**") or such other person as the Owner may designate in writing.

.2 No formal addenda shall be issued within 72 hours of the Tender Closing Time.

.3 No questions shall be submitted in the 96 hours before the Tender Closing Time (excludes weekends and holidays).

1.24 Acceptance

.1 The Owner reserves the right in its absolute discretion to accept the Tender which it deems most advantageous to itself and the right to reject any or all Tenders, in each case without giving any notice. The lowest or any Tender will not necessarily be accepted. In no event will the Owner be responsible for the costs of preparation or submission of a Tender.

.2 Tenders which contain qualifying conditions or otherwise fail to conform to the requirements of these Instructions to Tenderers or fail to comply with the process for submission set out in the Instructions to Tenderers may be disqualified or rejected. The

Owner may, however, in its sole discretion, reject or retain for its consideration Tenders which are non-conforming because they do not contain the content or form required by the Instructions to Tenderers or fail to comply with the process for submission set out in the Instructions to Tenderers.

1.25 Schedule

.1 For scheduling purposes, the intent of The Village of Lions Bay is to issue the **Notice of Award of the Contract on November 20, 2018.** The Tenderer shall use this date when preparing the construction schedule. If the date of the Notice of Award changes from that listed above, the Tenderer's schedule shall be extended by the equivalent length of time after that date.

.2 Tenderers are put on notice that the Contract price is subject to the terms of GC 13.1 – Liquidated Damages in the General Conditions of the Contract.

1.26 Pre-Tender Meeting

.1 The time and date of a non-mandatory **pre-Tender meeting is 10:00 a.m. on Wednesday, October 3rd, 2018**. It is strongly recommended that all Tenderers attend.

.2 The meeting will be conducted at the offices of the Owner located at 400 Centre Road, Lions Bay, BC, V0N 2E0, B.C.

.3 Due to the site conditions at the Place of the Work, all Tenderers are required to wear personal protective equipment including high-visibility vests and CSA approved steel-toed work boots.

1.27 Award of Contract

.1 The Owner reserves the full right, in its sole discretion and according to its own judgement of its best interest to:

.1 reject any or all Tenders;

.2 waive any defect or deficiency in a Tender which does not materially affect the Tender or the Tender price relative to the other Tenders and accept that Tender;

.3 accept any Tender, including any or a combination of Optional Item(s), or alternatives, which the Owner may accept.

.2 In exercising its discretion the Owner will have regard to its own investigations and the information provided in Section 1.2.2 of these Instructions including the statements, appendices, supporting documentation to the Tender Form and including the schedule and/or experience of the Tenderer, and any listed Subcontractors, to do the work. In no event shall the Owner be liable for a Tenderer's cost of preparing a Tender.

.3 If there are any discrepancies in the Tender Price Breakdown between the line prices and the extended totals, then the line prices shall be deemed to be correct and corresponding corrections shall be made to the extended totals.

.4 The award of the Contract is subject to approval by the Council for The Village of Lions Bay.

.5 The Owner reserves the right not to proceed with and award the Contract, and may cancel the Tender process at any time and for any reason prior to the award of the Contract, and will not be liable for any loss, damage, cost or expense incurred or suffered by a Tenderer as a result of such cancellation.

.6 Award of the Contract is subject to the availability of sufficient funds to complete the Work.

.7 The acceptance of a Tender and the issuance of a Notice of Award shall bind the successful Tenderer to execute the Contract within 2 weeks of the issuance of the Notice of Award.

1.28 Confidentiality

.1 Each Tender should clearly identify any information that is considered by the Tenderer to be confidential or proprietary information. However, The Village of Lions Bay is subject to the provisions of the *Freedom of Information and Protection of Privacy Act*. As a result, while Section 21 of the *Freedom of Information and Protection of Privacy Act* does offer some protection for confidential third party business, financial and proprietary information, the Owner cannot guarantee that any such information provided to The Village of Lions Bay will remain confidential if a request for access is made under the *Freedom of Information and Protection of Privacy Act.*

1.29 Limitation of Liability

.1 Each Tenderer acknowledges and agrees that the Owner shall in no event be responsible or held liable for any liabilities, losses, costs, damages (consequential or otherwise), expenses and third party claims, preparation costs, or loss of profits, whatsoever which Tenderer may sustain, incur or pay, or which may be brought against the Tenderer (including liability for any Tender), however the same may be caused, arising from or in relation to the submission by Tenderer of such Tender(s) or any act or omission of the Owner in relation to this Tender process, including, any decision by the Owner to cancel or terminate this Tender process, accept or reject any or all Tenders, short-list a Tender (including a non-compliant Tender) submitted by another Tenderer or third party, or procure the supply of the Work, in whole or in part, from a third party, and the Tenderer hereby releases, indemnifies and agrees to hold the Owner harmless from any such liabilities, losses, costs, damages, expenses and third party claims that may arise as a result of the Tenderer submitting a Tender.

.2 Each Tenderer is responsible to review and understand the terms and conditions of these Instructions to Tenderers, and the Specifications and scope of the Work being requested. The Owner makes no representation or warranty as to the accuracy or completeness of the information contained or referenced in these Instructions to Tenderers, or in any of the Contract Documents, or in relation to the supply of any information (whether written or oral) to Tenderers and each Tenderer is solely responsible to ensure that it has obtained and considered all information necessary to understand the requirements of the Instructions to Tenderers, and the Specifications and scope of the Work being requested. Each Tenderer waives for itself and its successors and assigns the right to sue The Village of Lions Bay for any losses, including economic loss, damages, costs or expenses, arising from or connected with any error, omission or misrepresentation in the preparation of these Instructions to

Tenderers, the Contract Documents, or in relation to the supply of any information, whether written or oral, to Tenderers.

1.30 Construction Documents

.1 Two complete paper copy sets of the issued for construction Contract Documents (inclusive of full-size Drawings, half-size Drawings and Specifications) will be issued to the successful Tenderer.

.2 Electronic copies of the Contract Documents in PDF format will be available to the successful Tenderer.

END OF SECTION

Tenderer's Checklist

Before submitting your tender, check the following points:

1.	Has your tender been signed, sealed and witnessed?	( )
2.	Have you enclosed the Bid Bond?	( )
3.	Have you enclosed the Agreement to Bond, signed and sealed by your proposed Surety?	( )
4.	Have you completed all schedules and prices in the Tender Form?	( )
5.	Have you indicated and included any Allowances in the Tender Form?	( )
6.	Have you listed your Sub-Contractors and major suppliers? (if applicable)	( )
7.	Have you completed Statement "B" – Senior Supervisory Staff?	( )
8.	Have you completed Statement "D" – Subcontractors and Suppliers?	( )
9.	Have you completed Statement "G" – Schedule of Alternatives? (if applicable)	( )
10.	Have you completed a Preliminary Construction Schedule showing major project work items?	( )
11.	Have you provided documentation demonstrating successful completion of at least five (5) water retaining concrete structures in the last fifteen (15) years?	( )
12.	Have you provided a Labour and Equipment Rate Table for Force Account Work?	( )
13.	Are the documents complete?	( )

END OF SECTION

1. GENERAL

1.1 Submission

.1 Tender for the Construction of:

THE VILLAGE OF LIONS BAY
HARVEY TANK REPLACEMENT PROJECT

.2 The following Tender is hereby submitted to:

The Village of Lions Bay Municipal Hall
P.O. BOX 141-400 Centre Road
Lions Bay, BC
V0N 2E0

hereinafter called the "Owner"

On behalf of:

_____
Contractor

_____
Address

hereinafter called the "Tenderer"

.3 (We), the undersigned, having fully examined the locality and Place of the Work, having fully investigated the conditions of the Work, having read and understood the Contract Documents (comprised of the tendering information including the Information to Tenderers, supplementary general conditions, general conditions, specifications and drawings, including all supplements, addenda and revisions to same to the date of this Tender) and having secured all of the information necessary to enable the submission of this Tender, hereby agree and offer to perform the totality of the Work described in the Contract Documents, in accordance with the Contract Documents, for the total sum of:

Total Tender Price for BASE BID (excluding GST) ***$.....**

Total Tender Price for OPTIONAL ITEMS (excluding GST) ***$.....**

*[Note: * To be completed by the Tenderer]*

.4 Further, we, the undersigned, hereby agree and offer to complete the Work in accordance with the Contract Documents and schedule of dates as outlined below:

.1 Substantial Performance of the Work: * **_____, 2019.**

.2 Total Completion of the Work: * **_____, 2020.**

.3 The Owner may accept any of the Optional Items in any order or combination, including all or none, the acceptance of which shall amend the above Substancial Perfomance and Total Completion dates as outlined below. The amount to be added to, or deducted from the schedule is to be entered for all requested Optional Items or Alternative Prices. For Optional Items that are segmented in Section 00 41 01, the number of days indicated shall be based on the assumption of acceptance by the Owner of the entirety of the Optional Item and shall be revised as required at the time of Contract Award if the Owner does not accept the entirety of the Optional Item. If there is no change to the schedule it should be indicated as zero (0) and decreases to the project schedule should be indicated by a negative symbol (-):

.1 Optional Items – 8.1: Increase schedule by *_____days

.5 Further, we, the undersigned, acknowledge that we have reviewed and agree to be bound by the terms and conditions of the Tender as set out in the Information to Tenderers.

*[Note: * To be completed by the Tenderer]*

1.2 Contingencies

.1 Payment of contingencies and allowances or portions thereof will only be made in the event the Engineer authorizes additional work, in which case the amount of the payment will be determined as specified. Any unused portion will be deducted from the Contract Price.

1.3 Additions and Deductions

.1 The Tenderer agrees that, if this tender is accepted by the Owner:

.1 It will carry out any additional or extra work (including the supplying of any additional Products pertaining thereto) or will delete any work as may be required by the Engineer in accordance with the Contract; and,

.2 The carrying out of any work referred to in paragraph (.1) above or the issuance by the Engineer of a Contract Change Order relating to such work or the acceptance by the Tenderer of such Contract Change Order shall not, except as expressly stated in such Contract Change Order, waive, affect or vary any of the terms of the Contract or of a Contract Change Order previously issued by the Engineer or any of the rights of the Owner or of the Engineer under the Contract.

.2 The Tenderer agrees that, if this tender is accepted by the Owner the prices applicable to work referred to in paragraph 1.3.1 above shall be determined as outlined in the General Conditions of the Contract as amended by the Supplemental General Conditions.

1.4 Addenda

.1 We, the undersigned, agree that we have received Addenda …….. to …… inclusive, and the Total Tender Price includes the provisions set out in such Addenda.

1.5 Declarations of Tenderer

.1 The Tenderer declares that no person, firm or corporation other than the Tenderer has any interest in this tender or in the proposed Contract for which this tender is made.

.2 The Tenderer declares that this tender is made without any connection, comparison of figures or arrangement with, or knowledge of, any other corporation, firm or person making a tender for the same Work and is in all respects fair and without collusion or fraud.

1.6 Conditions of Tender

.1 This Tender is irrevocable from the Tender Closing Time and is unconditionally open for acceptance for 90 days after the Tender Closing Time, whether any other tender has been previously accepted or not.

1.7 Disclaimer

.1 The Tenderer agrees and acknowledges there is no representation, warranty, collateral agreement or condition, whether direct or collateral, or expressed or implied, which induced the Tenderer to submit this tender, or on which reliance is placed by the Tenderer, or which affects this tender.

1.8 Signatures

This Tender is executed by the Tenderer at _____ this _____ day of _____ 20____.

_____ _____
Name of Tenderer

_____ _____
Address

_____ _____
Signature of Tenderer/Authorized Signatory, Title Signature of Witness

_____ _____
Signature of Tenderer/Authorized Signatory, Title Signature of Witness

Corporate Seal

NOTE: In the case of a tender submitted by a Corporation, the signatory or signatories warrant as follows: "I/We have authority to bind the Corporation."

If the tender is submitted by an individual or partnership, it is deemed to be given under seal.

END OF SECTION

Tender Price Breakdown

We certify that the following is an accurate and balanced breakdown of our tender price(s). Work required, but not specifically mentioned, is included in the item with which it is most closely associated.

Table 1: BASE BID ITEMS

Item				Lump Sum Price
BASE BID ITEMS – LUMP SUM				
1	**GENERAL REQUIREMENTS**			
	.1	Mobilization and Demobilization	$	
	.2	Erosion and Sedimentation Control	$	
	.3	Traffic Control	$	
	.4	O&M Manuals and Record Drawings	$	
		Sub Total General	$	
2	**HARVEY TANK SITE**			
	.1	Site Preparation	$	
	.2	Site Works	$	
	.3	Yard Piping /Utilities	$	
	.4	New Harvey Reservoir	$	
	.5	PRV Chamber Improvements	$	
	.6	Metals	$	
	.7	Electrical and Instrumental	$	
		Sub Total Harvey Tank Site	$	
		TENDER PRICE – BASE BID (excluding GST)*	$	

Notes:

* Enter these amounts in Section 01 41 00, Clause 1.1.3

Table 2: OPTIONAL ITEMS

Item					Lump Sum Price

OPTIONAL ITEMS

The Owner may accept any of the Optional Items in any order or combination, including all or none. The Owner may include solely from the Base Bid Tender Price, without considering any Optional Item(s), or Optional Item(s) will be considered in determining the acceptance of the tender. Optional Items are open for acceptance by the Owner for the same period of time as the Base Bid Tender Price.

The amount to be added to, or deducted from, the Base Bid Tender Price is to be entered below for each requested Optional Items. If there is no change to the Base Bid Tender Price for an Optional Item it should be indicated as a zero ($0.00). The Work of the Contract and the Contract Price will reflect the Optional Item(s), if any, accepted by the Owner at the time of Contract Award.

Acceptance of any Optional Item will not affect the Contract Completion time, unless specifically indicated as an increase or decrease in time, in number of days, on account of a particular Optional Item as indicated in Section 00 41 00, Clause 1.1.4.

The Tenderer must submit prices for all Optional Items shown in the places provided below. Such tender prices shall not include any general overhead costs, or other costs, or profit, not directly related to the Optional Items.

8	**OPTIONAL ITEMS – LUMP SUM**				
	.1	Local Disposal of Concrete at Harvey Creek Access Road			
		.1	Harvey Tank - Site Preparation	$	
TENDER PRICE – OPTIONAL ITEMS (excluding GST)**				**$**	

Notes:

** Enter these amounts in Section 01 41 00, Clause 1.1.3

END OF SECTION

Schedule of Quantities and Prices

Item	Description	Unit	Quantity	Unit Price ($)	Sub-Total[(1)] ($)
1	**Site Work**				
	a) Over-excavation, removal and disposal of native material, and supply and placement of imported granular fill material	m^3	1		
	b) Rock Blasting	m^3	1		
	c) Boulder Removal	m^3	1		
	d) Fencing	lm	1		
	e) Top soil	m2	1		
	f) Seeding	m2	1		
	g) Lock Block (including backfill)	ea	1		
2	**Piping**				
	a) 150mm PVC Pipe	m	1		
	b) 250mm DI Pipe	m	1		
	c) 250mm DI Gate Valve	ea	1		
	d) 150mm PVC Bend (22.5°, 45° or 90°)	ea	1		
	e) 250mm DI Bend (22.5°, 45° or 90°)	ea	1		
	f) 250x250x250 DI Tee	ea	1		
	g) 250mm 1506 Robar Coupler	ea	1		
	h) 1200mm diameter concrete manhole	ea	1		
	i) 1200mm diameter concrete risers	vm	1		

END OF SECTION

BID BOND

Standard Construction Document

CCDC 220 - 2002

No. _____ Bond Amount $_____

_____ as Principal, hereinafter called the Principal, and

_____ a corporation created and existing under the laws

of _____ and duly authorized to transact the business of Suretyship in _____ as Surety, hereinafter called the Surety, are held and firmly bound unto _____ as Obligee, hereinafter called the Obligee, in the amount of _____

_____ Dollars ($ _____) lawful money of Canada, for the payment of which sum the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

WHEREAS, the Principal has submitted a written bid to the Obligee, dated _____ day of _____, in the year _____

for _____

_____

The condition of this obligation is such that if the Principal shall have the bid accepted within the time period prescribed in the Obligee's bid documents, or, if no time period is specified in the Obligee's bid documents, within _____ ( ) days from the closing date as specified in the Obligee's bid documents, and the Principal enters into a formal contract and gives the specified security, then this obligation shall be void; otherwise, provided the Obligee takes all reasonable steps to mitigate the amount of such excess costs, the Principal and the Surety will pay to the Obligee the difference in money between the amount of the bid of the Principal and the amount for which the Obligee legally contracts with another party to perform the work if the latter amount be in excess of the former.

The Principal and Surety shall not be liable for a greater sum than the Bond Amount.

It is a condition of this bond that any suit or action must be commenced within seven (7) months of the date of this Bond.

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

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond dated _____ day of _____, in the year _____ .

SIGNED and SEALED

in the presence of

Principal

_____
Signature

ATTORNEY IN FACT

_____
Name of person signing

Surety

_____
Signature

_____
Name of person signing

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Canadian Construction Documents Committee

(CCDC 220 – 2002 has been approved by the Surety Association of Canada)

Standard Construction Document

PERFORMANCE BOND

CCDC 221 - 2002

No. _____ Bond Amount $_____

_____ as Principal, hereinafter called the Principal, and

_____ a corporation created and existing under the laws

of _____ and duly authorized to transact the business of Suretyship in _____ as Surety, hereinafter called the Surety, are held and firmly bound unto _____ as Obligee, hereinafter called the Obligee, in the amount of _____

_____ Dollars ($ _____) lawful money of Canada, for the payment of which sum the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

WHEREAS, the Principal has entered into a written contract with the Obligee, dated _____ day of _____, in the year _____

for _____

_____

hereinafter referred to as the Contract.

The condition of this obligation is such that if the Principal shall promptly and faithfully perform the Contract then this obligation shall be null and void; otherwise it shall remain in full force and effect.

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

1) remedy the default, or;
2) complete the Contract in accordance with its terms and conditions or;
3) obtain a bid or bids for submission to the Obligee for completing the Contract in accordance with its terms and conditions and upon determination by the Obligee and the Surety of the lowest responsible bidder, arrange for a contract between such bidder and the Obligee and make available as work progresses (even though there should be a default, or a succession of defaults, under the contract or contracts of completion, arranged under this paragraph) sufficient funds to pay to complete the Principal's obligations in accordance with the terms and conditions of the Contract and to pay those expenses incurred by the Obligee as a result of the Principal's default relating directly to the performance of the work under the Contract, less the balance of the Contract price; but not exceeding the Bond Amount. The balance of the Contract price is the total amount payable by the Obligee to the Principal under the Contract, less the amount properly paid by the Obligee to the Principal, or;
4) pay the Obligee the lesser of (1) the Bond Amount or (2) the Obligee's proposed cost of completion, less the balance of Contract price.

It is a condition of this bond that any suit or action must be commenced before the expiration of two (2) years from the earlier of (1) the date of Substantial Performance of the Contract as defined in the lien legislation where the work under the Contract is taking place, or, if no such definition exists, the date when the work is ready for use or is being used for the purpose intended, or (2) the date on which the Principal is declared in default by the Obligee.

The Surety shall not be liable for a greater sum than the Bond Amount.

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

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond dated _____ day of _____, in the year _____ .

SIGNED and SEALED

in the presence of

ATTORNEY IN FACT

Principal

_____
Signature

_____
Name of person signing

Surety

_____
Signature

_____
Name of person signing

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LABOUR & MATERIAL PAYMENT BOND (Trustee Form)

Standard Construction Document

CCDC 222 - 2002

No. _____ Bond Amount $_____

_____ as Principal, hereinafter called the Principal, and

_____ a corporation created and existing under the laws

of _____ and duly authorized to transact the business of Suretyship in _____ as Surety, hereinafter called the Surety, are held and firmly bound unto _____ as Obligee, hereinafter called the Obligee, in the amount of _____

_____ dollars ($ _____) lawful money of Canada, for the payment of which sum the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

WHEREAS, the Principal has entered into a written contract with the Obligee, dated _____ day of _____, in the year _____ for _____

_____

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

The Condition of this obligation is such that, if the Principal shall make payment to all Claimants for all labour and material used or reasonably required for use in the performance of the Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A Claimant for the purpose of this Bond is defined as one having a direct contract with the Principal for labour, material, or both, used or reasonably required for use in the performance of the Contract, labour and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment directly applicable to the Contract provided that a person, firm or corporation who rents equipment to the Principal to be used in the performance of the Contract under a contract which provides that all or any part of the rent is to be applied towards the purchase price thereof, shall only be a Claimant to the extent of the prevailing industrial rental value of such equipment for the period during which the equipment was used in the performance of the Contract. The prevailing industrial rental value of equipment shall be determined, insofar as it is practical to do so, by the prevailing rates in the equipment marketplace in which the work is taking place.

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

3. It is a condition precedent to the liability of the Surety under this Bond that such Claimant shall have given written notice as hereinafter set forth to each of the Principal, the Surety and the Obligee, stating with substantial accuracy the amount claimed, and that such Claimant shall have brought suit or action in accordance with this Bond, as set out in sub-clauses 3 (b) and 3 (c) below, Accordingly, no suit or action shall be commenced hereunder by any Claimant:

   a) unless such notice shall be served by mailing the same by registered mail to the Principal, the Surety and the Obligee, at any place where an office is regularly maintained for the transaction of business by such persons or served in any manner in which legal process may be served in the Province or Territory in which the subject matter of the Contract is located. Such notice shall be given.

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

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

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

c) other than in a Court of competent jurisdiction in the Province or Territory in which the work described in the Contract is to be installed or delivered as the case may be and not elsewhere, and the parties hereto agree to submit to the jurisdiction of such Court.

4. The Surety agrees not to take advantage of Article 2365 of the Civil Code of the Province of Quebec in the event that, by an act or an omission of a Claimant, the Surety can no longer be subrogated in the rights, hypothec and privileges of said Claimant.

5. Any material change in the contract between the Principal and the Obligee shall not prejudice the rights or interest of any Claimant under this Bond, who is not instrumental in bringing about or has not caused such change.

6. The amount of this Bond shall be reduced by, and to the extent of any payment or payments made in good faith, and in accordance with the provisions hereof, inclusive of the payment by the Surety of claims made under the applicable lien legislation or legislation relating to legal hypothecs, whether or not such claim is presented under and against this Bond.

7. The Surety shall not be liable for a greater sum than the Bond Amount.

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond dated _____ day of _____, in the year _____ .

SIGNED and SEALED

in the presence of

Principal

_____
Signature

ATTORNEY IN FACT

_____
Name of person signing

Surety

_____
Signature

_____
Name of person signing

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1. TENDERER'S SENIOR SUPERVISORY STAFF EXPERIENCE

Name	Appointment	Qualifications and Experience
	Project Manager	
	Project Superintendent	
	Safety Supervisor	

NOTE: Qualifications and experience (resumes) should be provided in detail on separate sheets attached to this page. Back-up capability and personnel should be indicated of each category of staffing.

2. SUBCONTRACTOR'S SENIOR SUPERVISORY STAFF EXPERIENCE

Name of Subcontractor: _____

Name	**Appointment**	**Qualifications and Experience**
	Project Superintendent	

Name of Subcontractor: _____

Name	**Appointment**	**Qualifications and Experience**
	Project Superintendent	

Name of Subcontractor: _____

Name	**Appointment**	**Qualifications and Experience**
	Project Superintendent	

END OF SECTION

1. SUB-CONTRACTORS AND SUPPLIERS

The Tenderer shall quote the name and address of each proposed sub-contractor or supplier, who will be responsible for more than 2.5 percent of the total Contract Work or as noted below. After the Tender has been accepted by the Owner, the Contractor shall not be allowed to substitute other sub-contractors or suppliers in place of those named below without written approval of the Engineer.

Where Contractor intends to undertake the work with his own forces, in the space allocated for the Subcontractor Name, indicate "Own Forces".

Sub-Trade Section	**Name and Address of Sub-Contractor**
Concrete Formwork	
Concrete Placement	
Civil Work	
Glass Fused Bolted Steel Tank	
Process Mechanical	
Electrical	
Electrical Testing / Commissioning	
Instrumentation	
PLC/HMI SCADA Programming	

Equipment	**Manufacturer and Model**
Glass Fused Bolted Steel Tank	

Statement "D" – Sub-Contractors and Suppliers

NOTE: Additional information can be provided on separate sheets attached to this page.

END OF SECTION

1. SCHEDULE OF ALTERNATIVES

Base the Tender on products identified in the Contract Documents. Where the Tenderer wishes to advance an alternative that could either save costs or increase the value of the project, these proposed alternatives should be listed in this form. Further consideration of alternatives during the Work will not be undertaken other than as allowed in the Contract.

Alternative	Description	(Savings) or Additional Costs

NOTE: Additional information can be provided on separate sheets attached to this page.

END OF SECTION

Agreement To Bond

Date: _____, 20____

"Name & Address of Surety Company"

The Village of Lions Bay
Village of Lions Bay Municipal Hall
P.O. Box 141-400 Centre Road
Lions Bay, BC, V0N 2E0

Gentlemen/Madam:

CONTRACT NO.:_____

Should the Village of Lions Bay [hereinafter referred to as the "Owner"] accept the Tender of and execute an Agreement with _____ [hereinafter referred to as the "Tenderer"], we, the undersigned Surety Company, do hereby consent and agree to become bound to the Owner as Surety for the Tenderer in any of the following Bonds, on the standard format of the Canadian Construction Association.

1. Performance Bond for an amount equal to 50% of the Total Tender Price.

2. Labour and Material Payment Bond for an amount equal to 50% of the Total Tender Price.

We, the undersigned Surety Company, agree to furnish the Owner with the said Bonds within 7 days after written notification that the Owner has requested the said Bond or Bonds. We hereby further declare that our Company is legally entitled to do business in the Province of British Columbia.

Yours truly,

_____
[Name of Surety Company]

_____
[Address]

[Seal]

NOTE: This Agreement must be executed on behalf of the Surety Company by its authorized Officers under the Company's corporate seal.

END OF SECTION

Form Certificate Of Insurance

PROOF OF LIABILITY INSURANCE WILL BE ACCEPTED ON THIS FORM ONLY

The Village of Lions Bay

CERTIFICATE OF INSURANCE

Contract Number (if applicable) _____ Description of Contract _____

INSUREDS: (Contractor) _____

AND The Village of Lions Bay AND All Sub-Contractors of either employed directly or in the work to be performed.

AND _____

POLICY	COMPANY & POLICY NO.	DATE		LIMITS OF LIABILITY
		EFFECTIVE	EXPIRATION	
GENERAL LIABILITY BODILY INJURY PROPERTY DAMAGE				Minimum Requirement $5,000,000. Inclusive Per Occurrence
AUTOMOBILE LIABILITY Must cover all vehicles on or behalf of (Contractor) BODILY INJURY PROPERTY DAMAGE				Minimum Requirement $5,000,000. Inclusive Per Occurrence
OTHER (Describe)				

IMPORTANT: This Certificate confirms that the Policies listed above are in full force and effect and that these Policies will not be amended to restrict coverage or cancelled without 30 days prior written notice being given to The Village of Lions Bay and further that the General Liability Policy listed above includes all coverages outlined under (1) and (2) below and includes coverages under (3) as follows:

GENERAL LIABILITY COVERAGE INCLUDES:

1) Cross Liability clause

2) (i) completed operations, which cover shall be maintained continuously in force for a period of not less than twenty-four months from the date of the Certificate of Total Performance of the Work.
   (ii) Blanket Contractual Liability
   (iii) Contingent Employers Liability
   (iv) Non-owned automobile Liability
   (v) Broad Form Property Damage
   (vi) Excavation

3) where applicable, includes coverage for
   (i) Underpinning, Shoring
   (ii) Demolition
   (iii) Building Raising or Moving
   (iv) Blasting or the use of explosives
   (v) Tunneling
   (vi) Pile driving, caisson work
   (vii) Use of aircraft or watercraft, owned or non-owned

Date _____, 20 _____ _____
NAME OF INSURANCE COMPANY (IES) (NOT BROKERS)

_____ BY _____
ADDRESS OF INSURANCE COMPANY OR BROKER (AUTHORIZED REPRESENTATIVE OR OFFICIAL)

TB2330(REV1.2/95)

END OF SECTION

CCDC 2

CCDC 2

stipulated price contract

2008

The Village of Lions Bay
Harvey Tank Replacement Project

Apply a CCDC 2 copyright seal here. The application of the seal demonstrates the intention of the party proposing the use of this document that it be an accurate and unamended form of CCDC 2 – 2008 except to the extent that any alterations, additions or modifications are set forth in supplementary conditions.

CANADIAN CONSTRUCTION DOCUMENTS COMMITTEE
CANADIAN CONSTRUCTION DOCUMENTS COMMITTEE
CANADIAN CONSTRUCTION DOCUMENTS COMMITTEE

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The Canadian Construction Documents Committee (CCDC) is a national joint committee responsible for the development, production and review of standard Canadian construction contracts, forms and guides. Formed in 1974 the CCDC is made up of volunteer representatives from:

Public Sector Owners
Private Sector Owners
Canadian Bar Association (Ex-Officio)
* The Association of Canadian Engineering Companies
* The Canadian Construction Association
* Construction Specifications Canada
* The Royal Architectural Institute of Canada

*Committee policy and procedures are directed and approved by the four constituent national organizations.

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AGREEMENT BETWEEN OWNER AND CONTRACTOR

For use when a stipulated price is the basis of payment.

This Agreement made on the _____ day of _____ in the year _____ .

by and between the parties

Village of Lions Bay

hereinafter called the "*Owner*"

and

hereinafter called the *"Contractor"*

The *Owner* and the *Contractor* agree as follows:

ARTICLE A-1 THE WORK

The *Contractor* shall:

1.1 perform the *Work* required by the *Contract Documents* for

Harvey Tank Replacement Project

insert above the name of the Work

located at

Village of Lions Bay, British Columbia, Canada

insert above the Place of the Work

for which the Agreement has been signed by the parties, and for which

AECOM Canada Ltd.

insert above the name of the Consultant

is acting as and is hereinafter called the "*Consultant*" and

1.2 do and fulfill everything indicated by the *Contract Documents*, and

1.3 commence the *Work* by the _____ day of _____ in the year _____ and, subject to adjustment in *Contract Time* as provided for in the *Contract Documents*, attain *Substantial Performance of the Work*, by the _____ day of _____ in the year _____ .

ARTICLE A-2 AGREEMENTS AND AMENDMENTS

2.1 The *Contract* supersedes all prior negotiations, representations or agreements, either written or oral, relating in any manner to the *Work*, including the bidding documents that are not expressly listed in Article A-3 of the Agreement - CONTRACT DOCUMENTS.

2.2 The *Contract* may be amended only as provided in the *Contract Documents*.

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ARTICLE A-3 CONTRACT DOCUMENTS

3.1 The following are the *Contract Documents* referred to in Article A-1 of the Agreement - THE WORK:

- Agreement between *Owner* and *Contractor*
- Definitions
- The General Conditions of the Stipulated Price Contract
- *

- Bid Bond
- Agreement to Bond
- Performance Bond
- Labour and Material Payment Bond
- Certificate of Insurance
- Information to Tenderers
- Tender Form, Associated Forms and Additional Information
- Supplementary General Conditions
- Issued for Construction Drawings (General, Civil, Process, Mechanical, Structural, Electrical)
- Issued for Construction Technical Specifications
- Appendices, as issued

* *(Insert here, attaching additional pages if required, a list identifying all other Contract Documents e.g. supplementary conditions; information documents; specifications, giving a list of contents with section numbers and titles, number of pages and date; material finishing schedules; drawings, giving drawing number, title, date, revision date or mark; addenda, giving title, number, date)*

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ARTICLE A-4 CONTRACT PRICE

4.1 The *Contract Price*, which excludes *Value Added Taxes*, is:

_____ /100 dollars $ _____

4.2 *Value Added Taxes* (of _____ %) payable by the *Owner* to the *Contractor* are:

_____ /100 dollars $ _____

4.3 Total amount payable by the *Owner* to the *Contractor* for the construction of the *Work* is:

_____ /100 dollars $ _____

4.4 These amounts shall be subject to adjustments as provided in the *Contract Documents*.

4.5 All amounts are in Canadian funds.

ARTICLE A-5 PAYMENT

5.1 Subject to the provisions of the *Contract Documents*, and in accordance with legislation and statutory regulations respecting holdback percentages and, where such legislation or regulations do not exist or apply, subject to a holdback of ten percent (10 %), the *Owner* shall:

.1 make progress payments to the *Contractor* on account of the *Contract Price* when due in the amount certified by the *Consultant* together with such *Value Added Taxes* as may be applicable to such payments, and

.2 upon *Substantial Performance of the Work*, pay to the *Contractor* the unpaid balance of the holdback amount when due together with such *Value Added Taxes* as may be applicable to such payment, and

.3 upon the issuance of the final certificate for payment, pay to the *Contractor* the unpaid balance of the *Contract Price* when due together with such *Value Added Taxes* as may be applicable to such payment.

5.2 In the event of loss or damage occurring where payment becomes due under the property and boiler insurance policies, payments shall be made to the *Contractor* in accordance with the provisions of GC 11.1 – INSURANCE.

5.3 Interest

.1 Should either party fail to make payments as they become due under the terms of the *Contract* or in an award by arbitration or court, interest at the following rates on such unpaid amounts shall also become due and payable until payment:

(1) 2% per annum above the prime rate for the first 60 days.

(2) 4% per annum above the prime rate after the first 60 days.

Such interest shall be compounded on a monthly basis. The prime rate shall be the rate of interest quoted by

_____

(Insert name of chartered lending institution whose prime rate is to be used)

for prime business loans as it may change from time to time.

.2 Interest shall apply at the rate and in the manner prescribed by paragraph 5.3.1 of this Article on the settlement amount of any claim in dispute that is resolved either pursuant to Part 8 of the General Conditions – DISPUTE RESOLUTION or otherwise, from the date the amount would have been due and payable under the *Contract*, had it not been in dispute, until the date it is paid.

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ARTICLE A-6 RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING

6.1 *Notices in Writing* will be addressed to the recipient at the address set out below. The delivery of a *Notice in Writing* will be by hand, by courier, by prepaid first class mail, or by facsimile or other form of electronic communication during the transmission of which no indication of failure of receipt is communicated to the sender. A *Notice in Writing* delivered by one party in accordance with this *Contract* will be deemed to have been received by the other party on the date of delivery if delivered by hand or courier, or if sent by mail it shall be deemed to have been received five calendar days after the date on which it was mailed, provided that if either such day is not a *Working Day*, then the *Notice in Writing* shall be deemed to have been received on the *Working Day* next following such day. A *Notice in Writing* sent by facsimile or other form of electronic communication shall be deemed to have been received on the date of its transmission 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 shall be deemed to have been received at the opening of business at the place of receipt on the first *Working Day* next following the transmission thereof. An address for a party may be changed by *Notice in Writing* to the other party setting out the new address in accordance with this Article.

Owner

Village of Lions Bay

*name of Owner**

400 Centre Road, Lions Bay, BC, V0N, 2E0

address

facsimile number *email address*

Contractor

*name of Contractor**

address

facsimile number *email address*

Consultant

AECOM Canada Ltd.

*name of Consultant**

3292 Production Way, Fourth Floor, Burnaby, BC, V5A 4R4

address

604-294-8597

facsimile number *email address*

** If it is intended that the notice must be received by a specific individual, that individual's name shall be indicated.*

ARTICLE A-7 LANGUAGE OF THE CONTRACT

7.1 When the *Contract Documents* are prepared in both the English and French languages, it is agreed that in the event of any apparent discrepancy between the English and French versions, the English / ~~French~~ # language shall prevail.
 # Complete this statement by striking out inapplicable term.

7.2 This Agreement is drawn in English at the request of the parties hereto. La présente convention est rédigée en anglais à la demande des parties.

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ARTICLE A-8 SUCCESSION

8.1 The *Contract* shall enure to the benefit of and be binding upon the parties hereto, their respective heirs, legal representatives, successors, and assigns.

In witness whereof the parties hereto have executed this Agreement by the hands of their duly authorized representatives.

SIGNED AND DELIVERED
in the presence of:

WITNESS

signature

name of person signing

signature

name of person signing

OWNER

name of owner

signature

name and title of person signing

signature

name and title of person signing

WITNESS

signature

name of person signing

signature

name of person signing

CONTRACTOR

name of Contractor

signature

name and title of person signing

signature

name and title of person signing

N.B. Where legal jurisdiction, local practice or Owner or Contractor requirement calls for:
(a) proof of authority to execute this document, attach such proof of authority in the form of a certified copy of a resolution naming the representative(s) authorized to sign the Agreement for and on behalf of the corporation or partnership; or
(b) the affixing of a corporate seal, this Agreement should be properly sealed.

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DEFINITIONS

The following Definitions shall apply to all *Contract Documents*.

1. **Change Directive**
A *Change Directive* is a written instruction prepared by the *Consultant* and signed by the *Owner* directing the *Contractor* to proceed with a change in the *Work* within the general scope of the *Contract Documents* prior to the *Owner* and the *Contractor* agreeing upon adjustments in the *Contract Price* and the *Contract Time*.

2. **Change Order**
A *Change Order* is a written amendment to the *Contract* prepared by the *Consultant* and signed by the *Owner* and the *Contractor* stating their agreement upon:
   - a change in the *Work*;
   - the method of adjustment or the amount of the adjustment in the *Contract Price*, if any; and
   - the extent of the adjustment in the *Contract Time*, if any.

3. **Construction Equipment**
Construction Equipment means all machinery and equipment, either operated or not operated, that is required for preparing, fabricating, conveying, erecting, or otherwise performing the *Work* but is not incorporated into the *Work*.

4. **Consultant**
The *Consultant* is the person or entity engaged by the *Owner* and identified as such in the Agreement. The *Consultant* is the Architect, the Engineer or entity licensed to practise in the province or territory of the *Place of the Work*. The term *Consultant* means the *Consultant* or the *Consultant*'s authorized representative.

5. **Contract**
The *Contract* is the undertaking by the parties to perform their respective duties, responsibilities and obligations as prescribed in the *Contract Documents* and represents the entire agreement between the parties.

6. **Contract Documents**
The *Contract Documents* consist of those documents listed in Article A-3 of the Agreement - CONTRACT DOCUMENTS and amendments agreed upon between the parties.

7. **Contract Price**
The *Contract Price* is the amount stipulated in Article A-4 of the Agreement - CONTRACT PRICE.

8. **Contract Time**
The *Contract Time* is the time stipulated in paragraph 1.3 of Article A-1 of the Agreement - THE WORK from commencement of the *Work* to *Substantial Performance of the Work*.

9. **Contractor**
The *Contractor* is the person or entity identified as such in the Agreement. The term *Contractor* means the *Contractor* or the *Contractor*'s authorized representative as designated to the *Owner* in writing.

10. **Drawings**
The *Drawings* are the graphic and pictorial portions of the *Contract Documents*, wherever located and whenever issued, showing the design, location and dimensions of the *Work*, generally including plans, elevations, sections, details, and diagrams.

11. **Notice in Writing**
A *Notice in Writing*, where identified in the *Contract Documents*, is a written communication between the parties or between them and the *Consultant* that is transmitted in accordance with the provisions of Article A-6 of the Agreement – RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING.

12. **Owner**
The *Owner* is the person or entity identified as such in the Agreement. The term *Owner* means the *Owner* or the *Owner*'s authorized agent or representative as designated to the *Contractor* in writing, but does not include the *Consultant*.

13. **Place of the Work**
The *Place of the Work* is the designated site or location of the *Work* identified in the *Contract Documents*.

14. **Product**
Product or Products means material, machinery, equipment, and fixtures forming the *Work*, but does not include *Construction Equipment*.

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15. Project
The *Project* means the total construction contemplated of which the *Work* may be the whole or a part.

16. Provide
Provide means to supply and install.

17. Shop Drawings
Shop Drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures, *Product* data, and other data which the *Contractor* provides to illustrate details of portions of the *Work*.

18. Specifications
The *Specifications* are that portion of the *Contract Documents*, wherever located and whenever issued, consisting of the written requirements and standards for *Products*, systems, workmanship, quality, and the services necessary for the performance of the *Work*.

19. Subcontractor
A *Subcontractor* is a person or entity having a direct contract with the *Contractor* to perform a part or parts of the *Work* at the *Place of the Work*.

20. Substantial Performance of the Work
Substantial Performance of the Work is as defined in the lien legislation applicable to the *Place of the Work*. If such legislation is not in force or does not contain such definition, or if the *Work* is governed by the Civil Code of Quebec, *Substantial Performance of the Work* shall have been reached when the *Work* is ready for use or is being used for the purpose intended and is so certified by the *Consultant*.

21. Supplemental Instruction
A *Supplemental Instruction* is an instruction, not involving adjustment in the *Contract Price* or *Contract Time*, in the form of *Specifications*, *Drawings*, schedules, samples, models or written instructions, consistent with the intent of the *Contract Documents*. It is to be issued by the *Consultant* to supplement the *Contract Documents* as required for the performance of the *Work*.

22. Supplier
A *Supplier* is a person or entity having a direct contract with the *Contractor* to supply *Products*.

23. Temporary Work
Temporary Work means temporary supports, structures, facilities, services, and other temporary items, excluding *Construction Equipment*, required for the execution of the *Work* but not incorporated into the *Work*.

24. Value Added Taxes
Value Added Taxes means such sum as shall be levied upon the *Contract Price* by the Federal or any Provincial or Territorial Government and is computed as a percentage of the *Contract Price* and includes the Goods and Services Tax, the Quebec Sales Tax, the Harmonized Sales Tax, and any similar tax, the collection and payment of which have been imposed on the *Contractor* by the tax legislation.

25. Work
The *Work* means the total construction and related services required by the *Contract Documents*.

26. Working Day
Working Day means a day other than a Saturday, Sunday, statutory holiday, or statutory vacation day that is observed by the construction industry in the area of the *Place of the Work*.

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GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

PART 1 GENERAL PROVISIONS

GC 1.1 CONTRACT DOCUMENTS

1.1.1 The intent of the *Contract Documents* is to include the labour, *Products* and services necessary for the performance of the *Work* by the *Contractor* in accordance with these documents. It is not intended, however, that the *Contractor* shall supply products or perform work not consistent with, not covered by, or not properly inferable from the *Contract Documents*.

1.1.2 Nothing contained in the *Contract Documents* shall create any contractual relationship between:
.1 the *Owner* and a *Subcontractor*, a *Supplier*, or their agent, employee, or other person performing any portion of the *Work*.
.2 the *Consultant* and the *Contractor*, a *Subcontractor*, a *Supplier*, or their agent, employee, or other person performing any portion of the *Work*.

1.1.3 The *Contract Documents* are complementary, and what is required by any one shall be as binding as if required by all.

1.1.4 Words and abbreviations which have well known technical or trade meanings are used in the *Contract Documents* in accordance with such recognized meanings.

1.1.5 References in the *Contract Documents* to the singular shall be considered to include the plural as the context requires.

1.1.6 Neither the organization of the *Specifications* nor the arrangement of *Drawings* shall control the *Contractor* in dividing the work among *Subcontractors* and *Suppliers*.

1.1.7 If there is a conflict within the *Contract Documents*:
.1 the order of priority of documents, from highest to lowest, shall be
- the Agreement between the *Owner* and the *Contractor*,
- the Definitions,
- Supplementary Conditions,
- the General Conditions,
- Division 1 of the *Specifications*,
- technical *Specifications*,
- material and finishing schedules,
- the *Drawings*.

.2 *Drawings* of larger scale shall govern over those of smaller scale of the same date.
.3 dimensions shown on *Drawings* shall govern over dimensions scaled from *Drawings*.
.4 later dated documents shall govern over earlier documents of the same type.

1.1.8 The *Owner* shall provide the *Contractor*, without charge, sufficient copies of the *Contract Documents* to perform the *Work*.

1.1.9 *Specifications*, *Drawings*, models, and copies thereof furnished by the *Consultant* are and shall remain the *Consultant*'s property, with the exception of the signed *Contract* sets, which shall belong to each party to the *Contract*. All *Specifications*, *Drawings* and models furnished by the *Consultant* are to be used only with respect to the *Work* and are not to be used on other work. These *Specifications*, *Drawings* and models are not to be copied or altered in any manner without the written authorization of the *Consultant*.

1.1.10 Models furnished by the *Contractor* at the *Owner*'s expense are the property of the *Owner*.

GC 1.2 LAW OF THE CONTRACT

1.2.1 The law of the *Place of the Work* shall govern the interpretation of the *Contract*.

GC 1.3 RIGHTS AND REMEDIES

1.3.1 Except as expressly provided in the *Contract Documents*, 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.

1.3.2 No action or failure to act by the *Owner*, *Consultant* or *Contractor* shall constitute a waiver of any right or duty afforded any of them under the *Contract*, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

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GC 1.4 ASSIGNMENT

1.4.1 Neither party to the *Contract* shall assign the *Contract* or a portion thereof without the written consent of the other, which consent shall not be unreasonably withheld.

PART 2 ADMINISTRATION OF THE CONTRACT

GC 2.1 AUTHORITY OF THE CONSULTANT

2.1.1 The *Consultant* will have authority to act on behalf of the *Owner* only to the extent provided in the *Contract Documents*, unless otherwise modified by written agreement as provided in paragraph 2.1.2.

2.1.2 The duties, responsibilities and limitations of authority of the *Consultant* as set forth in the *Contract Documents* shall be modified or extended only with the written consent of the *Owner*, the *Contractor* and the *Consultant*.

2.1.3 If the *Consultant*'s employment is terminated, the *Owner* shall immediately appoint or reappoint a *Consultant* against whom the *Contractor* makes no reasonable objection and whose status under the *Contract Documents* shall be that of the former *Consultant*.

GC 2.2 ROLE OF THE CONSULTANT

2.2.1 The *Consultant* will provide administration of the *Contract* as described in the *Contract Documents*.

2.2.2 The *Consultant* will visit the *Place of the Work* at intervals appropriate to the progress of construction to become familiar with the progress and quality of the work and to determine if the *Work* is proceeding in general conformity with the *Contract Documents*.

2.2.3 If the *Owner* and the *Consultant* agree, the *Consultant* will provide at the *Place of the Work*, one or more project representatives to assist in carrying out the *Consultant*'s responsibilities. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in writing to the *Contractor*.

2.2.4 The *Consultant* will promptly inform the *Owner* of the date of receipt of the *Contractor*'s applications for payment as provided in paragraph 5.3.1.1 of GC 5.3 – PROGRESS PAYMENT.

2.2.5 Based on the *Consultant*'s observations and evaluation of the *Contractor*'s applications for payment, the *Consultant* will determine the amounts owing to the *Contractor* under the *Contract* and will issue certificates for payment as provided in Article A-5 of the Agreement - PAYMENT, GC 5.3 - PROGRESS PAYMENT and GC 5.7 - FINAL PAYMENT.

2.2.6 The *Consultant* will not be responsible for and will not have control, charge or supervision of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs required in connection with the *Work* in accordance with the applicable construction safety legislation, other regulations or general construction practice. The *Consultant* will not be responsible for the *Contractor*'s failure to carry out the *Work* in accordance with the *Contract Documents*. The *Consultant* will not have control over, charge of or be responsible for the acts or omissions of the *Contractor*, *Subcontractors*, *Suppliers*, or their agents, employees, or any other persons performing portions of the *Work*.

2.2.7 Except with respect to GC 5.1 - FINANCING INFORMATION REQUIRED OF THE OWNER, the *Consultant* will be, in the first instance, the interpreter of the requirements of the *Contract Documents*.

2.2.8 Matters in question relating to the performance of the *Work* or the interpretation of the *Contract Documents* shall be initially referred in writing to the *Consultant* by the party raising the question for interpretations and findings and copied to the other party.

2.2.9 Interpretations and findings of the *Consultant* shall be consistent with the intent of the *Contract Documents*. In making such interpretations and findings the *Consultant* will not show partiality to either the *Owner* or the *Contractor*.

2.2.10 The *Consultant*'s interpretations and findings will be given in writing to the parties within a reasonable time.

2.2.11 With respect to claims for a change in *Contract Price*, the *Consultant* will make findings as set out in GC 6.6 – CLAIMS FOR A CHANGE IN CONTRACT PRICE.

2.2.12 The *Consultant* will have authority to reject work which in the *Consultant*'s opinion does not conform to the requirements of the *Contract Documents*. Whenever the *Consultant* considers it necessary or advisable, the *Consultant* will have authority to require inspection or testing of work, whether or not such work is fabricated, installed or completed. However, neither the authority of the *Consultant* to act nor any decision either to exercise or not to exercise such authority shall give rise to any duty or responsibility of the *Consultant* to the *Contractor*, *Subcontractors*, *Suppliers*, or their agents, employees, or other persons performing any of the *Work*.

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2.2.13 During the progress of the *Work* the *Consultant* will furnish *Supplemental Instructions* to the *Contractor* with reasonable promptness or in accordance with a schedule for such instructions agreed to by the *Consultant* and the *Contractor*.

2.2.14 The *Consultant* will review and take appropriate action upon *Shop Drawings*, samples and other *Contractor*'s submittals, in accordance with the *Contract Documents*.

2.2.15 The *Consultant* will prepare *Change Orders* and *Change Directives* as provided in GC 6.2 - CHANGE ORDER and GC 6.3 - CHANGE DIRECTIVE.

2.2.16 The *Consultant* will conduct reviews of the *Work* to determine the date of *Substantial Performance of the Work* as provided in GC 5.4 - SUBSTANTIAL PERFORMANCE OF THE WORK.

2.2.17 All certificates issued by the *Consultant* will be to the best of the *Consultant*'s knowledge, information and belief. By issuing any certificate, the *Consultant* does not guarantee the *Work* is correct or complete.

2.2.18 The *Consultant* will receive and review written warranties and related documents required by the *Contract* and provided by the *Contractor* and will forward such warranties and documents to the *Owner* for the *Owner*'s acceptance.

GC 2.3 REVIEW AND INSPECTION OF THE WORK

2.3.1 The *Owner* and the *Consultant* shall have access to the *Work* at all times. The *Contractor* shall provide sufficient, safe and proper facilities at all times for the review of the *Work* by the *Consultant* and the inspection of the *Work* by authorized agencies. If parts of the *Work* are in preparation at locations other than the *Place of the Work*, the *Owner* and the *Consultant* shall be given access to such work whenever it is in progress.

2.3.2 If work is designated for tests, inspections or approvals in the *Contract Documents*, or by the *Consultant*'s instructions, or by the laws or ordinances of the *Place of the Work*, the *Contractor* shall give the *Consultant* reasonable notification of when the work will be ready for review and inspection. The *Contractor* shall arrange for and shall give the *Consultant* reasonable notification of the date and time of inspections by other authorities.

2.3.3 The *Contractor* shall furnish promptly to the *Consultant* two copies of certificates and inspection reports relating to the *Work*.

2.3.4 If the *Contractor* covers, or permits to be covered, work that has been designated for special tests, inspections or approvals before such special tests, inspections or approvals are made, given or completed, the *Contractor* shall, if so directed, uncover such work, have the inspections or tests satisfactorily completed, and make good covering work at the *Contractor*'s expense.

2.3.5 The *Consultant* may order any portion or portions of the *Work* to be examined to confirm that such work is in accordance with the requirements of the *Contract Documents*. If the work is not in accordance with the requirements of the *Contract Documents*, the *Contractor* shall correct the work and pay the cost of examination and correction. If the work is in accordance with the requirements of the *Contract Documents*, the *Owner* shall pay the cost of examination and restoration.

2.3.6 The *Contractor* shall pay the cost of making any test or inspection, including the cost of samples required for such test or inspection, if such test or inspection is designated in the *Contract Documents* to be performed by the *Contractor* or is designated by the laws or ordinances applicable to the *Place of the Work*.

2.3.7 The *Contractor* shall pay the cost of samples required for any test or inspection to be performed by the *Consultant* or the *Owner* if such test or inspection is designated in the *Contract Documents*.

GC 2.4 DEFECTIVE WORK

2.4.1 The *Contractor* shall promptly correct defective work that has been rejected by the *Consultant* as failing to conform to the *Contract Documents* whether or not the defective work has been incorporated in the *Work* and whether or not the defect is the result of poor workmanship, use of defective products or damage through carelessness or other act or omission of the *Contractor*.

2.4.2 The *Contractor* shall make good promptly other contractors' work destroyed or damaged by such corrections at the *Contractor*'s expense.

2.4.3 If in the opinion of the *Consultant* it is not expedient to correct defective work or work not performed as provided in the *Contract Documents*, the *Owner* may deduct from the amount otherwise due to the *Contractor* the difference in value between the work as performed and that called for by the *Contract Documents*. If the *Owner* and the *Contractor* do not agree on the difference in value, they shall refer the matter to the *Consultant* for a determination.

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PART 3 EXECUTION OF THE WORK

GC 3.1 CONTROL OF THE WORK

3.1.1 The *Contractor* shall have total control of the *Work* and shall effectively direct and supervise the *Work* so as to ensure conformity with the *Contract Documents*.

3.1.2 The *Contractor* shall be solely responsible for construction means, methods, techniques, sequences, and procedures and for co-ordinating the various parts of the *Work* under the *Contract*.

GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

3.2.1 The *Owner* reserves the right to award separate contracts in connection with other parts of the *Project* to other contractors and to perform work with own forces.

3.2.2 When separate contracts are awarded for other parts of the *Project*, or when work is performed by the *Owner*'s own forces, the *Owner* shall:

.1 provide for the co-ordination of the activities and work of other contractors and *Owner*'s own forces with the *Work* of the *Contract*;

.2 assume overall responsibility for compliance with the applicable health and construction safety legislation at the *Place of the Work*;

.3 enter into separate contracts with other contractors under conditions of contract which are compatible with the conditions of the *Contract*;

.4 ensure that insurance coverage is provided to the same requirements as are called for in GC 11.1 - INSURANCE and co-ordinate such insurance with the insurance coverage of the *Contractor* as it affects the *Work*; and

.5 take all reasonable precautions to avoid labour disputes or other disputes on the *Project* arising from the work of other contractors or the *Owner*'s own forces.

3.2.3 When separate contracts are awarded for other parts of the *Project*, or when work is performed by the *Owner*'s own forces, the *Contractor* shall:

.1 afford the *Owner* and other contractors reasonable opportunity to store their products and execute their work;

.2 cooperate with other contractors and the *Owner* in reviewing their construction schedules; and

.3 promptly report to the *Consultant* in writing any apparent deficiencies in the work of other contractors or of the *Owner*'s own forces, where such work affects the proper execution of any portion of the *Work*, prior to proceeding with that portion of the *Work*.

3.2.4 Where the *Contract Documents* identify work to be performed by other contractors or the *Owner*'s own forces, the *Contractor* shall co-ordinate and schedule the *Work* with the work of other contractors and the *Owner*'s own forces as specified in the *Contract Documents*.

3.2.5 Where a change in the *Work* is required as a result of the co-ordination and integration of the work of other contractors or *Owner*'s own forces with the *Work*, the changes shall be authorized and valued as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 - CHANGE ORDER and GC 6.3 - CHANGE DIRECTIVE.

3.2.6 Disputes and other matters in question between the *Contractor* and other contractors shall be dealt with as provided in Part 8 of the General Conditions - DISPUTE RESOLUTION provided the other contractors have reciprocal obligations. The *Contractor* shall be deemed to have consented to arbitration of any dispute with any other contractor whose contract with the *Owner* contains a similar agreement to arbitrate.

GC 3.3 TEMPORARY WORK

3.3.1 The *Contractor* shall have the sole responsibility for the design, erection, operation, maintenance, and removal of *Temporary Work*.

3.3.2 The *Contractor* shall engage and pay for registered professional engineering personnel skilled in the appropriate disciplines to perform those functions referred to in paragraph 3.3.1 where required by law or by the *Contract Documents* and in all cases where such *Temporary Work* is of such a nature that professional engineering skill is required to produce safe and satisfactory results.

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3.3.3 Notwithstanding the provisions of GC 3.1 - CONTROL OF THE WORK, paragraphs 3.3.1 and 3.3.2 or provisions to the contrary elsewhere in the *Contract Documents* where such *Contract Documents* include designs for *Temporary Work* or specify a method of construction in whole or in part, such designs or methods of construction shall be considered to be part of the design of the *Work* and the *Contractor* shall not be held responsible for that part of the design or the specified method of construction. The *Contractor* shall, however, be responsible for the execution of such design or specified method of construction in the same manner as for the execution of the *Work*.

GC 3.4 DOCUMENT REVIEW

3.4.1 The *Contractor* shall review the *Contract Documents* and shall report promptly to the *Consultant* any error, inconsistency or omission the *Contractor* may discover. Such review by the *Contractor* shall be to the best of the *Contractor*'s knowledge, information and belief and in making such review the *Contractor* does not assume any responsibility to the *Owner* or the *Consultant* for the accuracy of the review. The *Contractor* shall not be liable for damage or costs resulting from such errors, inconsistencies or omissions in the *Contract Documents,* which the *Contractor* did not discover. If the *Contractor* does discover any error, inconsistency or omission in the *Contract Documents*, the *Contractor* shall not proceed with the work affected until the *Contractor* has received corrected or missing information from the *Consultant*.

GC 3.5 CONSTRUCTION SCHEDULE

3.5.1 The *Contractor* shall:

.1 prepare and submit to the *Owner* and the *Consultant* prior to the first application for payment, a construction schedule that indicates the timing of the major activities of the *Work* and provides sufficient detail of the critical events and their inter-relationship to demonstrate the *Work* will be performed in conformity with the *Contract Time*;

.2 monitor the progress of the *Work* relative to the construction schedule and update the schedule on a monthly basis or as stipulated by the *Contract Documents*; and

.3 advise the *Consultant* of any revisions required to the schedule as the result of extensions of the *Contract Time* as provided in Part 6 of the General Conditions - CHANGES IN THE WORK.

GC 3.6 SUPERVISION

3.6.1 The *Contractor* shall provide all necessary supervision and appoint a competent representative who shall be in attendance at the *Place of the Work* while work is being performed. The appointed representative shall not be changed except for valid reason.

3.6.2 The appointed representative shall represent the *Contractor* at the *Place of the Work*. Information and instructions provided by the *Consultant* to the *Contractor*'s appointed representative shall be deemed to have been received by the *Contractor*, except with respect to Article A-6 of the Agreement – RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING.

GC 3.7 SUBCONTRACTORS AND SUPPLIERS

3.7.1 The *Contractor* shall preserve and protect the rights of the parties under the *Contract* with respect to work to be performed under subcontract, and shall:

.1 enter into contracts or written agreements with *Subcontractors* and *Suppliers* to require them to perform their work as provided in the *Contract Documents*;

.2 incorporate the terms and conditions of the *Contract Documents* into all contracts or written agreements with *Subcontractors* and *Suppliers*; and

.3 be as fully responsible to the *Owner* for acts and omissions of *Subcontractors*, *Suppliers* and of persons directly or indirectly employed by them as for acts and omissions of persons directly employed by the *Contractor*.

3.7.2 The *Contractor* shall indicate in writing, if requested by the *Owner*, those *Subcontractors* or *Suppliers* whose bids have been received by the *Contractor* which the *Contractor* would be prepared to accept for the performance of a portion of the *Work*. Should the *Owner* not object before signing the *Contract*, the *Contractor* shall employ those *Subcontractors* or *Suppliers* so identified by the *Contractor* in writing for the performance of that portion of the *Work* to which their bid applies.

3.7.3 The *Owner* may, for reasonable cause, at any time before the *Owner* has signed the *Contract*, object to the use of a proposed *Subcontractor* or *Supplier* and require the *Contractor* to employ one of the other subcontract bidders.

3.7.4 If the *Owner* requires the *Contractor* to change a proposed *Subcontractor* or *Supplier*, the *Contract Price* and *Contract Time* shall be adjusted by the differences occasioned by such required change.

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3.7.5 The *Contractor* shall not be required to employ as a *Subcontractor* or *Supplier*, a person or firm to which the *Contractor* may reasonably object.

3.7.6 The *Owner*, through the *Consultant*, may provide to a *Subcontractor* or *Supplier* information as to the percentage of the *Subcontractor*'s or *Supplier*'s work which has been certified for payment.

GC 3.8 LABOUR AND PRODUCTS

3.8.1 The *Contractor* shall provide and pay for labour, *Products*, tools, *Construction Equipment*, water, heat, light, power, transportation, and other facilities and services necessary for the performance of the *Work* in accordance with the *Contract*.

3.8.2 Unless otherwise specified in the *Contract Documents*, *Products* provided shall be new. *Products* which are not specified shall be of a quality consistent with those specified and their use acceptable to the *Consultant*.

3.8.3 The *Contractor* shall maintain good order and discipline among the *Contractor*'s employees engaged on the *Work* and shall not employ on the *Work* anyone not skilled in the tasks assigned.

GC 3.9 DOCUMENTS AT THE SITE

3.9.1 The *Contractor* shall keep one copy of current *Contract Documents*, submittals, reports, and records of meetings at the *Place of the Work*, in good order and available to the *Owner* and the *Consultant*.

GC 3.10 SHOP DRAWINGS

3.10.1 The *Contractor* shall provide *Shop Drawings* as required in the *Contract Documents*.

3.10.2 The *Contractor* shall provide *Shop Drawings* to the *Consultant* to review in orderly sequence and sufficiently in advance so as to cause no delay in the *Work* or in the work of other contractors.

3.10.3 Upon request of the *Contractor* or the *Consultant*, they shall jointly prepare a schedule of the dates for provision, review and return of *Shop Drawings*.

3.10.4 The *Contractor* shall provide *Shop Drawings* in the form specified, or if not specified, as directed by the *Consultant*.

3.10.5 *Shop Drawings* provided by the *Contractor* to the *Consultant* shall indicate by stamp, date and signature of the person responsible for the review that the *Contractor* has reviewed each one of them.

3.10.6 The *Consultant*'s review is for conformity to the design concept and for general arrangement only.

3.10.7 *Shop Drawings* which require approval of any legally constituted authority having jurisdiction shall be provided to such authority by the *Contractor* for approval.

3.10.8 The *Contractor* shall review all *Shop Drawings* before providing them to the *Consultant*. The *Contractor* represents by this review that:

.1 the *Contractor* has determined and verified all applicable field measurements, field construction conditions, *Product* requirements, catalogue numbers and similar data, or will do so, and

.2 the *Contractor* has checked and co-ordinated each *Shop Drawing* with the requirements of the *Work* and of the *Contract Documents*.

3.10.9 At the time of providing *Shop Drawings*, the *Contractor* shall expressly advise the *Consultant* in writing of any deviations in a *Shop Drawing* from the requirements of the *Contract Documents*. The *Consultant* shall indicate the acceptance or rejection of such deviation expressly in writing.

3.10.10 The *Consultant*'s review shall not relieve the *Contractor* of responsibility for errors or omissions in the *Shop Drawings* or for meeting all requirements of the *Contract Documents*.

3.10.11 The *Contractor* shall provide revised *Shop Drawings* to correct those which the *Consultant* rejects as inconsistent with the *Contract Documents*, unless otherwise directed by the *Consultant*. The *Contractor* shall notify the *Consultant* in writing of any revisions to the *Shop Drawings* other than those requested by the *Consultant*.

3.10.12 The *Consultant* will review and return *Shop Drawings* in accordance with the schedule agreed upon, or, in the absence of such schedule, with reasonable promptness so as to cause no delay in the performance of the *Work*.

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GC 3.11 USE OF THE WORK

3.11.1 The *Contractor* shall confine *Construction Equipment*, *Temporary Work*, storage of *Products*, waste products and debris, and operations of employees and *Subcontractors* to limits indicated by laws, ordinances, permits, or the *Contract Documents* and shall not unreasonably encumber the *Place of the Work*.

3.11.2 The *Contractor* shall not load or permit to be loaded any part of the *Work* with a weight or force that will endanger the safety of the *Work*.

GC 3.12 CUTTING AND REMEDIAL WORK

3.12.1 The *Contractor* shall perform the cutting and remedial work required to make the affected parts of the *Work* come together properly.

3.12.2 The *Contractor* shall co-ordinate the *Work* to ensure that the cutting and remedial work is kept to a minimum.

3.12.3 Should the *Owner*, the *Consultant*, other contractors or anyone employed by them be responsible for ill-timed work necessitating cutting or remedial work to be performed, the cost of such cutting or remedial work shall be valued as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 - CHANGE ORDER and GC 6.3 - CHANGE DIRECTIVE.

3.12.4 Cutting and remedial work shall be performed by specialists familiar with the *Products* affected and shall be performed in a manner to neither damage nor endanger the *Work*.

GC 3.13 CLEANUP

3.13.1 The *Contractor* shall maintain the *Work* in a safe and tidy condition and free from the accumulation of waste products and debris, other than that caused by the *Owner*, other contractors or their employees.

3.13.2 Before applying for *Substantial Performance of the Work* as provided in GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK, the *Contractor* shall remove waste products and debris, other than that resulting from the work of the *Owner*, other contractors or their employees, and shall leave the *Place of the Work* clean and suitable for use or occupancy by the *Owner*. The *Contractor* shall remove products, tools, *Construction Equipment*, and *Temporary Work* not required for the performance of the remaining work.

3.13.3 Prior to application for the final payment, the *Contractor* shall remove any remaining products, tools, *Construction Equipment*, *Temporary Work*, and waste products and debris, other than those resulting from the work of the *Owner*, other contractors or their employees.

PART 4 ALLOWANCES

GC 4.1 CASH ALLOWANCES

4.1.1 The *Contract Price* includes the cash allowances, if any, stated in the *Contract Documents*. The scope of work or costs included in such cash allowances shall be as described in the *Contract Documents*.

4.1.2 The *Contract Price*, and not the cash allowances, includes the *Contractor*'s overhead and profit in connection with such cash allowances.

4.1.3 Expenditures under cash allowances shall be authorized by the *Owner* through the *Consultant*.

4.1.4 Where the actual cost of the *Work* under any cash allowance exceeds the amount of the allowance, the *Contractor* shall be compensated for the excess incurred and substantiated plus an amount for overhead and profit on the excess as set out in the *Contract Documents*. Where the actual cost of the *Work* under any cash allowance is less than the amount of the allowance, the *Owner* shall be credited for the unexpended portion of the cash allowance, but not for the *Contractor*'s overhead and profit on such amount. Multiple cash allowances shall not be combined for the purpose of calculating the foregoing.

4.1.5 The *Contract Price* shall be adjusted by *Change Order* to provide for any difference between the amount of each cash allowance and the actual cost of the work under that cash allowance.

4.1.6 The value of the work performed under a cash allowance is eligible to be included in progress payments.

4.1.7 The *Contractor* and the *Consultant* shall jointly prepare a schedule that shows when the *Consultant* and *Owner* must authorize ordering of items called for under cash allowances to avoid delaying the progress of the *Work*.

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GC 4.2 CONTINGENCY ALLOWANCE

4.2.1 The *Contract Price* includes the contingency allowance, if any, stated in the *Contract Documents*.

4.2.2 The contingency allowance includes the *Contractor*'s overhead and profit in connection with such contingency allowance.

4.2.3 Expenditures under the contingency allowance shall be authorized and valued as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 - CHANGE ORDER and GC 6.3 - CHANGE DIRECTIVE.

4.2.4 The *Contract Price* shall be adjusted by *Change Order* to provide for any difference between the expenditures authorized under paragraph 4.2.3 and the contingency allowance.

PART 5 PAYMENT

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

5.1.1 The *Owner* shall, at the request of the *Contractor*, before signing the *Contract*, and promptly from time to time thereafter, furnish to the *Contractor* reasonable evidence that financial arrangements have been made to fulfill the *Owner*'s obligations under the *Contract*.

5.1.2 The *Owner* shall give the *Contractor Notice in Writing* of any material change in the *Owner*'s financial arrangements to fulfill the *Owner*'s obligations under the *Contract* during the performance of the *Contract*.

GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT

5.2.1 Applications for payment on account as provided in Article A-5 of the Agreement - PAYMENT may be made monthly as the *Work* progresses.

5.2.2 Applications for payment shall be dated the last day of each payment period, which is the last day of the month or an alternative day of the month agreed in writing by the parties.

5.2.3 The amount claimed shall be for the value, proportionate to the amount of the *Contract*, of *Work* performed and *Products* delivered to the *Place of the Work* as of the last day of the payment period.

5.2.4 The *Contractor* shall submit to the *Consultant*, at least 15 calendar days before the first application for payment, a schedule of values for the parts of the *Work*, aggregating the total amount of the *Contract Price*, so as to facilitate evaluation of applications for payment.

5.2.5 The schedule of values shall be made out in such form and supported by such evidence as the *Consultant* may reasonably direct and when accepted by the *Consultant*, shall be used as the basis for applications for payment, unless it is found to be in error.

5.2.6 The *Contractor* shall include a statement based on the schedule of values with each application for payment.

5.2.7 Applications for payment for *Products* delivered to the *Place of the Work* but not yet incorporated into the *Work* shall be supported by such evidence as the *Consultant* may reasonably require to establish the value and delivery of the *Products*.

GC 5.3 PROGRESS PAYMENT

5.3.1 After receipt by the *Consultant* of an application for payment submitted by the *Contractor* in accordance with GC 5.2 - APPLICATIONS FOR PROGRESS PAYMENT:

.1 the *Consultant* will promptly inform the *Owner* of the date of receipt of the *Contractor*'s application for payment,

.2 the *Consultant* will issue to the *Owner* and copy to the *Contractor*, no later than 10 calendar days after the receipt of the application for payment, a certificate for payment in the amount applied for, or in such other amount as the *Consultant* determines to be properly due. If the *Consultant* amends the application, the *Consultant* will promptly advise the *Contractor* in writing giving reasons for the amendment,

.3 the *Owner* shall make payment to the *Contractor* on account as provided in Article A-5 of the Agreement - PAYMENT on or before 20 calendar days after the later of:

- receipt by the *Consultant* of the application for payment, or
- the last day of the monthly payment period for which the application for payment is made.

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GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK

5.4.1 When the *Contractor* considers that the *Work* is substantially performed, or if permitted by the lien legislation applicable to the *Place of the Work* a designated portion thereof which the *Owner* agrees to accept separately is substantially performed, the *Contractor* shall, within one *Working Day*, deliver to the *Consultant* and to the *Owner* a comprehensive list of items to be completed or corrected, together with a written application for a review by the *Consultant* to establish *Substantial Performance of the Work* or substantial performance of the designated portion of the *Work*. Failure to include an item on the list does not alter the responsibility of the *Contractor* to complete the *Contract*.

5.4.2 The *Consultant* will review the *Work* to verify the validity of the application and shall promptly, and in any event, no later than 20 calendar days after receipt of the *Contractor*'s list and application:

.1 advise the *Contractor* in writing that the *Work* or the designated portion of the *Work* is not substantially performed and give reasons why, or

.2 state the date of *Substantial Performance of the Work* or a designated portion of the *Work* in a certificate and issue a copy of that certificate to each of the *Owner* and the *Contractor*.

5.4.3 Immediately following the issuance of the certificate of *Substantial Performance of the Work*, the *Contractor*, in consultation with the *Consultant*, shall establish a reasonable date for finishing the *Work*.

GC 5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

5.5.1 After the issuance of the certificate of *Substantial Performance of the Work*, the *Contractor* shall:

.1 submit an application for payment of the holdback amount,

.2 submit CCDC 9A 'Statutory Declaration' to state that all accounts for labour, subcontracts, *Products*, *Construction Equipment*, and other indebtedness which may have been incurred by the *Contractor* in the *Substantial Performance of the Work* and for which the *Owner* might in any way be held responsible have been paid in full, except for amounts properly retained as a holdback or as an identified amount in dispute.

5.5.2 After the receipt of an application for payment from the *Contractor* and the statement as provided in paragraph 5.5.1, the *Consultant* will issue a certificate for payment of the holdback amount.

5.5.3 Where the holdback amount required by the applicable lien legislation has not been placed in a separate holdback account, the *Owner* shall, 10 calendar days prior to the expiry of the holdback period stipulated in the lien legislation applicable to the *Place of the Work*, place the holdback amount in a bank account in the joint names of the *Owner* and the *Contractor*.

5.5.4 In the common law jurisdictions, the holdback amount authorized by the certificate for payment of the holdback amount is due and payable on the first calendar day following the expiration of the holdback period stipulated in the lien legislation applicable to the *Place of the Work*. Where lien legislation does not exist or apply, the holdback amount shall be due and payable in accordance with other legislation, industry practice or provisions which may be agreed to between the parties. The *Owner* may retain out of the holdback amount any sums required by law to satisfy any liens against the *Work* or, if permitted by the lien legislation applicable to the *Place of the Work*, other third party monetary claims against the *Contractor* which are enforceable against the *Owner*.

5.5.5 In the Province of Quebec, the holdback amount authorized by the certificate for payment of the holdback amount is due and payable 30 calendar days after the issuance of the certificate. The *Owner* may retain out of the holdback amount any sums required to satisfy any legal hypothecs that have been taken, or could be taken, against the *Work* or other third party monetary claims against the *Contractor* which are enforceable against the *Owner*.

GC 5.6 PROGRESSIVE RELEASE OF HOLDBACK

5.6.1 In the common law jurisdictions, where legislation permits and where, upon application by the *Contractor*, the *Consultant* has certified that the work of a *Subcontractor* or *Supplier* has been performed prior to *Substantial Performance of the Work*, the *Owner* shall pay the *Contractor* the holdback amount retained for such subcontract work, or the *Products* supplied by such *Supplier*, on the first calendar day following the expiration of the holdback period for such work stipulated in the lien legislation applicable to the *Place of the Work*. The *Owner* may retain out of the holdback amount any sums required by law to satisfy any liens against the *Work* or, if permitted by the lien legislation applicable to the *Place of the Work*, other third party monetary claims against the *Contractor* which are enforceable against the *Owner*.

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5.6.2 In the Province of Quebec, where, upon application by the *Contractor*, the *Consultant* has certified that the work of a *Subcontractor* or *Supplier* has been performed prior to *Substantial Performance of the Work*, the *Owner* shall pay the *Contractor* the holdback amount retained for such subcontract work, or the *Products* supplied by such *Supplier*, no later than 30 calendar days after such certification by the *Consultant*. The *Owner* may retain out of the holdback amount any sums required to satisfy any legal hypothecs that have been taken, or could be taken, against the *Work* or other third party monetary claims against the *Contractor* which are enforceable against the *Owner*.

5.6.3 Notwithstanding the provisions of the preceding paragraphs, and notwithstanding the wording of such certificates, the *Contractor* shall ensure that such subcontract work or *Products* are protected pending the issuance of a final certificate for payment and be responsible for the correction of defects or work not performed regardless of whether or not such was apparent when such certificates were issued.

GC 5.7 FINAL PAYMENT

5.7.1 When the *Contractor* considers that the *Work* is completed, the *Contractor* shall submit an application for final payment.

5.7.2 The *Consultant* will, no later than 10 calendar days after the receipt of an application from the *Contractor* for final payment, review the *Work* to verify the validity of the application and advise the *Contractor* in writing that the application is valid or give reasons why it is not valid.

5.7.3 When the *Consultant* finds the *Contractor*'s application for final payment valid, the *Consultant* will promptly issue a final certificate for payment.

5.7.4 Subject to the provision of paragraph 10.4.1 of GC 10.4 - WORKERS' COMPENSATION, and any lien legislation applicable to the *Place of the Work*, the *Owner* shall, no later than 5 calendar days after the issuance of a final certificate for payment, pay the *Contractor* as provided in Article A-5 of the Agreement - PAYMENT.

GC 5.8 WITHHOLDING OF PAYMENT

5.8.1 If because of climatic or other conditions reasonably beyond the control of the *Contractor*, there are items of work that cannot be performed, payment in full for that portion of the *Work* which has been performed as certified by the *Consultant* shall not be withheld or delayed by the *Owner* on account thereof, but the *Owner* may withhold, until the remaining portion of the *Work* is finished, only such an amount that the *Consultant* determines is sufficient and reasonable to cover the cost of performing such remaining work.

GC 5.9 NON-CONFORMING WORK

5.9.1 No payment by the *Owner* under the *Contract* nor partial or entire use or occupancy of the *Work* by the *Owner* shall constitute an acceptance of any portion of the *Work* or *Products* which are not in accordance with the requirements of the *Contract Documents*.

PART 6 CHANGES IN THE WORK

GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

6.1.1 The *Owner*, through the *Consultant*, without invalidating the *Contract*, may make:

.1 changes in the *Work* consisting of additions, deletions or other revisions to the *Work* by *Change Order* or *Change Directive*, and

.2 changes to the *Contract Time* for the *Work*, or any part thereof, by *Change Order*.

6.1.2 The *Contractor* shall not perform a change in the *Work* without a *Change Order* or a *Change Directive*.

GC 6.2 CHANGE ORDER

6.2.1 When a change in the *Work* is proposed or required, the *Consultant* will provide the *Contractor* with a written description of the proposed change in the *Work*. The *Contractor* shall promptly present, in a form acceptable to the *Consultant*, a method of adjustment or an amount of adjustment for the *Contract Price*, if any, and the adjustment in the *Contract Time*, if any, for the proposed change in the *Work*.

6.2.2 When the *Owner* and *Contractor* agree to the adjustments in the *Contract Price* and *Contract Time* or to the method to be used to determine the adjustments, such agreement shall be effective immediately and shall be recorded in a *Change Order*. The value of the work performed as the result of a *Change Order* shall be included in the application for progress payment.

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GC 6.3 CHANGE DIRECTIVE

6.3.1 If the *Owner* requires the *Contractor* to proceed with a change in the *Work* prior to the *Owner* and the *Contractor* agreeing upon the corresponding adjustment in *Contract Price* and *Contract Time*, the *Owner*, through the *Consultant*, shall issue a *Change Directive*.

6.3.2 A *Change Directive* shall only be used to direct a change in the *Work* which is within the general scope of the *Contract Documents*.

6.3.3 A *Change Directive* shall not be used to direct a change in the *Contract Time* only.

6.3.4 Upon receipt of a *Change Directive*, the *Contractor* shall proceed promptly with the change in the *Work*.

6.3.5 For the purpose of valuing *Change Directives*, changes in the *Work* that are not substitutions or otherwise related to each other shall not be grouped together in the same *Change Directive*.

6.3.6 The adjustment in the *Contract Price* for a change carried out by way of a *Change Directive* shall be determined on the basis of the cost of the *Contractor*'s actual expenditures and savings attributable to the *Change Directive*, valued in accordance with paragraph 6.3.7 and as follows:

.1 If the change results in a net increase in the *Contractor*'s cost, the *Contract Price* shall be increased by the amount of the net increase in the *Contractor*'s cost, plus the *Contractor*'s percentage fee on such net increase.

.2 If the change results in a net decrease in the *Contractor*'s cost, the *Contract Price* shall be decreased by the amount of the net decrease in the *Contractor*'s cost, without adjustment for the *Contractor*'s percentage fee.

.3 The *Contractor*'s fee shall be as specified in the *Contract Documents* or as otherwise agreed by the parties.

6.3.7 The cost of performing the work attributable to the *Change Directive* shall be limited to the actual cost of the following:

.1 salaries, wages and benefits paid to personnel in the direct employ of the *Contractor* under a salary or wage schedule agreed upon by the *Owner* and the *Contractor*, or in the absence of such a schedule, actual salaries, wages and benefits paid under applicable bargaining agreement, and in the absence of a salary or wage schedule and bargaining agreement, actual salaries, wages and benefits paid by the *Contractor*, for personnel

(1) stationed at the *Contractor*'s field office, in whatever capacity employed;

(2) engaged in expediting the production or transportation of material or equipment, at shops or on the road;

(3) engaged in the preparation or review of *Shop Drawings*, fabrication drawings, and coordination drawings; or

(4) engaged in the processing of changes in the *Work*.

.2 contributions, assessments or taxes incurred for such items as employment insurance, provincial or territorial health insurance, workers' compensation, and Canada or Quebec Pension Plan, insofar as such cost is based on wages, salaries or other remuneration paid to employees of the *Contractor* and included in the cost of the *Work* as provided in paragraph 6.3.7.1;

.3 travel and subsistence expenses of the *Contractor*'s personnel described in paragraph 6.3.7.1;

.4 all *Products* including cost of transportation thereof;

.5 materials, supplies, *Construction Equipment*, *Temporary Work*, and hand tools not owned by the workers, including transportation and maintenance thereof, which are consumed in the performance of the *Work*; and cost less salvage value on such items used but not consumed, which remain the property of the *Contractor*;

.6 all tools and *Construction Equipment*, exclusive of hand tools used in the performance of the *Work*, whether rented from or provided by the *Contractor* or others, including installation, minor repairs and replacements, dismantling, removal, transportation, and delivery cost thereof;

.7 all equipment and services required for the *Contractor*'s field office;

.8 deposits lost;

.9 the amounts of all subcontracts;

.10 quality assurance such as independent inspection and testing services;

.11 charges levied by authorities having jurisdiction at the *Place of the Work*;

.12 royalties, patent licence fees and damages for infringement of patents and cost of defending suits therefor subject always to the *Contractor*'s obligations to indemnify the *Owner* as provided in paragraph 10.3.1 of GC 10.3 - PATENT FEES;

.13 any adjustment in premiums for all bonds and insurance which the *Contractor* is required, by the *Contract Documents*, to purchase and maintain;

.14 any adjustment in taxes, other than *Value Added Taxes*, and duties for which the *Contractor* is liable;

.15 charges for long distance telephone and facsimile communications, courier services, expressage, and petty cash items incurred in relation to the performance of the *Work*;

.16 removal and disposal of waste products and debris; and

.17 safety measures and requirements.

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6.3.8 Notwithstanding any other provisions contained in the General Conditions of the *Contract*, it is the intention of the parties that the cost of any item under any cost element referred to in paragraph 6.3.7 shall cover and include any and all costs or liabilities attributable to the *Change Directive* other than those which are the result of or occasioned by any failure on the part of the *Contractor* to exercise reasonable care and diligence in the *Contractor*'s attention to the *Work*. Any cost due to failure on the part of the *Contractor* to exercise reasonable care and diligence in the *Contractor*'s attention to the *Work* shall be borne by the *Contractor*.

6.3.9 The *Contractor* shall keep full and detailed accounts and records necessary for the documentation of the cost of performing the *Work* attributable to the *Change Directive* and shall provide the *Consultant* with copies thereof when requested.

6.3.10 For the purpose of valuing *Change Directives*, the *Owner* shall be afforded reasonable access to all of the *Contractor*'s pertinent documents related to the cost of performing the *Work* attributable to the *Change Directive*.

6.3.11 Pending determination of the final amount of a *Change Directive*, the undisputed value of the *Work* performed as the result of a *Change Directive* is eligible to be included in progress payments.

6.3.12 If the *Owner* and the *Contractor* do not agree on the proposed adjustment in the *Contract Time* attributable to the change in the *Work*, or the method of determining it, the adjustment shall be referred to the *Consultant* for determination.

6.3.13 When the *Owner* and the *Contractor* reach agreement on the adjustment to the *Contract Price* and to the *Contract Time*, this agreement shall be recorded in a *Change Order*.

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

6.4.1 If the *Owner* or the *Contractor* discover conditions at the *Place of the Work* which are:

.1 subsurface or otherwise concealed physical conditions which existed before the commencement of the *Work* which differ materially from those indicated in the *Contract Documents*; or

.2 physical conditions, other than conditions due to weather, that are of a nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the *Contract Documents*,

then the observing party shall give *Notice in Writing* to the other party of such conditions before they are disturbed and in no event later than 5 *Working Days* after first observance of the conditions.

6.4.2 The *Consultant* will promptly investigate such conditions and make a finding. If the finding is that the conditions differ materially and this would cause an increase or decrease in the *Contractor*'s cost or time to perform the *Work*, the *Consultant*, with the *Owner*'s approval, will issue appropriate instructions for a change in the *Work* as provided in GC 6.2 - CHANGE ORDER or GC 6.3 - CHANGE DIRECTIVE.

6.4.3 If the *Consultant* finds that the conditions at the *Place of the Work* are not materially different or that no change in the *Contract Price* or the *Contract Time* is justified, the *Consultant* will report the reasons for this finding to the *Owner* and the *Contractor* in writing.

6.4.4 If such concealed or unknown conditions relate to toxic and hazardous substances and materials, artifacts and fossils, or mould, the parties will be governed by the provisions of GC 9.2 - TOXIC AND HAZARDOUS SUBSTANCES, GC 9.3 - ARTIFACTS AND FOSSILS and GC 9.5 – MOULD.

GC 6.5 DELAYS

6.5.1 If the *Contractor* is delayed in the performance of the *Work* by an action or omission of the *Owner*, *Consultant* or anyone employed or engaged by them directly or indirectly, contrary to the provisions of the *Contract Documents*, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. The *Contractor* shall be reimbursed by the *Owner* for reasonable costs incurred by the *Contractor* as the result of such delay.

6.5.2 If the *Contractor* is delayed in the performance of the *Work* by a stop work order issued by a court or other public authority and providing that such order was not issued as the result of an act or fault of the *Contractor* or any person employed or engaged by the *Contractor* directly or indirectly, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. The *Contractor* shall be reimbursed by the *Owner* for reasonable costs incurred by the *Contractor* as the result of such delay.

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6.5.3 If the *Contractor* is delayed in the performance of the *Work* by:

.1 labour disputes, strikes, lock-outs (including lock-outs decreed or recommended for its members by a recognized contractors' association, of which the *Contractor* is a member or to which the *Contractor* is otherwise bound),

.2 fire, unusual delay by common carriers or unavoidable casualties,

.3 abnormally adverse weather conditions, or

.4 any cause beyond the *Contractor*'s control other than one resulting from a default or breach of *Contract* by the *Contractor*,

then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. The extension of time shall not be less than the time lost as the result of the event causing the delay, unless the *Contractor* agrees to a shorter extension. The *Contractor* shall not be entitled to payment for costs incurred by such delays unless such delays result from actions by the *Owner*, *Consultant* or anyone employed or engaged by them directly or indirectly.

6.5.4 No extension shall be made for delay unless *Notice in Writing* of the cause of delay is given to the *Consultant* not later than 10 *Working Days* after the commencement of the delay. In the case of a continuing cause of delay only one *Notice in Writing* shall be necessary.

6.5.5 If no schedule is made under paragraph 2.2.13 of GC 2.2 - ROLE OF THE CONSULTANT, then no request for extension shall be made because of failure of the *Consultant* to furnish instructions until 10 *Working Days* after demand for such instructions has been made.

GC 6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

6.6.1 If the *Contractor* intends to make a claim for an increase to the *Contract Price*, or if the *Owner* intends to make a claim against the *Contractor* for a credit to the *Contract Price*, the party that intends to make the claim shall give timely *Notice in Writing* of intent to claim to the other party and to the *Consultant*.

6.6.2 Upon commencement of the event or series of events giving rise to a claim, the party intending to make the claim shall:

.1 take all reasonable measures to mitigate any loss or expense which may be incurred as a result of such event or series of events, and

.2 keep such records as may be necessary to support the claim.

6.6.3 The party making the claim shall submit within a reasonable time to the *Consultant* a detailed account of the amount claimed and the grounds upon which the claim is based.

6.6.4 Where the event or series of events giving rise to the claim has a continuing effect, the detailed account submitted under paragraph 6.6.3 shall be considered to be an interim account and the party making the claim shall, at such intervals as the *Consultant* may reasonably require, submit further interim accounts giving the accumulated amount of the claim and any further grounds upon which it is based. The party making the claim shall submit a final account after the end of the effects resulting from the event or series of events.

6.6.5 The *Consultant's* findings, with respect to a claim made by either party, will be given by *Notice in Writing* to both parties within 30 *Working Days* after receipt of the claim by the *Consultant*, or within such other time period as may be agreed by the parties.

6.6.6 If such finding is not acceptable to either party, the claim shall be settled in accordance with Part 8 of the General Conditions - DISPUTE RESOLUTION.

PART 7 DEFAULT NOTICE

GC 7.1 OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT

7.1.1 If the *Contractor* is adjudged bankrupt, or makes a general assignment for the benefit of creditors because of the *Contractor*'s insolvency, or if a receiver is appointed because of the *Contractor*'s insolvency, the *Owner* may, without prejudice to any other right or remedy the *Owner* may have, terminate the *Contractor*'s right to continue with the *Work*, by giving the *Contractor* or receiver or trustee in bankruptcy *Notice in Writing* to that effect.

7.1.2 If the *Contractor* neglects to prosecute the *Work* properly or otherwise fails to comply with the requirements of the *Contract* to a substantial degree and if the *Consultant* has given a written statement to the *Owner* and *Contractor* that sufficient cause exists to justify such action, the *Owner* may, without prejudice to any other right or remedy the *Owner* may have, give the *Contractor Notice in Writing* that the *Contractor* is in default of the *Contractor*'s contractual obligations and instruct the *Contractor* to correct the default in the 5 *Working Days* immediately following the receipt of such *Notice in Writing*.

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7.1.3 If the default cannot be corrected in the 5 *Working Days* specified or in such other time period as may be subsequently agreed in writing by the parties, the *Contractor* shall be in compliance with the *Owner*'s instructions if the *Contractor*:
.1 commences the correction of the default within the specified time, and
.2 provides the *Owner* with an acceptable schedule for such correction, and
.3 corrects the default in accordance with the *Contract* terms and with such schedule.

7.1.4 If the *Contractor* fails to correct the default in the time specified or in such other time period as may be subsequently agreed in writing by the parties, without prejudice to any other right or remedy the *Owner* may have, the *Owner* may:
.1 correct such default and deduct the cost thereof from any payment then or thereafter due the *Contractor* provided the *Consultant* has certified such cost to the *Owner* and the *Contractor*, or
.2 terminate the *Contractor*'s right to continue with the *Work* in whole or in part or terminate the *Contract*.

7.1.5 If the *Owner* terminates the *Contractor*'s right to continue with the *Work* as provided in paragraphs 7.1.1 and 7.1.4, the *Owner* shall be entitled to:
.1 take possession of the *Work* and *Products* at the *Place of the Work*; subject to the rights of third parties, utilize the *Construction Equipment* at the *Place of the Work*; finish the *Work* by whatever method the *Owner* may consider expedient, but without undue delay or expense, and
.2 withhold further payment to the *Contractor* until a final certificate for payment is issued, and
.3 charge the *Contractor* the amount by which the full cost of finishing the *Work* as certified by the *Consultant*, including compensation to the *Consultant* for the *Consultant*'s additional services and a reasonable allowance as determined by the *Consultant* to cover the cost of corrections to work performed by the *Contractor* that may be required under GC 12.3 - WARRANTY, exceeds the unpaid balance of the *Contract Price*; however, if such cost of finishing the *Work* is less than the unpaid balance of the *Contract Price*, the *Owner* shall pay the *Contractor* the difference, and
.4 on expiry of the warranty period, charge the *Contractor* the amount by which the cost of corrections to the *Contractor*'s work under GC 12.3 - WARRANTY exceeds the allowance provided for such corrections, or if the cost of such corrections is less than the allowance, pay the *Contractor* the difference.

7.1.6 The *Contractor*'s obligation under the *Contract* as to quality, correction and warranty of the work performed by the *Contractor* up to the time of termination shall continue after such termination of the *Contract*.

GC 7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT

7.2.1 If the *Owner* is adjudged bankrupt, or makes a general assignment for the benefit of creditors because of the *Owner*'s insolvency, or if a receiver is appointed because of the *Owner*'s insolvency, the *Contractor* may, without prejudice to any other right or remedy the *Contractor* may have, terminate the *Contract* by giving the *Owner* or receiver or trustee in bankruptcy *Notice in Writing* to that effect.

7.2.2 If the *Work* is suspended or otherwise delayed for a period of 20 *Working Days* or more under an order of a court or other public authority and providing that such order was not issued as the result of an act or fault of the *Contractor* or of anyone directly or indirectly employed or engaged by the *Contractor*, the *Contractor* may, without prejudice to any other right or remedy the *Contractor* may have, terminate the *Contract* by giving the *Owner Notice in Writing* to that effect.

7.2.3 The *Contractor* may give *Notice in Writing* to the *Owner*, with a copy to the *Consultant*, that the *Owner* is in default of the *Owner*'s contractual obligations if:
.1 the *Owner* fails to furnish, when so requested by the *Contractor*, reasonable evidence that financial arrangements have been made to fulfill the *Owner*'s obligations under the *Contract*, or
.2 the *Consultant* fails to issue a certificate as provided in GC 5.3 - PROGRESS PAYMENT, or
.3 the *Owner* fails to pay the *Contractor* when due the amounts certified by the *Consultant* or awarded by arbitration or court, or
.4 the *Owner* violates the requirements of the *Contract* to a substantial degree and the *Consultant*, except for GC 5.1 - FINANCING INFORMATION REQUIRED OF THE OWNER, confirms by written statement to the *Contractor* that sufficient cause exists.

7.2.4 The *Contractor*'s *Notice in Writing* to the *Owner* provided under paragraph 7.2.3 shall advise that if the default is not corrected within 5 *Working Days* following the receipt of the *Notice in Writing*, the *Contractor* may, without prejudice to any other right or remedy the *Contractor* may have, suspend the *Work* or terminate the *Contract*.

7.2.5 If the *Contractor* terminates the *Contract* under the conditions set out above, the *Contractor* shall be entitled to be paid for all work performed including reasonable profit, for loss sustained upon *Products* and *Construction Equipment*, and such other damages as the *Contractor* may have sustained as a result of the termination of the *Contract*.

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PART 8 DISPUTE RESOLUTION

GC 8.1 AUTHORITY OF THE CONSULTANT

8.1.1 Differences between the parties to the *Contract* as to the interpretation, application or administration of the *Contract* or any failure to agree where agreement between the parties is called for, herein collectively called disputes, which are not resolved in the first instance by findings of the *Consultant* as provided in GC 2.2 - ROLE OF THE CONSULTANT, shall be settled in accordance with the requirements of Part 8 of the General Conditions - DISPUTE RESOLUTION.

8.1.2 If a dispute arises under the *Contract* in respect of a matter in which the *Consultant* has no authority under the *Contract* to make a finding, the procedures set out in paragraph 8.1.3 and paragraphs 8.2.3 to 8.2.8 of GC 8.2 - NEGOTIATION, MEDIATION AND ARBITRATION, and in GC 8.3 - RETENTION OF RIGHTS apply to that dispute with the necessary changes to detail as may be required.

8.1.3 If a dispute is not resolved promptly, the *Consultant* will give such instructions as in the *Consultant*'s opinion are necessary for the proper performance of the *Work* and to prevent delays pending settlement of the dispute. The parties shall act immediately according to such instructions, it being understood that by so doing neither party will jeopardize any claim the party may have. If it is subsequently determined that such instructions were in error or at variance with the *Contract Documents*, the *Owner* shall pay the *Contractor* costs incurred by the *Contractor* in carrying out such instructions which the *Contractor* was required to do beyond what the *Contract Documents* correctly understood and interpreted would have required, including costs resulting from interruption of the *Work*.

GC 8.2 NEGOTIATION, MEDIATION AND ARBITRATION

8.2.1 In accordance with the Rules for Mediation of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing, the parties shall appoint a Project Mediator

.1 within 20 *Working Days* after the *Contract* was awarded, or

.2 if the parties neglected to make an appointment within the 20 *Working Days*, within 10 *Working Days* after either party by *Notice in Writing* requests that the Project Mediator be appointed.

8.2.2 A party shall be conclusively deemed to have accepted a finding of the *Consultant* under GC 2.2 - ROLE OF THE CONSULTANT and to have expressly waived and released the other party from any claims in respect of the particular matter dealt with in that finding unless, within 15 *Working Days* after receipt of that finding, the party sends a *Notice in Writing* of dispute to the other party and to the *Consultant*, which contains the particulars of the matter in dispute and the relevant provisions of the *Contract Documents*. The responding party shall send a *Notice in Writing* of reply to the dispute within 10 *Working Days* after receipt of such *Notice in Writing* setting out particulars of this response and any relevant provisions of the *Contract Documents*.

8.2.3 The parties shall make all reasonable efforts to resolve their dispute by amicable negotiations and agree to provide, without prejudice, frank, candid and timely disclosure of relevant facts, information and documents to facilitate these negotiations.

8.2.4 After a period of 10 *Working Days* following receipt of a responding party's *Notice in Writing* of reply under paragraph 8.2.2, the parties shall request the Project Mediator to assist the parties to reach agreement on any unresolved dispute. The mediated negotiations shall be conducted in accordance with the Rules for Mediation of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing.

8.2.5 If the dispute has not been resolved within 10 *Working Days* after the Project Mediator was requested under paragraph 8.2.4 or within such further period agreed by the parties, the Project Mediator shall terminate the mediated negotiations by giving *Notice in Writing* to the *Owner*, the *Contractor* and the *Consultant*.

8.2.6 By giving a *Notice in Writing* to the other party and the *Consultant*, not later than 10 *Working Days* after the date of termination of the mediated negotiations under paragraph 8.2.5, either party may refer the dispute to be finally resolved by arbitration under the Rules for Arbitration of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing. The arbitration shall be conducted in the jurisdiction of the *Place of the Work*.

8.2.7 On expiration of the 10 *Working Days*, the arbitration agreement under paragraph 8.2.6 is not binding on the parties and, if a *Notice in Writing* is not given under paragraph 8.2.6 within the required time, the parties may refer the unresolved dispute to the courts or to any other form of dispute resolution, including arbitration, which they have agreed to use.

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8.2.8 If neither party, by *Notice in Writing*, given within 10 *Working Days* of the date of *Notice in Writing* requesting arbitration in paragraph 8.2.6, requires that a dispute be arbitrated immediately, all disputes referred to arbitration as provided in paragraph 8.2.6 shall be

.1 held in abeyance until
(1) *Substantial Performance of the Work*,
(2) the *Contract* has been terminated, or
(3) the *Contractor* has abandoned the *Work*,
whichever is earlier; and

.2 consolidated into a single arbitration under the rules governing the arbitration under paragraph 8.2.6.

GC 8.3 RETENTION OF RIGHTS

8.3.1 It is agreed that no act by either party shall be construed as a renunciation or waiver of any rights or recourses, provided the party has given the *Notice in Writing* required under Part 8 of the General Conditions - DISPUTE RESOLUTION and has carried out the instructions as provided in paragraph 8.1.3 of GC 8.1 – AUTHORITY OF THE CONSULTANT.

8.3.2 Nothing in Part 8 of the General Conditions - DISPUTE RESOLUTION shall be construed in any way to limit a party from asserting any statutory right to a lien under applicable lien legislation of the jurisdiction of the *Place of the Work* and the assertion of such right by initiating judicial proceedings is not to be construed as a waiver of any right that party may have under paragraph 8.2.6 of GC 8.2 – NEGOTIATION, MEDIATION AND ARBITRATION to proceed by way of arbitration to adjudicate the merits of the claim upon which such a lien is based.

PART 9 PROTECTION OF PERSONS AND PROPERTY

GC 9.1 PROTECTION OF WORK AND PROPERTY

9.1.1 The *Contractor* shall protect the *Work* and the *Owner*'s property and property adjacent to the *Place of the Work* from damage which may arise as the result of the *Contractor*'s operations under the *Contract*, and shall be responsible for such damage, except damage which occurs as the result of:

.1 errors in the *Contract Documents*;

.2 acts or omissions by the *Owner*, the *Consultant*, other contractors, their agents and employees.

9.1.2 Before commencing any work, the *Contractor* shall determine the location of all underground utilities and structures indicated in the *Contract Documents* or that are reasonably apparent in an inspection of the *Place of the Work*.

9.1.3 Should the *Contractor* in the performance of the *Contract* damage the *Work*, the *Owner*'s property or property adjacent to the *Place of the Work*, the *Contractor* shall be responsible for making good such damage at the *Contractor*'s expense.

9.1.4 Should damage occur to the *Work* or *Owner*'s property for which the *Contractor* is not responsible, as provided in paragraph 9.1.1, the *Contractor* shall make good such damage to the *Work* and, if the *Owner* so directs, to the *Owner*'s property. The *Contract Price* and *Contract Time* shall be adjusted as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 - CHANGE ORDER and GC 6.3 - CHANGE DIRECTIVE.

GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

9.2.1 For the purposes of applicable legislation related to toxic and hazardous substances, the *Owner* shall be deemed to have control and management of the *Place of the Work* with respect to existing conditions.

9.2.2 Prior to the *Contractor* commencing the *Work*, the *Owner* shall,

.1 take all reasonable steps to determine whether any toxic or hazardous substances are present at the *Place of the Work*, and

.2 provide the *Consultant* and the *Contractor* with a written list of any such substances that are known to exist and their locations.

9.2.3 The *Owner* shall take all reasonable steps to ensure that no person's exposure to any toxic or hazardous substances exceeds the time weighted levels prescribed by applicable legislation at the *Place of the Work* and that no property is damaged or destroyed as a result of exposure to, or the presence of, toxic or hazardous substances which were at the *Place of the Work* prior to the *Contractor* commencing the *Work*.

9.2.4 Unless the *Contract* expressly provides otherwise, the *Owner* shall be responsible for taking all necessary steps, in accordance with applicable legislation in force at the *Place of the Work*, to dispose of, store or otherwise render harmless toxic or hazardous substances which were present at the *Place of the Work* prior to the *Contractor* commencing the *Work*.

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9.2.5 If the *Contractor*

.1 encounters toxic or hazardous substances at the *Place of the Work*, or

.2 has reasonable grounds to believe that toxic or hazardous substances are present at the *Place of the Work*,

which were not brought to the *Place of the Work* by the *Contractor* or anyone for whom the *Contractor* is responsible and which were not disclosed by the *Owner* or which were disclosed but have not been dealt with as required under paragraph 9.2.4, the *Contractor* shall

.3 take all reasonable steps, including stopping the *Work*, to ensure that no person's exposure to any toxic or hazardous substances exceeds any applicable time weighted levels prescribed by applicable legislation at the *Place of the Work*, and

.4 immediately report the circumstances to the *Consultant* and the *Owner* in writing.

9.2.6 If the *Owner* and *Contractor* do not agree on the existence, significance of, or whether the toxic or hazardous substances were brought onto the *Place of the Work* by the *Contractor* or anyone for whom the *Contractor* is responsible, the *Owner* shall retain and pay for an independent qualified expert to investigate and determine such matters. The expert's report shall be delivered to the *Owner* and the *Contractor*.

9.2.7 If the *Owner* and *Contractor* agree or if the expert referred to in paragraph 9.2.6 determines that the toxic or hazardous substances were not brought onto the place of the *Work* by the *Contractor* or anyone for whom the *Contractor* is responsible, the *Owner* shall promptly at the *Owner's* own expense:

.1 take all steps as required under paragraph 9.2.4;

.2 reimburse the *Contractor* for the costs of all steps taken pursuant to paragraph 9.2.5;

.3 extend the *Contract* time for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor* and the expert referred to in 9.2.6 and reimburse the *Contractor* for reasonable costs incurred as a result of the delay; and

.4 indemnify the *Contractor* as required by GC 12.1 - INDEMNIFICATION.

9.2.8 If the *Owner* and *Contractor* agree or if the expert referred to in paragraph 9.2.6 determines that the toxic or hazardous substances were brought onto the place of the *Work* by the *Contractor* or anyone for whom the *Contractor* is responsible, the *Contractor* shall promptly at the *Contractor's* own expense:

.1 take all necessary steps, in accordance with applicable legislation in force at the *Place of the Work*, to safely remove and dispose the toxic or hazardous substances;

.2 make good any damage to the *Work*, the *Owner*'s property or property adjacent to the place of the *Work* as provided in paragraph 9.1.3 of GC 9.1 – PROTECTION OF WORK AND PROPERTY;

.3 reimburse the *Owner* for reasonable costs incurred under paragraph 9.2.6; and

.4 indemnify the Owner as required by GC 12.1 - INDEMNIFICATION.

9.2.9 If either party does not accept the expert's findings under paragraph 9.2.6, the disagreement shall be settled in accordance with Part 8 of the General Conditions - Dispute Resolution. If such disagreement is not resolved promptly, the parties shall act immediately in accordance with the expert's determination and take the steps required by paragraph 9.2.7 or 9.2.8 it being understood that by so doing, neither party will jeopardize any claim that party may have to be reimbursed as provided by GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES.

GC 9.3 ARTIFACTS AND FOSSILS

9.3.1 Fossils, coins, articles of value or antiquity, structures and other remains or things of scientific or historic interest discovered at the *Place or Work* shall, as between the *Owner* and the *Contractor*, be deemed to be the absolute property of the *Owner*.

9.3.2 The *Contractor* shall take all reasonable precautions to prevent removal or damage to discoveries as identified in paragraph 9.3.1, and shall advise the *Consultant* upon discovery of such items.

9.3.3 The *Consultant* will investigate the impact on the *Work* of the discoveries identified in paragraph 9.3.1. If conditions are found that would cause an increase or decrease in the *Contractor's* cost or time to perform the *Work*, the *Consultant*, with the *Owner's* approval, will issue appropriate instructions for a change in the *Work* as provided in GC 6.2 - CHANGE ORDER or GC 6.3 CHANGE DIRECTIVE.

GC 9.4 CONSTRUCTION SAFETY

9.4.1 Subject to paragraph 3.2.2.2 of GC 3.2 - CONSTRUCTION BY OWNER OR OTHER CONTRACTORS, the *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance with the rules, regulations and practices required by the applicable construction health and safety legislation and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the *Work*.

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GC 9.5 MOULD

9.5.1 If the *Contractor* or *Owner* observes or reasonably suspects the presence of mould at the *Place of the Work*, the remediation of which is not expressly part of the *Work*,

.1 the observing party shall promptly report the circumstances to the other party in writing, and

.2 the *Contractor* shall promptly take all reasonable steps, including stopping the *Work* if necessary, to ensure that no person suffers injury, sickness or death and that no property is damaged as a result of exposure to or the presence of the mould, and

.3 if the *Owner* and *Contractor* do not agree on the existence, significance or cause of the mould or as to what steps need be taken to deal with it, the *Owner* shall retain and pay for an independent qualified expert to investigate and determine such matters. The expert's report shall be delivered to the *Owner* and *Contractor*.

9.5.2 If the *Owner* and *Contractor* agree, or if the expert referred to in paragraph 9.5.1.3 determines that the presence of mould was caused by the *Contractor*'s operations under the *Contract*, the *Contractor* shall promptly, at the *Contractor*'s own expense:

.1 take all reasonable and necessary steps to safely remediate or dispose of the mould, and

.2 make good any damage to the *Work*, the *Owner*'s property or property adjacent to the *Place of the Work* as provided in paragraph 9.1.3 of GC 9.1 - PROTECTION OF WORK AND PROPERTY, and

.3 reimburse the *Owner* for reasonable costs incurred under paragraph 9.5.1.3, and

.4 indemnify the *Owner* as required by GC 12.1 - INDEMNIFICATION.

9.5.3 If the *Owner* and *Contractor* agree, or if the expert referred to in paragraph 9.5.1.3 determines that the presence of mould was not caused by the *Contractor*'s operations under the *Contract*, the *Owner* shall promptly, at the *Owner*'s own expense:

.1 take all reasonable and necessary steps to safely remediate or dispose of the mould, and

.2 reimburse the *Contractor* for the cost of taking the steps under paragraph 9.5.1.2 and making good any damage to the *Work* as provided in paragraph 9.1.4 of GC 9.1 - PROTECTION OF WORK AND PROPERTY, and

.3 extend the *Contract Time* for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor* and the expert referred to in paragraph 9.5.1.3 and reimburse the *Contractor* for reasonable costs incurred as a result of the delay, and

.4 indemnify the *Contractor* as required by GC 12.1 - INDEMNIFICATION.

9.5.4 If either party does not accept the expert's finding under paragraph 9.5.1.3, the disagreement shall be settled in accordance with Part 8 of the General Conditions - DISPUTE RESOLUTION. If such desagreement is not resolved promptly, the parties shall act immediately in accordance with the expert's determination and take the steps required by paragraphs 9.5.2 or 9.5.3, it being understood that by so doing neither party will jeopardize any claim the party may have to be reimbursed as provided by GC 9.5 - MOULD.

PART 10 GOVERNING REGULATIONS

GC 10.1 TAXES AND DUTIES

10.1.1 The *Contract Price* shall include all taxes and customs duties in effect at the time of the bid closing except for *Value Added Taxes* payable by the *Owner* to the *Contractor* as stipulated in Article A-4 of the Agreement - CONTRACT PRICE.

10.1.2 Any increase or decrease in costs to the *Contractor* due to changes in such included taxes and duties after the time of the bid closing shall increase or decrease the *Contract Price* accordingly.

GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

10.2.1 The laws of the *Place of the Work* shall govern the *Work*.

10.2.2 The *Owner* shall obtain and pay for development approvals, building permit, permanent easements, rights of servitude, and all other necessary approvals and permits, except for the permits and fees referred to in paragraph 10.2.3 or for which the *Contract Documents* specify as the responsibility of the *Contractor*.

10.2.3 The *Contractor* shall be responsible for the procurement of permits, licences, inspections, and certificates, which are necessary for the performance of the *Work* and customarily obtained by contractors in the jurisdiction of the *Place of the Work* after the issuance of the building permit. The *Contract Price* includes the cost of these permits, licences, inspections, and certificates, and their procurement.

10.2.4 The *Contractor* shall give the required notices and comply with the laws, ordinances, rules, regulations, or codes which are or become in force during the performance of the *Work* and which relate to the *Work*, to the preservation of the public health, and to construction safety.

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10.2.5 The *Contractor* shall not be responsible for verifying that the *Contract Documents* are in compliance with the applicable laws, ordinances, rules, regulations, or codes relating to the *Work*. If the *Contract Documents* are at variance therewith, or if, subsequent to the time of bid closing, changes are made to the applicable laws, ordinances, rules, regulations, or codes which require modification to the *Contract Documents*, the *Contractor* shall advise the *Consultant* in writing requesting direction immediately upon such variance or change becoming known. The *Consultant* will make the changes required to the *Contract Documents* as provided in GC 6.1 - OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 - CHANGE ORDER and GC 6.3 - CHANGE DIRECTIVE.

10.2.6 If the *Contractor* fails to advise the *Consultant* in writing; and fails to obtain direction as required in paragraph 10.2.5; and performs work knowing it to be contrary to any laws, ordinances, rules, regulations, or codes; the *Contractor* shall be responsible for and shall correct the violations thereof; and shall bear the costs, expenses and damages attributable to the failure to comply with the provisions of such laws, ordinances, rules, regulations, or codes.

10.2.7 If, subsequent to the time of bid closing, changes are made to applicable laws, ordinances, rules, regulations, or codes of authorities having jurisdiction which affect the cost of the *Work*, either party may submit a claim in accordance with the requirements of GC 6.6 – CLAIMS FOR A CHANGE IN CONTRACT PRICE.

GC 10.3 PATENT FEES

10.3.1 The *Contractor* shall pay the royalties and patent licence fees required for the performance of the *Contract*. The *Contractor* shall hold the *Owner* harmless from and against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of the *Contractor*'s performance of the *Contract* which are attributable to an infringement or an alleged infringement of a patent of invention by the *Contractor* or anyone for whose acts the *Contractor* may be liable.

10.3.2 The *Owner* shall hold the *Contractor* harmless against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of the *Contractor*'s performance of the *Contract* which are attributable to an infringement or an alleged infringement of a patent of invention in executing anything for the purpose of the *Contract*, the model, plan or design of which was supplied to the *Contractor* as part of the *Contract Documents*.

GC 10.4 WORKERS' COMPENSATION

10.4.1 Prior to commencing the *Work*, again with the *Contractor*'s application for payment of the holdback amount following *Substantial Performance of the Work* and again with the *Contractor*'s application for final payment, the *Contractor* shall provide evidence of compliance with workers' compensation legislation at the *Place of the Work*, including payments due thereunder.

10.4.2 At any time during the term of the *Contract*, when requested by the *Owner*, the *Contractor* shall provide such evidence of compliance by the *Contractor* and *Subcontractors*.

PART 11 INSURANCE AND CONTRACT SECURITY

GC 11.1 INSURANCE

11.1.1 Without restricting the generality of GC 12.1 - INDEMNIFICATION, the *Contractor* shall provide, maintain and pay for the following insurance coverages, the minimum requirements of which are specified in CCDC 41 – CCDC Insurance Requirements in effect at the time of bid closing except as hereinafter provided:

.1 General liability insurance in the name of the *Contractor* and include, or in the case of a single, blanket policy, be endorsed to name, the *Owner* and the *Consultant* as insureds but only with respect to liability, other than legal liability arising out of their sole negligence, arising out of the operations of the *Contractor* with regard to the *Work*. General liability insurance shall be maintained from the date of commencement of the *Work* until one year from the date of *Substantial Performance of the Work*. Liability coverage shall be provided for completed operations hazards from the date of *Substantial Performance of the Work*, as set out in the certificate of *Substantial Performance of the Work*, on an ongoing basis for a period of 6 years following *Substantial Performance of the Work*.

.2 Automobile Liability Insurance from the date of commencement of the *Work* until one year after the date of *Substantial Performance of the Work*.

.3 Aircraft or Watercraft Liability Insurance when owned or non-owned aircraft or watercraft are used directly or indirectly in the performance of the *Work*

.4 "Broad form" property insurance in the joint names of the *Contractor*, the *Owner* and the *Consultant*. The policy shall include as insureds all *Subcontractors*. The "Broad form" property insurance shall be provided from the date of commencement of the *Work* until the earliest of:

(1) 10 calendar days after the date of *Substantial Performance of the Work*;

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(2) on the commencement of use or occupancy of any part or section of the *Work* unless such use or occupancy is for construction purposes, habitational, office, banking, convenience store under 465 square metres in area, or parking purposes, or for the installation, testing and commissioning of equipment forming part of the *Work*;

(3) when left unattended for more than 30 consecutive calendar days or when construction activity has ceased for more than 30 consecutive calendar days.

.5 Boiler and machinery insurance in the joint names of the *Contractor*, the *Owner* and the *Consultant*. The policy shall include as insureds all *Subcontractors*. The coverage shall be maintained continuously from commencement of use or operation of the boiler and machinery objects insured by the policy and until 10 calendar days after the date of *Substantial Performance of the Work*.

.6 The "Broad form" property and boiler and machinery policies shall provide that, in the case of a loss or damage, payment shall be made to the *Owner* and the *Contractor* as their respective interests may appear. In the event of loss or damage:

(1) the *Contractor* shall act on behalf of the *Owner* for the purpose of adjusting the amount of such loss or damage payment with the insurers. When the extent of the loss or damage is determined, the *Contractor* shall proceed to restore the *Work*. Loss or damage shall not affect the rights and obligations of either party under the *Contract* except that the *Contractor* shall be entitled to such reasonable extension of *Contract Time* relative to the extent of the loss or damage as the *Consultant* may recommend in consultation with the *Contractor*;

(2) the *Contractor* shall be entitled to receive from the *Owner*, in addition to the amount due under the *Contract*, the amount which the *Owner*'s interest in restoration of the *Work* has been appraised, such amount to be paid as the restoration of the *Work* proceeds in accordance with the progress payment provisions. In addition the *Contractor* shall be entitled to receive from the payments made by the insurer the amount of the *Contractor*'s interest in the restoration of the *Work*; and

(3) to the *Work* arising from the work of the *Owner*, the *Owner*'s own forces or another contractor, the *Owner* shall, in accordance with the *Owner*'s obligations under the provisions relating to construction by *Owner* or other contractors, pay the *Contractor* the cost of restoring the *Work* as the restoration of the *Work* proceeds and as in accordance with the progress payment provisions.

.7 Contractors' Equipment Insurance from the date of commencement of the *Work* until one year after the date of *Substantial Performance of the Work*.

11.1.2 Prior to commencement of the *Work* and upon the placement, renewal, amendment, or extension of all or any part of the insurance, the *Contractor* shall promptly provide the *Owner* with confirmation of coverage and, if required, a certified true copy of the policies certified by an authorized representative of the insurer together with copies of any amending endorsements applicable to the *Work*.

11.1.3 The parties shall pay their share of the deductible amounts in direct proportion to their responsibility in regards to any loss for which the above policies are required to pay, except where such amounts may be excluded by the terms of the *Contract*.

11.1.4 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 *Consultant*. The *Contractor* shall pay the cost thereof to the *Owner* on demand or the *Owner* may deduct the cost from the amount which is due or may become due to the *Contractor*.

11.1.5 All required insurance policies shall be with insurers licensed to underwrite insurance in the jurisdiction of the *Place of the Work*.

11.1.6 If a revised version of CCDC 41 – INSURANCE REQUIREMENTS is published, which specifies reduced insurance requirements, the parties shall address such reduction, prior to the *Contractor*'s insurance policy becoming due for renewal, and record any agreement in a *Change Order*.

11.1.7 If a revised version of CCDC 41 – INSURANCE REQUIREMENTS is published, which specifies increased insurance requirements, the *Owner* may request the increased coverage from the Contractor by way of a *Change Order*.

11.1.8 A *Change Directive* shall not be used to direct a change in the insurance requirements in response to the revision of CCDC 41 – INSURANCE REQUIREMENTS.

GC 11.2 CONTRACT SECURITY

11.2.1 The *Contractor* shall, prior to commencement of the *Work* or within the specified time, provide to the *Owner* any *Contract* security specified in the *Contract Documents*.

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11.2.2 If the *Contract Documents* require surety bonds to be provided, such bonds shall be issued by a duly licensed surety company authorized to transact the business of suretyship in the province or territory of the *Place of the Work* and shall be maintained in good standing until the fulfillment of the *Contract*. The form of such bonds shall be in accordance with the latest edition of the CCDC approved bond forms.

PART 12 INDEMNIFICATION, WAIVER OF CLAIMS AND WARRANTY

GC 12.1 INDEMNIFICATION

12.1.1 Without restricting the parties' obligation to indemnify as described in paragraphs 12.1.4 and 12.1.5, the *Owner* and the *Contractor* shall each indemnify and hold harmless the other from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings whether in respect to losses suffered by them or in respect to claims by third parties that arise out of, or are attributable in any respect to their involvement as parties to this *Contract*, provided such claims are:

.1 caused by:

(1) the negligent acts or omissions of the party from whom indemnification is sought or anyone for whose acts or omissions that party is liable, or

(2) a failure of the party to the *Contract* from whom indemnification is sought to fulfill its terms or conditions; and

.2 made by *Notice in Writing* within a period of 6 years from the date of *Substantial Performance of the Work* as set out in the certificate of *Substantial Performance of the Work* issued pursuant to paragraph 5.4.2.2 of GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK or within such shorter period as may be prescribed by any limitation statute of the province or territory of the *Place of the Work*.

The parties expressly waive the right to indemnity for claims other than those provided for in this *Contract*.

12.1.2 The obligation of either party to indemnify as set forth in paragraph 12.1.1 shall be limited as follows:

.1 In respect to losses suffered by the *Owner* and the *Contractor* for which insurance is to be provided by either party pursuant to GC 11.1 – INSURANCE, the general liability insurance limit for one occurrence as referred to in CCDC 41 in effect at the time of bid closing.

.2 In respect to losses suffered by the *Owner* and the *Contractor* for which insurance is not required to be provided by either party in accordance with GC 11.1 – INSURANCE, the greater of the *Contract Price* as recorded in Article A-4 – CONTRACT PRICE or $2,000,000, but in no event shall the sum be greater than $20,000,000.

.3 In respect to claims by third parties for direct loss resulting from bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, the obligation to indemnify is without limit. In respect to all other claims for indemnity as a result of claims advanced by third parties, the limits of indemnity set forth in paragraphs 12.1.2.1 and 12.1.2.2 shall apply.

12.1.3 The obligation of either party to indemnify the other as set forth in paragraphs 12.1.1 and 12.1.2 shall be inclusive of interest and all legal costs.

12.1.4 The *Owner* and the *Contractor* shall indemnify and hold harmless the other from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of their obligations described in GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES.

12.1.5 The *Owner* shall indemnify and hold harmless the *Contractor* from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings:

.1 as described in paragraph 10.3.2 of GC 10.3 – PATENT FEES, and

.2 arising out of the *Contractor*'s performance of the *Contract* which are attributable to a lack of or defect in title or an alleged lack of or defect in title to the *Place of the Work*.

12.1.6 In respect to any claim for indemnity or to be held harmless by the *Owner* or the *Contractor*:

.1 *Notice in Writing* of such claim shall be given within a reasonable time after the facts upon which such claim is based became known;

.2 should any party be required as a result of its obligation to indemnify another to pay or satisfy a final order, judgment or award made against the party entitled by this contract to be indemnified, then the indemnifying party upon assuming all liability for any costs that might result shall have the right to appeal in the name of the party against whom such final order or judgment has been made until such rights of appeal have been exhausted.

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GC 12.2 WAIVER OF CLAIMS

12.2.1 Subject to any lien legislation applicable to the *Place of the Work*, as of the fifth calendar day before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work*, the *Contractor* waives and releases the *Owner* from all claims which the *Contractor* has or reasonably ought to have knowledge of that could be advanced by the *Contractor* against the *Owner* arising from the *Contractor*'s involvement in the *Work*, including, without limitation, those arising from negligence or breach of contract in respect to which the cause of action is based upon acts or omissions which occurred prior to or on the date of *Substantial Performance of the Work*, except as follows:

.1 claims arising prior to or on the date of *Substantial Performance of the Work* for which *Notice in Writing* of claim has been received by the *Owner* from the *Contractor* no later than the sixth calendar day before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work*;

.2 indemnification for claims advanced against the *Contractor* by third parties for which a right of indemnification may be asserted by the *Contractor* against the *Owner* pursuant to the provisions of this *Contract*;

.3 claims for which a right of indemnity could be asserted by the *Contractor* pursuant to the provisions of paragraphs 12.1.4 or 12.1.5 of GC 12.1 – INDEMNIFICATION; and

.4 claims resulting from acts or omissions which occur after the date of *Substantial Performance of the Work*.

12.2.2 The *Contractor* waives and releases the *Owner* from all claims referenced in paragraph 12.2.1.4 except for those referred in paragraphs 12.2.1.2 and 12.2.1.3 and claims for which *Notice in Writing* of claim has been received by the *Owner* from the *Contractor* within 395 calendar days following the date of *Substantial Performance of the Work*.

12.2.3 Subject to any lien legislation applicable to the *Place of the Work*, as of the fifth calendar day before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work*, the *Owner* waives and releases the *Contractor* from all claims which the *Owner* has or reasonably ought to have knowledge of that could be advanced by the *Owner* against the *Contractor* arising from the *Owner*'s involvement in the *Work*, including, without limitation, those arising from negligence or breach of contract in respect to which the cause of action is based upon acts or omissions which occurred prior to or on the date of *Substantial Performance of the Work*, except as follows:

.1 claims arising prior to or on the date of *Substantial Performance of the Work* for which *Notice in Writing* of claim has been received by the *Contractor* from the *Owner* no later than the sixth calendar day before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work*;

.2 indemnification for claims advanced against the *Owner* by third parties for which a right of indemnification may be asserted by the *Owner* against the *Contractor* pursuant to the provisions of this *Contract*;

.3 claims for which a right of indemnity could be asserted by the *Owner* against the *Contractor* pursuant to the provisions of paragraph 12.1.4 of GC 12.1 - INDEMNIFICATION;

.4 damages arising from the *Contractor*'s actions which result in substantial defects or deficiencies in the *Work*. "Substantial defects or deficiencies" mean those defects or deficiencies in the *Work* which affect the *Work* to such an extent or in such a manner that a significant part or the whole of the *Work* is unfit for the purpose intended by the *Contract Documents*;

.5 claims arising pursuant to GC 12.3 - WARRANTY; and

.6 claims arising from acts or omissions which occur after the date of *Substantial Performance of the Work*.

12.2.4 The *Owner* waives and releases the *Contractor* from all claims referred to in paragraph 12.2.3.4 except claims for which *Notice in Writing* of claim has been received by the *Contractor* from the *Owner* within a period of six years from the date of *Substantial Performance of the Work* should any limitation statute of the Province or Territory of the *Place of the Work* permit such agreement. If the applicable limitation statute does not permit such agreement, within such shorter period as may be prescribed by:

.1 any limitation statute of the Province or Territory of the *Place of the Work*; or

.2 if the *Place of the Work* is the Province of Quebec, then Article 2118 of the Civil Code of Quebec.

12.2.5 The *Owner* waives and releases the *Contractor* from all claims referenced in paragraph 12.2.3.6 except for those referred in paragraph 12.2.3.2, 12.2.3.3 and those arising under GC 12.3 – WARRANTY and claims for which *Notice in Writing* has been received by the *Contractor* from the *Owner* within 395 calendar days following the date of *Substantial Performance of the Work*.

12.2.6 "*Notice in Writing* of claim" as provided for in GC 12.2 – WAIVER OF CLAIMS to preserve a claim or right of action which would otherwise, by the provisions of GC 12.2 – WAIVER OF CLAIMS, be deemed to be waived, must include the following:

.1 a clear and unequivocal statement of the intention to claim;

.2 a statement as to the nature of the claim and the grounds upon which the claim is based; and

.3 a statement of the estimated quantum of the claim.

12.2.7 The party giving "*Notice in Writing* of claim" as provided for in GC 12.2 – WAIVER OF CLAIMS shall submit within a reasonable time a detailed account of the amount claimed.

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12.2.8 Where the event or series of events giving rise to a claim made under paragraphs 12.2.1 or 12.2.3 has a continuing effect, the detailed account submitted under paragraph 12.2.7 shall be considered to be an interim account and the party making the claim shall submit further interim accounts, at reasonable intervals, giving the accumulated amount of the claim and any further grounds upon which it is based. The party making the claim shall submit a final account after the end of the effects resulting from the event or series of events.

12.2.9 If a *Notice in Writing* of claim pursuant to paragraph 12.2.1.1 is received on the seventh or sixth calendar day before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work*, the period within which *Notice in Writing* of claim shall be received pursuant to paragraph 12.2.3.1 shall be extended to two calendar days before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work*.

12.2.10 If a *Notice in Writing* of claim pursuant to paragraph 12.2.3.1 is received on the seventh or sixth calendar day before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work*, the period within which *Notice in Writing* of claim shall be received pursuant to paragraph12.2.1.1 shall be extended to two calendar days before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work*.

GC 12.3 WARRANTY

12.3.1 Except for extended warranties as described in paragraph 12.3.6, the warranty period under the *Contract* is one year from the date of *Substantial Performance of the Work*.

12.3.2 The *Contractor* shall be responsible for the proper performance of the *Work* to the extent that the design and *Contract Documents* permit such performance.

12.3.3 The *Owner*, through the *Consultant*, shall promptly give the *Contractor Notice in Writing* of observed defects and deficiencies which occur during the one year warranty period.

12.3.4 Subject to paragraph 12.3.2, the *Contractor* shall correct promptly, at the *Contractor*'s expense, defects or deficiencies in the *Work* which appear prior to and during the one year warranty period.

12.3.5 The *Contractor* shall correct or pay for damage resulting from corrections made under the requirements of paragraph 12.3.4.

12.3.6 Any extended warranties required beyond the one year warranty period as described in paragraph 12.3.1, shall be as specified in the *Contract Documents*. Extended warranties shall be issued by the warrantor to the benefit of the *Owner*. The *Contractor*'s responsibility with respect to extended warranties shall be limited to obtaining any such extended warranties from the warrantor. The obligations under such extended warranties are solely the responsibilities of the warrantor.

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CANADIAN CONSTRUCTION DOCUMENTS COMMITTEE
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CCDC 41
CCDC INSURANCE REQUIREMENTS

PUBLICATION DATE: JANUARY 21, 2008

1. General liability insurance shall be with limits of not less than $5,000,000 per occurrence, an aggregate limit of not less than $5,000,000 within any policy year with respect to completed operations, and a deductible not exceeding $5,000. The insurance coverage shall not be less than the insurance provided by IBC Form 2100 (including an extension for a standard provincial and territorial form of non-owned automobile liability policy) and IBC Form 2320. To achieve the desired limit, umbrella or excess liability insurance may be used. Subject to satisfactory proof of financial capability by the *Contractor*, the *Owner* may agree to increase the deductible amounts.

2. Automobile liability insurance in respect of vehicles that are required by law to be insured under a contract by a Motor Vehicle Liability Policy, shall have limits of not less than $5,000,000 inclusive per occurrence for bodily injury, death and damage to property, covering all vehicles owned or leased by the *Contractor*. Where the policy has been issued pursuant to a government-operated automobile insurance system, the *Contractor* shall provide the *Owner* with confirmation of automobile insurance coverage for all automobiles registered in the name of the *Contractor*.

3. Aircraft and watercraft liability insurance with respect to owned or non-owned aircraft and watercraft (if used directly or indirectly in the performance of the *Work*), including use of additional premises, shall have limits of not less than $5,000,000 inclusive per occurrence for bodily injury, death and damage to property including loss of use thereof and limits of not less than $5,000,000 for aircraft passenger hazard. Such insurance shall be in a form acceptable to the *Owner*.

4. "Broad form" property insurance shall have limits of not less than the sum of 1.1 times *Contract Price* and the full value, as stated in the *Contract*, of *Products* and design services that are specified to be provided by the *Owner* for incorporation into the *Work*, with a deductible not exceeding $5,000. The insurance coverage shall not be less than the insurance provided by IBC Forms 4042 and 4047 (excluding flood and earthquake) or their equivalent replacement. Subject to satisfactory proof of financial capability by the *Contractor*, the *Owner* may agree to increase the deductible amounts.

5. Boiler and machinery insurance shall have limits of not less than the replacement value of the permanent or temporary boilers and pressure vessels, and other insurable objects forming part of the *Work*. The insurance coverage shall not be less than the insurance provided by a comprehensive boiler and machinery policy.

6. "Broad form" contractors' equipment insurance coverage covering *Construction Equipment* used by the *Contractor* for the performance of the *Work*, shall be in a form acceptable to the *Owner* and shall not allow subrogation claims by the insurer against the *Owner*. Subject to satisfactory proof of financial capability by the *Contractor* for self-insurance, the *Owner* may agree to waive the equipment insurance requirement.

7. Standard Exclusions

   7.1 In addition to the broad form property exclusions identified in IBC forms 4042(1995), and 4047(2000), the *Contractor* is not required to provide the following insurance coverage:
   - Asbestos
   - Cyber Risk
   - Mould
   - Terrorism

Association of Canadian Engineering Companies

Canadian Construction Association

Construction Specifications Canada

The Royal Architectural Institute of Canada

THE VILLAGE OF LIONS BAY

SUPPLEMENTARY GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

CCDC2-2008

For this Contract, the Owner will use the Canadian Construction Documents Committee, Standard Construction Document CCDC2 Stipulated Price Contract – 2008 for the duration of this Contract with amendments as noted in the sections below.

These Supplementary Conditions presuppose the use of the Standard Construction Document CCDC2 – 2008 Stipulated Price Contract. These "Supplementary Conditions" void, supersede or amend the applicable provisions of the standard form CCDC2 – 2008 Stipulated Price Contract "Agreement", "Definitions" and "General Conditions", as the case may be, as hereinafter provided.

ARTICLE A-1 THE WORK

Delete article A-1.3 in its entirety and replace with the following:

"1.3 commence the *Work* within the time required under GC 3.1.4, and attain *Substantial Performance* of the *Work* by December 15, 2019 and *Total Completion* of the *Work* by January 31, 2020, subject to adjustment of the *Contract Time* as provided for in the *Contract Documents*."

ARTICLE A-3 CONTRACT DOCUMENTS

Add article A-3.2 to provide as follows:

"3.2 The *Contractor* acknowledges that it has reviewed and satisfied itself as to the *Contract Documents*, including without limitation, the plans, specifications and other materials referred to in this Article, and all other materials it desires, prior to execution of this *Contract*."

Add the following new Articles:

"ARTICLE A-9 NO DUTY OF CARE"

"9.1 The *Contractor* acknowledges that the *Owner*, in the preparation of the *Contract Documents*, supply of oral or written information to *Tenderers*, review of *Tenders* or the carrying out of the *Owner's* responsibilities under the *Contract* does not owe a duty of care to the *Contractor* and the *Contractor* waives for itself and its successors the right to sue the *Owner* in tort for any loss, including economic loss, damage, cost or expense arising from or connected with any error, omission or misrepresentation occurring in the preparation of the *Contract Documents*, supply of oral or written information to *Tenderers*, review of tenders or the carrying out of the *Owner's* responsibilities under the *Contract*."

"ARTICLE A-10 TIME OF THE ESSENCE"

"10.1 All time limits stated in this *Contract* are of the essence of the *Contract*."

DEFINITIONS

The following definitions are amended:

4. Consultant

Add the following sentence:

"The words "Engineer", "Contract Administrator" or "Consultant" wherever used in the *Contract Documents* shall be regarded as synonymous."

9. Contractor

Add the following sentence:

"For the purpose of the *Contract*, the words "*Contractor*" and "*General Contractor*" shall be regarded as synonymous."

19. Subcontractor

Delete and replace with the following:

"A *Subcontractor* is a person, firm or corporation, which has been approved by the *Owner*, undertaking the execution of a part of the *Work* by virtue of an agreement with the *Contractor*."

20. Substantial Performance of the Work

Add the following sentence:

"*Substantial Performance of the Work* shall be achieved when both the following conditions are met:

- all *Work*, as certified by the *Consultant*, is capable of completion or correction at a cost of not more than:
  - i) 3% of the first $500,000 of the *Contract Price*;
  - ii) 2% of the next $500,000 of the *Contract Price*;
  - iii) 1% of the balance of the *Contract Price;* and
  - iv) the *Work* is ready for use or is being used for the purpose intended and is full commissioned and is so certified by the *Consultant*."

The following definitions are added to the Agreement:

27. Addendum

Addendum means an addition to or a change in the *Contract Documents* that is issued by the *Consultant* prior to the tender closing.

28. Base Bid Price

The *Base Bid Price* is the price stated as the sum for which the Tenderer offers to perform the *Work* and does not include *Work* for which, under the Tender Price Breakdown, an *Optional Item* was submitted.

29. Builders Lien Act

Builders Lien Act means the *Builders Lien Act*, S.B.C. 1997, c45, as amended, and all regulations thereto, and any successor legislation in the Province of British Columbia in relation to builders liens.

30. Certificate of Completion

A *Certificate of Completion* is a certificate of completion as defined in the *Builders Lien Act*.

31. Engineer's Representative

The *Engineer's Representative* means any person authorized from time to time by the *Engineer* to perform the duties of the *Engineer* whose authority shall be notified in writing to the Contractor by the *Engineer*.

32. Final Acceptance

Final Acceptance means the *Work* has successfully passed all inspections and testing requirements at the end of the warrantee period.

33. Optional Items

The *Optional Items* means *Work* which may be described in the Tender Price Breakdown that will be undertaken and included in the *Work* at the election of the *Owner*.

34. Tender Form

Tender Form means the Invitation to Tender issued by the *Owner* for the *Project* dated September 2018, including the Instructions to Tenderers and all associated forms, schedules, related documents and additional information.

35. Total Performance of the Work

Total Performance of the Work means when the entire *Work*, except those items arising from the provisions of GC 12.3 – WARRANTY, has been totally performed to the requirements of the *Contract Documents* and is so certified by the *Consultant*.

In addition to all prior requirements of the *Contract*, *Total Performance* will not occur until the *Work* has passed all inspections and testing requirements.

The words "Total Completion of the Work" and "Total Performance of the Work" wherever used in the *Contract Documents* shall be regarded as synonymous.

GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

GC 1.1 CONTRACT DOCUMENTS

Delete paragraph 1.1.7.1 in its entirety and replace it with the following:

"1.1.7.1 the order of priority of documents, from highest to lowest, shall be,
- the Agreement between the Owner and the Contractor
- the Definitions
- the Addenda
- Supplementary General Conditions of the Stipulated Price Contract
- General Conditions of the Stipulated Price Contract
- Technical Specifications
- Drawings
- Information to Tenderers
- The Tender Submission Documents per Item 1.2 in the Information to Tenderers
- Appendices, as issued
- Master Municipal Construction Documents (MMCD) – Platinum Edition"

Add new paragraphs 1.1.7.5 and 1.1.7.6 as follows:

"1.1.7.5 structural *Drawings* shall govern over mechanical and electrical *Drawings*;

1.1.7.6 subject to the above, if any specifications or *Drawings* conflict with any other specifications or *Drawings*, the more stringent shall govern."

Add new paragraph 1.1.11 as follows:

"1.1.11 The table of contents and the headings of all the articles, paragraphs, parts and sections of any of the *Contract Documents* are provided for convenience of reference only and shall not affect the construction or interpretation of the *Contract Documents*."

GC 2.4 DEFECTIVE WORK

Amend Paragraph 2.4.1 by adding ", at the *Contractor's* expense," after "*Contract Documents*".

GC 3.4 DOCUMENT REVIEW

Add new paragraph 3.4.2 as follows:

"3.4.2 Notwithstanding the foregoing, inconsistencies and omissions shall not include lack of reference on the *Drawings* or in the *Specifications* to labour and/or *Products* that are required or normally recognized within respective trade practices as being necessary for the complete execution of the *Work*."

GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT

Add GC 5.2.8 as follows:

"5.2.8 Notwithstanding any other provision of this *Agreement*, the *Contractor* agrees that it shall not submit any application for payment on account of the *Contract Price* under this GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT if following payment, the balance of the *Contract Price* would be less than the potential reduction in the *Contract Price* under Article A-4.6."

Add GC 5.2.9 as follows:

"5.2.9 Before any payment is made by the *Owner* to the *Contractor*, the *Consultant* or the *Owner* may by written notice require that the *Contractor* furnish such further detailed information as the *Consultant* or the *Owner* may determine is necessary to establish compliance by the *Contractor* with the *Contract Documents*."

GC 5.3 PROGRESS PAYMENT

Delete paragraph 5.2.7 in its entirety and replace with the following:

"5.2.7 The *Contractor* shall submit one copy of all applications for payment and all applications for payment, except the first, shall be accompanied by a form of statutory declaration approved by the *Owner* completed and sworn before a Notary Public or a Commissioner for Oaths for the Province of British Columbia, which statutory declaration must include a statement that all accounts for labour, subcontracts, *Products*, construction machinery and equipment and other indebtedness which may have been incurred by the *Contractor* in the performance of the *Work* covered by the immediately preceding progress claim, and for which the *Owner* might in any way be held responsible, have been paid in full, except holdback monies properly retained."

Add GC 5.3.2 as follows:

"5.3.2 Notwithstanding any other provision of this *Agreement*, the *Owner* shall not be obligated to make any payment on account of the *Contract Price* under this GC 5.3 PROGRESS PAYMENT if following payment, the balance of the *Contract Price* would be less than the potential reduction in the *Contract Price* under Article A-4.6."

GC 6.5 DELAYS

Add the following new paragraphs:

"6.5.6 If the *Contractor's* operations expose any items which may indicate an archaeological find, such as building remains, hardware, accumulations of bones, pottery, or arrowheads:

.1 The *Contractor* shall immediately notify the *Consultant* and suspend operations within the area identified by the *Consultant*. *Work* shall remain suspended within that area until otherwise directed by the *Consultant* in writing.

.2 Any delay in the completion date of the *Contract* that is caused by such a cessation of construction operations will be considered to be beyond the *Contractor's* control in accordance with paragraph GC 6.5.3, but will not be considered to be a delay resulting from an action of the *Owner* or the *Consultant* or anyone employed or engaged by them directly or indirectly.

.3 Any work directed or authorised by the *Consultant* with an archaeological find will be considered a change in *Work* authorized by a *Change Directive,* and GC 6.3 shall apply."

GC 9.1 PROTECTION OF WORK AND PROPERTY

Add the following new paragraphs:

"9.1.5 The *Contractor* shall be responsible generally for the care, maintenance and protection of the *Work* during construction and during any shut-down or suspension of the *Work*.

9.1.6 The *Contractor* shall ensure that all rights and privileges presently accorded to all properties adjacent to the *Place of the Work* are maintained.

9.1.7 When carrying out excavation work, the *Contractor* may encounter underground utilities such as, without limitation, sewers, gas mains, telephone cables, power cables, and water mains. The *Contractor* shall be fully responsible for any breakage or damage to such utilities, and the *Contractor* shall pay the full cost of repairing such damages and making good any losses or damages which are caused as a result of his or her operation in carrying out this *Contract*.

9.1.8 It shall be the *Contractor's* responsibility to obtain written permission and to make any required arrangements with the owners of any adjacent properties on which the *Contractor* may encroach.

9.1.9 The *Contractor* shall furnish and bear the cost of any watchman the *Contractor* may require for protection to perform this *Contract.*

9.1.10 The *Contractor* shall be responsible for and ensure security at the *Place of the Work*.

9.1.11 The *Contractor* shall, at his cost,
a) Be responsible for storing all of the materials supplied for the Work either by himself or the Owner, until it has been incorporated into the completed Work;
b) Store all materials in a manner which will prevent damage from the weather, dirt, foreign matter, vandalism and theft;
c) Replace all materials supplied by himself or the Owner which are found to be stolen, missing or damaged while under his care;
d) Replace all materials found to be defective in manufacture which have been supplied by himself."

GC 9.4 CONSTRUCTION SAFETY

Add the following new paragraph:

"9.4.2 The *Contractor* shall be responsible for and ensure the safety not only of the workers, *Subcontractors*, tradesmen and suppliers and their plant and equipment but also of all other

persons who enter the *Place of the Work* whether during working hours or not and for that purpose shall erect such fencing, boardings and signs and shall employ such safety measures as may be necessary to ensure the safety of such persons."

GC 11.1 INSURANCE

Amend paragraph 11.1.1 as follows:

Delete the words "the minimum requirements of which are specified in CCDC 41 – CCDC Insurance Requirements in effect at the time of bid closing except as hereinafter provided" in lines 2 and 3.

Delete paragraph 11.1.1.1 and replace with the following:

".1 Commercial general liability insurance in the form of a wrap-up liability insurance in the amount of not less than five million dollars ($5,000,000) per occurrence. The Owner, the Consultant and all Subcontractors involved in the performance of the Work shall be additional insureds under the commercial general liability insurance policy which shall contain a cross liability clause whereby one insured can make a claim, or bring an action, against another insured. The commercial general liability insurance shall remain in force from the commencement of the performance of the Work under the Contract, and shall include completed operations coverage effective for a period of two (2) years following issuance of the Certificate of Completion."

Delete paragraph 11.1.1.2 and replace with the following:

".2 Vehicle liability insurance in the amount of not less than $5,000,000 per occurrence from the date of commencement of the *Work* until one year after the date of issue of the *Certificate of Completion*."

Add the following to paragraph 11.1.1:

".8 Course of construction or builder's risk insurance in the amount of 100% of the *Contract Price*."

".9 Professional liability insurance in the amount of not less than $2,000,000 for any professionals that the *Contractor* may engage in performing the *Work* in this *Contract*."

Delete paragraphs 11.1.6 to 11.1.8 in their entirety and replace with the following new paragraphs:

"11.1.6 All insurance policies shall have the right of subrogation waived as against the *Owner*, the *Consultant*, their employees and agents.

11.1.7 All insurance policies shall contain provisions to the effect that thirty (30) days prior notice of cancellation will be given in writing to each insured, including the *Owner*. In the event that some or all of the insurance policies required under this *Contract* are cancelled, the *Contractor* shall promptly obtain insurance with other insurers so as to comply with the provisions of this *Contract*.

11.1.8 The *Contractor* shall ensure that its *Subcontractors* comply with all applicable insurance requirements.

11.1.9 Where the *Work* involves blasting and other activities, any exclusions of such aspects of the *Work* shall be deleted from the insurance policies."

GC 11.2 CONTRACT SECURITY

Delete paragraph 11.2.1 in its entirety and replace with the following:

"11.2.1 The *Contractor* shall, at least 7 calendar days prior to the commencement of construction, provide to the *Owner* a performance bond and a labour and material payment bond, each in the amount of 50% of the *Contract Price* covering the performance of the *Work*."

Delete paragraph 11.2.2 in its entirety and replace with the following:

"11.2.2 All bonds shall be issued by a duly licensed surety company authorized to transact a business of suretyship in British Columbia and in a form acceptable to the *Owner*, and shall be maintained in good standing until the fulfillment of the *Contract* including all warranty obligations pursuant to GC12.3 WARRANTY.

Add new PART 13 ADDITIONAL GENERAL CONDITIONS:

"PART 13 ADDITIONAL GENERAL CONDITIONS

GC 13.1 LIQUIDATED DAMAGES

13.1.1 If the *Contractor* fails to attain *Substantial Performance of the Work* on or before the date stipulated for attaining *Substantial Performance of the Work* in Article A-1.3 of Article A-1 THE WORK of the Agreement Between Owner and Contractor (the "*Substantial Performance Date"*), the *Contractor* shall pay to the *Owner* liquidated damages calculated as $1,000 for each calendar day that *Substantial Performance of the Work* extends beyond the *Substantial Performance Date.*

It is expressly agreed that it may be difficult to calculate the damages which would result from the *Contractor's* failure to attain *Substantial Performance of the Work* by the *Substantial Performance Date*, and the parties agree that the liquidated damages payable under this section 13.1.1 are not intended to be a penalty but rather represent the parties' best estimate of the damages the Owner is likely to suffer as a result of the Contractor's failure to attain *Substantial Performance of the Work* by the *Substantial Performance Date*, and the delay to the *Owner* resulting from that failure.

13.1.2 In the event that the *Consultant* reasonably determines that the *Contractor* is not progressing in accordance with the *Schedule* with the result that the *Contractor* will not achieve *Substantial Performance of the Work* by the *Substantial Performance Date*, the *Owner* may commence to hold back amounts from payments due to the *Contractor* totaling an amount sufficient to cover the *Consultant's* estimate of liquidated damages that may be payable

pursuant to paragraph 13.1.1. In the event that the *Owner* holds back more than is owed pursuant to paragraph 13.1.1, it shall forthwith pay such excess to the *Contractor*.

13.1.3 The *Owner* may deduct any amount due under this paragraph from any monies that may be due or payable to the *Contractor* on any account whatsoever. The liquidated damages payable under this paragraph are in addition to and without prejudice to any other remedy, action or other right that may be available to the *Owner* as a result of the Contractor's failure to attain *Substantial Performance of the Work* by the *Substantial Performance Date."*

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

1. GENERAL

1.1 Description of Work

.1 The Work to be performed under this Contract shall include the labour, equipment, and materials required to complete the Village of Lions Bay Harvey Tank Replacement Project, as specified in the Contract Documents.

.2 The Work includes, but is not limited to the following elements:

.1 Demolition and disposal of one above concrete potable water reservoir (Harvey Tank);

.2 Demolition and removal of electrical devices, piping and appurtenances;

.3 Upsizing an existing valve chamber.

.4 Construction of a new 2.33 ML above ground glass fused bolted steel reservoir to store potable water.

.5 Siteworks including ground improvements for structural foundations, excavating, backfilling, grading, drainage, fencing, retaining walls, site dewatering and landscaping.

.6 Installation of process mechanical piping, valves, fittings and appurtenances for interconnection of the proposed works.

.7 Electrical and instrumentation to service the new facilities and miscellaneous required to complete the Work.

1.2 Coordination

.1 Cooperate and liaise with other contractors, utility agencies, the Owner's employees or their appointed representatives in order to make appropriate working arrangements to ensure satisfactory execution and timely completion of the Work. The Contractor will not have exclusive rights to the construction area.

.2 Attend coordination meetings, as directed by the Engineer, when the Engineer considers that they are necessary for ensuring the sufficiency of the liaison and co-operation with other contractors. The Contractor shall be deemed to have allowed in his Tender Price for any interference to his operations which may result from any of the above. He must also take all precautions necessary to ensure that he does not hinder or delay in any way the progress of these other parties or cause damage to their completed work.

1.3 Sequence of Work

.1 Every effort shall be made in the scheduling of the work to ensure the Village of Lions Bay can still supply potable water to the residents. With this in mind, a specified sequence of work is proposed.

.2 Refer to Section 01 12 16 – Work Sequences and Tie-ins.

1.4 Contractor Use of Premises

.1 Generally restrict operations to the construction and laydown areas as indicated on the drawings or directed by the Engineer.

.2 The Owner will make reasonable efforts to accommodate the work of the Contractor.

.3 Obtain and pay for use of additional storage, access or work areas needed for work under this Contract.

1.5 Completion Dates

.1 The completion dates for the project are noted in Section 00 73 00. These dates will establish the Time Limits for the Contract.

.2 Time and all time limits stated in the Contract Documents are of the essence of the Contract. The Contractor shall perform his work expeditiously and with adequate forces to achieve the completion dates.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 Continuity of Potable Water Supply

.1 The Village of Lions Bay supplies water to its community through two systems: Magnesia and Harvey. While Harvey Reservoir is proposed for replacement, the Magnesia system can be used to supply potable water to the community.

.2 Magnesia Creek Water Supply and Storage Reservoir does not have sufficient capacity to supply flows for fire protection to the entire system and hence the Work has to be scheduled so that the following conditions are met:

.1 The Contractor shall maintain the Harvey Creek water supply as a viable supply of water throughout the entire project with the acceptation of planned disruption which should be short and submit to approval and input from the Village.

.2 The Oceanview tank is located near the Harvey tank and is currently not in service. The Oceanview tank is isolated from the water distribution system and kept full of non-potable water for emergency fire flow supply. The Contractor shall recommission the Oceanview tank during replacement of the Harvey tank. The Oceanview tank shall be configured to provide potable water service, chlorine contact time and storage as required to maintain an acceptable level of service and fire flow protection during construction.

.3 The Contractor must schedule all work so that there is minimum interruption of potable water supply to the community.

.4 The work sequences and tie-in procedures specified in this Section enable the Contractor to perform construction activities concurrently with Owner activities required to continue to supply potable water to the community. The Contractor may propose alternative work sequences, tie-in plans or procedures that maintain normal plant operations for review by the Engineer.

1.2 Water Service Disruption

.1 Prepare a detailed plan for any construction activity which will potentially cause a water service disruption to the residents of Lions Bay. Provide the plan at least 5 business days in advance of starting the Work to the Engineer and the Owner. The plan must include details on the construction activity, anticipated time and extent of water service disruption, temporary water supply provisions and anticipated end time of the water service disruption.

.2 Contractor must provide all equipment for temporary potable water supply to affected residents.

1.3 Work Sequence and Tie-In – General

.1 Allow a maximum of 4 hours for piping tie-ins unless specifically noted otherwise. Allow a maximum of 2 hours for capping off existing piping. Coordinate all work with the Engineer and Owner. Minimize the duration that any equipment is out of service by

pre-installation of as much piping as possible. Provide bypass piping and pumping as required if time required to complete Work exceeds time noted above.

.2 Construction Work Areas, as identified on the Plans define the general area of the Work.

1.4 Proposed Work Sequence and Tie-In Plan

.1 Construction means and methods are ultimately the responsibility of the Contractor. However, a suggested construction sequence and tie-in plan has been developed to minimize the interruption in the water supply for the Village of Lions Bay.

.2 The Contractor is responsible for the work sequence and tie-ins and all costs associated with undertaking the Work.

.3 Submit a construction sequence plan at least one week in advance of the scheduled work for approval. No work shall commence without the Engineer's review.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 General

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

.2 Payment will be made on the basis of the Lump Sum Prices in Section 00 41 01 – Tender Price Breakdown and the Unit Prices in Section 00 41 05 – Schedule of Quantities and Prices, and in accordance with the General and Supplementary General Conditions.

.3 Costs for Work and material not expressly listed in the Tender Price Breakdown, but included in the Drawings and/or Specifications by either direct mention or implication, shall be included with items to which they pertain most closely.

.4 The prices tendered for supply and installation of materials shall be full compensation of labour, materials, equipment, transportation, testing, and commissioning with all other work subsidiary and incidental thereto for which separate payment is not provided elsewhere.

.5 All payment items are inclusive of labour, material and equipment required to complete the Work.

.6 The method of measurement of the quantities for payment and the basis for payment will be in accordance with the following items of this Section. All measurements will be done by the Engineer using generally accepted methods of field survey.

.7 The items mentioned in this Section refer to the items so numbered in the Tender Price Breakdown.

.8 Descriptions contained in the payment clauses provide a general description of the tasks. They are not meant to limit the Work.

.9 Quantities stated in the Schedule of Quantities and Prices are given for the purpose of providing a uniform basis for the comparison of tenders. Payment for items listed in the Schedule will only be made on the quantities actually determined by field measurement. The Contractor agrees that he will have no basis for revising the unit prices(s) should actual quantities vary.

2. APPLICATIONS FOR PAYMENT

.1 Refer to Part 5 Payment – General Conditions (CCDC 2), and Section 00 73 00 – Supplementary General Conditions.

.2 The Contractor shall use standard forms for submission of progress claims in the format agreed prior to the end of each month of Work.

.3 Show previous amount claimed and the amount claimed for the period ending. Show percentage of Work completed to date and holdback retained.

3. CHANGES IN THE WORK

.1 Refer to Part 6 Changes in the Work – General Conditions (CCDC 2), and Section 00 73 00 – Supplementary General Conditions.

.2 Changes to the work will be defined as below and be documented using the following forms:

.1 **Field Order** – Will be used when an instruction is given to the Contractor in the field, which may result in an adjustment to the Contract Price. A Field Order signed by the Engineer and the Owner is authorization to proceed with the Work on a Lump Sum, Unit Price or Force Account/Time and Material basis as stipulated on the Field Order form. Extra work shall not commence until the Contractor receives a copy of the Field Order signed by the Owner and the Engineer.

.2 **Field Memo** – Will be issued by the Engineer and be used as an instruction in situations where the change is not anticipated to result in an adjustment to the Contract Price.

.3 **Change Order** – Will be used for additions or deletions to the Work which originate in the form of revisions to Drawings and Specifications, and which may result in a change to the Contract Price. A Change Order signed by the Engineer and the Owner is authorization to proceed with the Work as stipulated in the Change Order. Extra work shall not commence until the Contractor receives a copy of the Change Order signed by the Owner and Engineer.

.3 Contemplated Changes in the Work

.1 Where a change in the Work is contemplated, the Engineer will give the Contractor written notice advising the Contractor of a contemplated change in the Work. Such notice requires that the Contractor submit either a lump sum quotation or an estimate based on unit prices and quantities, or labour and equipment rates, to the Engineer within the time specified on the form. **Such notice is for information only and is not an instruction to execute changes, or to stop Work in progress.** The Contractor's quotation shall:

.1 Make reference to the contemplated change order letter;

.2 Be set out in sufficient detail acceptable to the Engineer;

.3 Indicate the methodology and resources that the Contractor shall use to perform the extra work;

.4 Indicate the cost or credit to complete the changes in the work;

.5 Indicate the schedule to perform the changes in the work; and indicate the impact on the overall project schedule.

.6 Indicate any incremental cost impact included in quotation to maintain the Completion Date;

.7 Indicate that quotation will remain open for acceptance by the Owner for thirty (30) days; and

.8 Submit all required back-up documents.

.2 The Engineer will review the Contractor's quotations for contemplated changes in the Work to determine whether the quotation is acceptable, requires resubmittal or should be rejected. Support quotation with additional substantiating data if requested by the Engineer.

.3 When the quotation has been evaluated and is deemed acceptable to the Engineer, the Engineer will prepare and complete a Change Order entering the acceptable quotation adjustments to the Contract Price and Completion Date for the Owner's signature. Once the Change Order is signed and fully executed by the Owner, it will then be forwarded to the Contractor for signature. The Change Order, signed by the Owner, records and authorizes the Contractor to proceed with the Work.

.4 Methods for Valuing and Evaluating Changes in the Work

.1 Lump Sum Change Orders and Field Orders

.1 The content of Change Orders or Field Orders will be based on a prior quotation from the Contractor and agreed to by the Engineer and the Owner.

.2 The Contractor shall submit all necessary backup and the quotation shall be broken down as much as required by the Engineer.

.2 Unit Price Change Orders and Field Orders

.1 The content of Change Orders or Field Orders will be based on either prior agreed quantities or a survey of completed Work.

.2 The amounts of unit prices shall be those quoted in the Schedules to the Contract.

.3 When quantities can be determined prior to start of Work, the Engineer will prepare and complete a Change Order or Field Order describing the Work and entering the agreed confirmed unit prices, total quantities and total cost adjustments to the Contract Price and the construction schedule, for the Owner's signature. Once the Change Order or Field Order is signed and fully executed by the Owner, it will then be forwarded to the Contractor for signature. The Change Order, signed by the Owner, records and authorizes the Contractor to proceed with the Work.

.4 When quantities **cannot be determined** prior to start of Work, the Engineer will assign to the Contractor a Field Order signed by the Owner agreeing and

authorizing the described Work to proceed immediately on the basis of the unit prices and an estimate mutually agreed upon. Upon completion of the changes involved, the Engineer will complete the Field Order entering the final total cost for the Work based on agreed confirmed unit prices and actual measured quantities support data submitted for the Owner's signature to adjust the Contract Price and Completion Date as applicable.

.3 Force Account/Time and Material Change Orders and Field Orders

.1 When a change in the Work cannot be agreed upon by the Lump Sum and Unit Price methods, the Engineer may authorize the Work to be carried out on a Force Account/Time and Material basis.

.2 The Contractor's Labour and Equipment Rate Table provided with the Tender will be used to assess the cost of performing changes in the Work.

.3 The Engineer will provide the Contractor with a Field Order, signed by the Owner agreeing and authorizing the described extra work to proceed immediately on a Force Account/Time and Material basis as reviewed on the Work Site.

.4 The Contractor shall support claims for changes determined by this method via numbered Daily Time Sheets (DTS) submitted the day following the Work with dates and times the Work was performed and by whom; time record, summary of hours worked and hourly rates paid; receipts and invoices for equipment used, listing dates and times of use; materials and products used, listings quantities; subcontracts.

.5 Submit claims on standard form.

.6 Upon completion of the changes, the Engineer will complete the Field Order entering the final approved total cost for the extra work involved, based on agreed confirmed time and material support data, invoices, time sheets and records submitted for the Owner's signature to adjust the Contract Price and Completion Date as applicable.

.7 The percentage mark-up permitted for changes in the Work done on a Force Account basis is specified in the General Conditions.

.4 Quotations for changes in the Work shall show credits for work deleted from the Contract as a result of the change in the Work, if applicable.

.5 The mark-up on each change shall be applied to the net difference between credits and extras except in the case where the change results in a net credit to the Contract Price, in which case the Contractor is not entitled to charge mark-up on the net credit.

.6 Any dispute arising under this Section shall be governed by Part 8 Dispute Resolution – General Conditions (CCDC 2).

4. PRODUCTS

Not applicable.

5. EXECUTION – BASE BID ITEMS

5.1 Item 1.1 – Mobilization and Demobilization

.1 Mobilization shall include all costs associated with moving personnel, materials and equipment to the site, setting up temporary facilities and all preparation for performing the Work pursuant to Section 01 71 13 – Mobilization and Demobilization.

.2 Demobilization shall include all costs associated with removal of all personnel, materials and equipment, and cleanup of the site.

.3 The cost for mobilization and demobilization shall not exceed 5% of the Total Tender Price.

.4 Payment will be made as follows:

.1 60% of the lump sum price will be included in the first progress payment certificate.

.2 40% of the lump sum price will be included in the final progress payment certificate.

5.2 Item 1.2 – Erosion and Sediment Control

.1 This item shall include all costs associated with the supply, installation and maintenance of Erosion and Sediment Control and Environmental Protection measures required for the Work pursuant to Section 01 35 35 – Environmental Protection and relevant Specifications.

.2 Payment will be made as follows:

.1 80% of the lump sum price in percentage of completion of the overall project.

.2 20% of the lump sum price upon Completion.

.3 Payment will be made on receipt and acceptance of the Record Drawings

5.3 Item 1.3 – Traffic Control

.1 This item shall include all costs associated with the temporary vehicle movement, site access and parking not incorporated into the final work, as well as traffic control during construction for the duration of the Work pursuant to Section 01 91 10 – Commissioning and Handover and Section 01 55 01 – Traffic Control, Vehicle Access and relevant Specifications.

.2 Payment will be made on the percentage complete applied to the lump sum price tendered

5.4 Item 1.4 – O&M Manuals and Record Drawings

.1 This item shall include all costs associated with the preparation and submission of Operation and Maintenance (O&M) Manuals and Contractor red-line ("As-built") Drawings pursuant to Section 01 32 19 – Submittals.

.2 Payment will be made on receipt and acceptance of final O&M Manuals and Record Drawings from the Contractor and Equipment Manufacturers.

5.5 Item 2.1 – Site Preparation

.1 This item shall include all costs associated with the demolition, removal and disposal of all material and items (including Harvey Tank, existing pipes and fitting) required to complete the Work pursuant to Section 02 41 01 – Sitework Demolition and Removal and as per the Drawings and relevant Specifications.

.2 This item shall include all costs associated with clearing and grubbing necessary to prepare the site for the Work pursuant to Section 31 11 01 – Clearing and Grubbing, the Drawings and other relevant Specifications.

.3 This item shall include all costs associated with the stripping, stockpiling, handling and reuse on site of topsoil necessary for the Work as per the Drawing and relevant Specifications.

.4 Payment will be made on the percentage complete applied to the lump sum price tendered.

5.6 Item 2.2 – Site Work

.1 This item shall include all costs associated with earthworks for the proposed construction including, but not limited to, common excavation, imported backfill, subgrade preparation, granular materials, dewatering, geotextile, retaining walls, and site and roadbed grading for the Work as per the Drawings and other relevant Specifications.

.2 This item shall include all costs associated with the supply and installation of the fencing, gates and appurtenances as per Drawing as relative Specifications

.3 This item shall include all costs associated with site restoration, finish grading and landscaping (including seeding) as per the Drawings and relevant Specifications.

.4 Payment will be made on the percentage completed applied to the lump sum price tendered.

5.7 Item 2.3 – Yard Piping / Utilities

.1 This item shall include all costs associated with the supply, installation and testing of all underground piping and services, including fittings, valves and appurtenances as per the Drawings and relevant Specifications.

.2 This item shall include all costs associated with supply and installation of specified drainage apparatuses and all other means methods and materials required to complete the Work as per the Drawings and relevant Specifications.

.3 This item shall include all costs associated with the supply, installation and testing of manholes and catch basins as per the Drawings and relevant Specifications.

.4 Payment will be made on the percentage complete applied to the lump sum price tendered.

5.8 Item 2.4 – New Harvey Reservoir

.1 This item shall include all costs associated to furnish and erect a glass-fused-to-steel, bolted-steel water storage tank, including foundation, tank structure and tank appurtenances as shown on the contract drawings and relevant specifications.

.2 This item shall include all costs associated with the supply and installation of all reservoir piping, fittings and appurtenances as per the Drawings and relevant Specifications. Co-ordination with other trades for the supply of hardware, pipe sleeves, and other embedded material including the related layout drawings and installation will not be measured but considered incidental work.

.3 Supply and installation of waterstops, construction joints, and expansion joints will not be measured but considered incidental work.

.4 Heating of water and aggregates and providing cold weather protection for the concrete foundation will not be measured but considered incidental to work.

.5 Cooling the concrete and providing hot weather protection will not be measured but considered incident to work.

.6 Repair of any deficiencies in the glass-fused-to-steel, bolted-steel water storage tank structure, liner or concrete foundation will not be measured but be considered incidental work.

.7 Payment will be made on the percentage complete applied to the lump sum price tendered.

5.9 Item 2.5 – PRV Chamber Improvements

.1 This item shall include all costs associated with concrete works for construction of the PRV Walk-in Structure, as per the Drawings and relevant Specifications.

.2 This item shall include all costs associated with the supply and install of pipes, valves, fittings and appurtenances as per the Drawings and relevant Specifications.

.3 Payment will be made on the percentage complete applied to the lump sum price tendered.

5.10 Item 2.6 – Metals

.1 This item shall include all costs associated with metal items including handrails, guardrails, grating, checkerplate, ladders, hatches, structural steel framework, beams, pipe and duct supports, and other miscellaneous metals not otherwise identified, as per the Drawings and relevant Specifications.

.2 Payment will be made on the percentage complete applied to the lump sum price tendered.

5.11 Item 2.7 – Electrical and Instrumental

.1 This item shall include all costs associated with the supply and installation of electrical and instrumental equipment, as required, and all appurtenances and ancillary items as per the Drawings and Specifications.

.2 Payment will be made on the percentage complete applied to the lump sum price tendered.

6. EXECUTION – OPTIONAL ITEMS

6.1 Item 8.1.1 – Local Disposal of Concrete at Harvey Creek Access Road

.1 This item shall include the change in disposal of demolished concrete from off site to local disposal at the specified location east of Harvey Reservoir adjacent to the Harvey Creek Access Road at the location specified in the Drawings. This item shall include all costs associated with the demolition, separation, loading, hauling, transport, unloading, placement and disposal required to complete the Work pursuant to Section 02 41 01 – Sitework Demolition and Removal, the Drawings and relevant Specifications. This item shall also include all costs associated with clearing, grubbing, stripping, stockpiling, handling and reuse of on site topsoil and native fill necessary to prepare the site.

.2 Payment for will be made on the percentage complete applied to the lump sum price tendered.

.1 Payment for 8.1.1 shall be in addition to Item 2.1.

7. EXECUTION – UNIT RATE ITEMS

7.1 Item 1.a) – Over Excavation

.1 This items shall include all costs associated with the over excavation, removal and disposal off site of native material, and supply of placement of imported granular fill material as directed the Engineer and pursuant to relative Specifications.

.2 Measurement of payment for over excavation will be made by loose truck box volume as determined by the Engineer.

.3 Measurement for payment for supply and placement of imported granular fill material will be based on weigh tickets provided to the Engineer as loads are delivered.

.4 Payment for will be based on the unit rate provided in the Schedule of Quantities.

7.2 Item 1.b) – Rock Blasting

.1 This item shall include all costs associated with the removal and disposal off site of rock by blasting and includes all necessary drilling, vibration monitoring and control to limits of specified, all warning and protection measures required to ensure safe blasting and pursuant to regulations and relative Specifications.

.2 Measurement of payment for volume of rock removed by blasting will be made calculated from cross-sections of original rock surface and design subgrade lines for excavation.

.3 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.3 Item 1.c) – Boulder Removal

.1 This item shall include all costs associated with the removal and disposal off site of boulders and rock fragments having a volume in excess of $1m^3$.

.2 Volume of boulders and rock fragments will be determined by measuring three maximum mutually perpendicular dimensions with volume to be produced of these three dimensions. No payment will be made for boulders and rock fragments which can be lifted by equipment available on site.

.3 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.4 Item 1.d) – Fencing

.1 This item shall include all cost associated with the supply and install of Chain Link Fencing as directed by Engineer and pursuant to relative Specifications.

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.5 Item 1.e) – Top Soil

.1 This item shall include all costs associated with the supply and placement of topsoil as directed by the Engineer and pursuant to relative Specification.

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.6 Item 1.f) – Seeding

.1 This item shall include all costs associated with the supply and placement of seed as directed by the Engineer and pursuant to relative Specification.

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.7 Item 1.g) – Lock Block

.1 This item shall include all costs associated with the supply and placement of lock blocks as directed by the Engineer and shall include granular backfill and compaction pursuant to relative Specification.

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.8 Item 2.a) PVC Perimeter Drain Pipe

.1 This item shall include all costs associated with the supply and installation of respective diameter PVC perimeter drain pipe including, but not limited to, excavation, backfill, and compaction and testing as directed by the Engineer and pursuant to relative Specifications.

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.9 Item 2.b) Ductile Iron Pipe

.1 This item shall include all costs associated with the supply and installation of respective diameter Ductile Iron Pipe including, but not limited to, excavation, backfill, and compaction and testing as directed by the Engineer and pursuant to relative Specifications.

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.10 Item 2.c) DI Ductile Iron Gate Valve

.1 This item shall include all costs associated with the supply and installation of respective diameter Ductile Iron Gate Valves including, but not limited to, excavation, backfill, and compaction and testing as directed by the Engineer and pursuant to relative Specifications.

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.11 Item 2.d) PVC Bends

.1 This item shall include all costs associated with the supply and installation of respective PVC bends including, but not limited to, excavation, backfill, and compaction and testing as directed by the Engineer and pursuant to relative Specifications

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.12 Item 2.e) Ductile Iron Bends

.1 This item shall include all costs associated with the supply and installation of respective Ductile Iron Bends including, but not limited to, excavation, backfill, and compaction and testing as directed by the Engineer and pursuant to relative Specifications

.2 Payment will be based on the unit rate provided in the Schedule of Quantities.

7.13 Item 2.f) – Ductile Iron Tees

.1 This item shall include all costs associated with the supply and installation of respective diameter Ductile Iron Tees including, but not limited to, excavation, backfill, and compaction and testing as directed by the Engineer and pursuant to relative Specifications

.2 Payment will be based on the unit rate provided in the Schedule of Quantities

7.14 Item 2.g) – Robar Couplers

.1 This item shall include all costs associated with the supply and installation of respective diameter Robar Couplers including, but not limited to, excavation, backfill, and compaction and testing as directed by the Engineer and pursuant to relative Specifications

.2 Payment will be based on the unit rate provided in the Schedule of Quantities

7.15 Item 2.h) and 2.i) – Concrete Manhole and Risers

.1 This item shall include all costs associated with the supply and installation concrete manholes and vertical riser sections including, but not limited to, excavation, backfill, and compaction and testing as directed by the Engineer and pursuant to relative Specifications

.2 Payment will be based on the unit rate provided in the Schedule of Quantities

END OF SECTION

1. GENERAL

1.1 Preconstruction Meeting

.1 Within fifteen (15) calendar days after award of Contract, the Engineer will request a project meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Representatives of the Owner, Engineer, Contractor, and Major Subcontractors must be in attendance.

.3 Representatives of the Contractor and Subcontractors attending the preconstruction meeting must be qualified and authorized to act on behalf of the party each represents.

.4 After the time and location of this meeting has been established, the Contractor shall notify all parties concerned a minimum of five (5) days before the meeting.

.5 The Engineer will arrange space and facilities for this meeting.

.6 The Engineer will chair and record discussions and decisions, and circulate the meeting notes to all parties concerned.

.7 Agenda to include the following:

.1 Appointment and notification of official representatives of participants in the Work.

.2 Schedule of the Work, progress scheduling.

.3 Schedule of shop drawing submissions.

.4 Schedule for the procurement and delivery of specified equipment.

.5 Requirements for temporary facilities, site signs, offices, storage sheds, utilities, hoarding, site access and use.

.6 Site security.

.7 Health and Safety issues:

.1 As part of this agenda item, the contractor will be asked to complete a Safety Checklist.

.8 Modification procedures, Contemplated Change Notices and Change Order procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements (GC) as originated by the Owner or in the case of a savings, by the Contractor.

.9 Product and tool storage.

.10 Weather protection.

.11 Record drawings.

.12 Operation and maintenance manuals.

.13 Commissioning, acceptance, and handover.

.14 Warrantees.

.15 Monthly progress claims, administrative procedures, photographs, holdbacks.

.16 Appointment of inspection and testing agencies or firms.

.17 Insurances and transcript of policies.

.18 Communications routing and logistics.

.19 Access to site and work areas.

.20 Survey.

.21 A schedule for progress meetings.

.22 Emergency telephone numbers.

.23 Other items as arise at the meeting.

1.2 Progress Meetings

.1 The Engineer will schedule and administer progress meetings every month throughout the construction period. A meeting agenda will be provided at least two days prior to the meeting.

.2 Representatives of the Owner, Engineer, Contractor, and Major Subcontractors must be in attendance. Contractor to arrange for the attendance of other subcontractors and suppliers as necessary to address issues on the agenda.

.3 Representatives of the Contractor, Subcontractors, and Suppliers attending meetings must be qualified and authorized to act on behalf of the party each represents.

.4 Agenda for Construction Progress Meetings to include the following:

.1 Review and approval of minutes of previous meeting.

.2 Field observations, problems, conflicts.

.3 Review of environmental items.

.4 Review submittal schedules: Expedite as required.

.5 Progress, schedule, during succeeding work period.

.6 Problems which impede construction schedule.

.7 Corrective measures and procedures to regain projected schedule.

.8 Revisions to construction schedule.

.9 Site coordination review.

.10 Maintenance of quality standards.

.11 Review of site cleanliness.

.12 Review of site safety and security.

.13 Review of temporary facilities.

.14 Review requests for information.

.15 Review of contemplated change notices, field orders, change orders, and field instructions.

.16 Review proposed changes for effect on construction schedule and on completion date.

.17 Review of progress payments.

.18 Outstanding action items.

.19 Date and location of next meeting.

.20 Other business.

.5 The Engineer will preside at the meetings.

.6 The Engineer will record notes of the project meetings, including significant proceedings, decisions, “Action By" parties, dates for completion of duties, etc.

1.3 Special Meetings

.1 Special meetings may be requested by the Owner, Engineer, or Contractor to discuss specific issues. Generally, three days notice is required for special meetings. The agenda will be fashioned to suit the meeting. Minutes will be kept by the Engineer.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 Site Conditions/Limits

.1 Examination of Site

.1 Prior to commencing actual construction work, inspect field conditions, obtain and confirm actual site dimensions, examine surface conditions as required to ensure correct execution of the Work.

.2 Maintain or arrange for the removal, relocation and replacement as appropriate of any existing utilities which may be affected by the works, whether buried or surface utilities, signs, structures or any other object which may be in conflict with the works.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 Schedule

.1 Prepare a time scaled, precedence diagramming network schedule using the critical path method. This detailed schedule will provide a basis for determining the progress status of the project relative to the completion time and specific dates and for determining the acceptability of the Contractor's requests for payment.

.2 Show all significant construction activities, shop drawing submittals, procurement activities and receipts of materials and equipment which the Contractor intends to store on site for at least one month prior to installation. Indicate assigned dollar values for each scheduled activity. Show the dependencies between activities so that it may be established what effect the progress of any one activity has on the schedule. Assign each activity an identification number (first two characters must be the specification division number).

.3 Assign an activity code to all activities to allow sorting reports and schedules by both specification division number and process area.

.4 Assign activity codes to all appropriate construction activities to allow sorting on each of the following items in reports and schedules:

.1 Coordination/tie-in activities associated with existing operating facilities and other contracts.

.2 Submittal, fabrication, delivery, installation, and testing of items. Include unloading in delivery activities.

.3 Installation of major equipment items and their associated piping systems.

.5 When requested, submit to the Engineer for information, a separate schedule filtered to show coordination/tie-in or other disruptive work activities with existing facilities only.

.6 Establish activity codes by mutual agreement with the Engineer.

.7 Show completion time and all specific dates and sequencing requirements described in Section 01 12 16. Identify activities making up the critical path.

.8 Unless specifically approved by the Engineer, show activities on the schedule with a duration not longer than 5 working days (except activities showing only submittal, fabrication or delivery of material or equipment). Divide activities which exceed these limits into more detailed components. Base the scheduled duration of each activity on the work being performed during the normal 40 hour work week with allowances made for legal holidays and normal weather conditions.

.9 Based on the construction schedule and the agreed Tender Price Breakdown, develop cash flow projections for the entire project period.

1.2 Schedule Submittal

.1 Prepare and submit a preliminary schedule showing in accordance with Section 00 21 13.

.2 Within 15 days after award of Contract, prepare and submit a preliminary schedule showing the activities through the first 90 days of the Project, for review, to the Engineer.

.3 Within 30 days of the Notice of Award, submit complete schedule and cash flow projection.

.4 The schedule for the Contract shall be based on the Contract completion dates, and the milestone dates for critical activities.

.5 Submit the entire schedule in digital form, based on the use of MS Project or similar software, and the following information on hard copy:

.1 Tabular listing of activities sorted by early start and showing activity description, scheduled duration in working days, early and late start and finish dates, total float, predecessors and/or successors to each activity and the cost assigned to each activity.

.2 Time scaled logic diagram for all scheduled activities.

.3 Projected monthly draw request (histogram and tabular).

.4 Critical path report.

.5 Narrative describing the basis of the schedule.

1.3 Schedule Review

.1 Schedule shall show dates of commencement and completion of various parts of the Work, ordering and delivery dates of Products, phasing and timing for various subtrades and all other detailed information to the satisfaction of the Engineer.

.2 The Engineer will review the submitted schedules and cash flow projections within 14 working days of receipt. If the Engineer finds that the submitted schedule does not comply with the specified requirements, or does not provide acceptable schedule detail, the deficiencies will be identified in writing to the Contractor for correction and resubmittal. Correct and resubmit the schedule within 10 working days after the deficiencies have been identified by the Engineer.

.3 The accepted schedule will serve as background for the requests for payment.

.4 Submit for review in accordance with Section 01 32 19.

1.4 Schedule Revisions

.1 Submit proposed revisions to the accepted construction schedule to the Engineer for review. Changes in timing for activities may be modified with agreement of the Contractor and Engineer. A change affecting the Contract Price, the completion time and work sequencing may be made only by approved change order.

.2 Where required, add separate activities to the construction schedule for each approved change order.

.3 Should the actual sequence of work performed by the Contractor deviate from the planned sequence indicated in the accepted schedule, the Engineer may require the Contractor to revise the schedule to reflect changes in the actual sequence and/or the future sequence of work.

.4 Within 20 days following approval of the Contractor's testing and commissioning plan (Section 01 91 10), submit a schedule revision incorporating the approved plan into the construction schedule.

.5 Submit with each schedule revision all information as called for in submitting the original construction schedule in both digital form and in hard copy.

1.5 Progress Reports

.1 Submit an updated schedule on a monthly basis concurrent with the submittal of the progress payment request. Indicate on the updated schedule progress achieved to date on all activities. Submit the updated schedule and other information in digital form and in hard copy as specified for the original construction schedule.

.2 Provide updated cash flow projections with each progress report of significant schedule revisions.

.3 Each report shall include sufficient details on the work completed and the anticipated work to be undertaken for the next report period. If the progress falls behind schedule, the Contractor shall include explanations for the delay and propose remedial actions.

1.6 Manpower/Overtime

.1 Should the Work fail to progress according to the approved progress schedule, work such additional time (including weekends and holidays), employ additional workers, or both, as may be required to bring the Work back on schedule, at no additional cost to the Owner.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 General Requirements

.1 Provide pre- and post-construction photographs as indicated and specified.

.2 Section includes administrative and procedural requirements for the following:

.1 Pre and post construction photographs.

.2 Weekly Construction Progress Report photographs.

.3 Construction photography including production of time-lapse sequence video recordings.

1.2 Definitions

.1 For the purposes of this contract, photographer and videographer shall be used interchangeably and shall mean anyone capturing digital imagery or media.

1.3 Submittals:

.1 Field Reports:

.1 One (1) electronic draft copy and three (3) hard copy and one (1) electronic final Pre-Construction reports.

.2 One (1) electronic draft copy and three (3) hard copy and one (1) electronic final Post-Construction reports.

.2 Key Plan: Submit key plan of Project site with notation of vantage points marked for location and direction of each photograph. Include same information as corresponding photographic documentation.

.3 Digital Photographs: Submit image files within 7 days of taking photographs.

.1 Identification: Provide the following information with each image description in file metadata tag:

.1 Name of Project.

.2 Name and contact information for photographer.

.3 Name of Client.

.4 Name of Contractor.

.5 Date photograph was taken.

.6 Description of vantage point, indicating location and direction (by compass point).

.7 Unique sequential identifier keyed to accompanying key plan.

1.4 Quality Assurance:

.1 Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

.2 Photographer to make and retain all photographs and digital files.

1.5 Usage Rights:

.1 Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

2. PRODUCTS

2.1 Photographic Media:

.1 Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

.2 Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to Engineer.

.3 Provide digital images on USB Flash Drive (USB).

2.2 Project Camera:

.1 Provide fixed exterior camera installations, mounted to provide unobstructed view of construction sites from location approved by Engineer.

.2 Provide one (1) fixed-location camera per construction site, with the following characteristics:

.1 Minimum sensor resolution of 8 megapixels.

.2 Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.

.3 Provide power supply or sufficient batteries to keep camera charged during all construction activities reasonably worth capturing at the discretion of the Engineer.

3. EXECUTION

3.1 Construction Photographs:

.1 General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

.2 Provide construction photographs for existing (pre-construction) and final (post-construction) conditions. The reports shall include location and description of site; results of visual inspection; color photograph; description of existing site conditions The Owner's Representative shall examine said draft reports and may indicate additional information that is required.

.1 Up to fifty (50) color photographs (25 photographs pre-construction and 25 photographs post-construction) to the satisfaction of the Owner's Representative shall be taken at the facility listed below listed below:

.1 Harvey Water Treatment Plant and Tank Site

.2 Do not include date stamp on post-construction photographs.

.3 Take 20 photographs weekly and submit with the Weekly Construction Progress Reports. Select vantage points to show status of construction and progress since last photographs were taken.

3.2 Time-Lapse Sequence Construction Photographs:

.1 Take photographs as indicated, to show status of construction and progress.

.1 Frequency: Take photographs daily on a maximum of 15 minute intervals with the cutoff date associated with each Application for Payment.

.2 Vantage Points: Following suggestions by Owner's Representative and Contractor, photographer to select vantage points. During each of the construction phases, take the required shots from same vantage point each time to create a time-lapse sequence as follows:

.1 At the completion of demolition and clearing at each site.

.2 At completion of each structural excavation.

.3 At completion of each structural foundation.

.4 At completion of framing or forming for structures.

.5 At completion of enclosures of structures.

.6 At 1-week intervals, progress photography during construction of facilities. Photos of any week need show only new work performed during month.

.7 Such special photographs required by Engineer.

.8 Interior Work, through date of Substantial Completion.

.3 Views:

.1 Coordinate with Engineer on views to be taken. In general views from locations to adequately illustrate state of project and condition of construction.

.2 At least one (1) different views of photographic subject.

.3 Succeeding photography of same photographic subject to be taken, insofar as practical, from the same view points as preceding photographic sessions. Variations in this procedure to be approved by Engineer.

.4 Mount camera on tripod before starting capturing media unless otherwise necessary to show area of construction.

END OF SECTION

1. GENERAL

1.1 General Requirements

.1 Unless otherwise noted, make submittals to the Engineer for review.

.2 The Contractor shall establish and maintain an approved electronic document control system to for the management of all project related files and documentation. The system shall be made accessible to the Owner and Engineer.

.3 Provide and submit mark-ups of the technical specifications to identify where the equipment differs from that specified.

.4 Make submittals with reasonable promptness and in an orderly sequence to avoid any delay in the Work. Failure to submit in ample time is not considered cause for an extension of Contract Time, and no claim for extension by reason of such default will be allowed.

.5 Do not proceed with Work affected by submittals until review is complete.

.6 The submittal reviews do not authorize changes in cost or time. Changes involving cost or time are authorized only by a signed change order.

1.2 Shop Drawings

.1 "Shop Drawings" mean custom drawings, specific product data, diagrams, illustrations, schedules, performance charts, brochures and other data, which are to be provided to illustrate details of a portion of the Work.

.2 Arrange for the preparation of clearly identified shop drawings as specified or as the Engineer may reasonably request. Shop drawings are to clearly indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work. Where articles or equipment attach or connect to other articles or equipment, clearly indicate that all such attachments and connections have been properly coordinated, regardless of the trade under which the adjacent articles or equipment will be supplied and installed. Notify the Engineer in writing of any deviations in shop drawings from the requirements of the Contract Documents.

.3 **Shop drawings must be submitted with the appropriate Specification Sections attached noting both compliance with and deviations from the Specifications**.

.4 Examine all shop drawings prior to submission to the Engineer to ensure that all necessary requirements have been determined and verified and that each shop drawing has been checked and coordinated with the requirements of the Work and the Contract Documents. Examination of each shop drawing shall be indicated by stamp, date and signature of a responsible person of the Subcontractor for supplied items and of the General Contractor for fabricated items. Shop drawings not stamped, signed and dated will be returned without being reviewed and stamped "Resubmit".

.5 Submit shop drawings with reasonable promptness and in an orderly sequence so as to cause no delay in the Work. Failure to submit shop drawings in ample time is not to be considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed. Jointly prepare a schedule fixing the dates for submission and return of shop drawings.

.6 The Engineer will review and return shop drawings in accordance with the schedule agreed upon or otherwise with reasonable promptness so as to cause no delay in the Work. Allow sufficient time for review and consideration by the Engineer. Claims for costs or contract extensions due to such review time will not be allowed.

.7 The Contractor may elect to utilize the FTP site described in clause 1.1.2 to enable the electronic transfer of shop drawings.

.8 Shop drawing review by the Engineer is solely to ascertain conformance with the general design concept. Responsibility for approval of detail design inherent in shop drawings rests with the Contractor and review by the Engineer shall not imply such approval.

.9 Review of Shop Drawings by the Engineer shall not relieve the Contractor of his responsibility for errors or omissions in shop drawings or for proper completion of the Work in accordance with the Contract Documents.

.10 Responsibility for verification and correlation of field dimensions, fabrication processes, techniques of construction, installation and coordination of all parts of the Work rests with the Contractor.

.11 Shop drawings will be returned to the Contractor with one of the following notations:

.1 When stamped “REVIEWED”, distribute additional copies as required for execution of the Work.

.2 When stamped “REVIEWED AS MODIFIED”, ensure that all copies for use are modified and distributed, same as specified for “REVIEWED ONLY”. Resubmit for final records.

.3 When stamped “REVISE & RESUBMIT”, make the necessary revisions, as indicated, consistent with the Contract Documents and submit again for review.

.4 When stamped “REJECTED”, submit other drawings, brochures, etc. for review consistent with the Contract Documents.

.5 Only shop drawings bearing “REVIEWED” or “REVIEWED AS MODIFIED” shall be used on the Work unless otherwise authorized by the Engineer.

.6 It is understood that the following is to be read in conjunction with the wording on the Engineer’s shop drawing review stamp applied to each and every data sheet or drawing submitted:

> “This review by the Engineer is for the sole purpose of ascertaining general conformance with the Contract design concept. This review does not mean

that the Engineer approves the detail design inherent in the shop drawings, responsibility for which remains with the Contractor, and such review does not relieve the Contractor of the responsibility for errors or omissions in the shop drawing or of his responsibility for meeting all requirements of the Contract Documents. Be responsible for confirming and correlating dimensions at the Place of the Work, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all subtrades."

.12 After submittals are stamped "REVIEWED", no further revisions are permitted unless re-submitted to the Engineer for further review.

.13 Any adjustments made on shop drawings by the Engineer are not intended to change the Contract Price. If it is deemed that such adjustments affect the Contract Price, clearly state as such in writing prior to proceeding with fabrication and installation of work.

.14 Make changes in shop drawings which the Engineer may require consistent with Contract Documents. When re-submitting, notify the Engineer in writing of any revisions other than those requested by the Engineer.

.15 Shop drawings indicating design requirements not included in the Contract Documents require the seal of a qualified Professional Engineer, registered in British Columbia.

.16 Only two reviews of a shop drawing will be made by the Engineer at no cost. Each additional review will be charged to the Contractor at the Engineer's scheduled rates. The Engineer's charges for additional work will be deducted from the Contractor's Progress Certificates.

1.3 Product Data

.1 "Product Data" mean general diagrams, illustrations, brochures and other data, which are to be provided to illustrate items of construction materials, equipment, furnishings, and other elements of the work.

.2 Submit Product Data for the Engineer's review as specified or as the Engineer may reasonably request. Reference Product Data to drawings and specifications.

.3 Where the submittal of Product Data is required, submit Product Data prior to arranging for delivery of Products to site.

.4 Submit Product Data with reasonable promptness and in orderly sequence. Failure to submit Product Data in ample time is not to be considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Notify the Engineer in writing, at the time of submission, of any deviations in Product Data from requirements of Contract Documents.

.6 The Engineer will not review Product Data.

.7 Receipt of Product Data by the Engineer shall not relieve the Contractor of his responsibility providing the specified Products for incorporation in the Work in accordance with the Contract Documents.

1.4 Samples

.1 Submit, in duplicate, Samples for the Engineer's review as specified or as the Engineer may reasonably request. Clearly label samples as to origin and intended use in the Work. Reference samples to drawings and specifications.

.2 Submit Samples with reasonable promptness and in orderly sequence so as to cause no delay in the Work. Failure to submit samples in ample time is not to be considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

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

.4 The Engineer's review of Samples will be for conformity of design concept and general arrangement only. Such review is not to be considered relief of responsibility for errors or omissions in Samples or of responsibility for meeting all requirements of the Contract Documents.

.5 Any adjustments made on Samples by the Engineer are not intended to change the Contract Price. If it is deemed that such adjustments affect the Contract Price, clearly state as much in writing prior to proceeding with fabrication and installation of the Work.

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

.7 Where changes or modifications of the Products for which samples are submitted are required, re-submit samples embodying the required changes or modifications.

.8 Where colour, pattern or texture is a criterion, submit a full range of samples.

.9 Reviewed samples will become the standard of workmanship and material against which the performed Work will be verified and accepted.

1.5 Record Drawings

.1 After award of Contract the Engineer will provide a complete set of drawings for the purpose of maintaining Project record drawings. These drawings shall consist of a full size white paper copy and survey provided as both a .CSV file and digital AutoCAD including breaklines, where applicable.

.2 Record on the white prints on a daily basis, work constructed differently than shown on the Contract Documents. Record all changes in the Work caused by site conditions, or originated by the Owner, the Engineer, the Contractor, or a Subcontractor and by addenda, supplemental drawings, site instructions, supplementary instructions, change orders,

correspondence, and directions of regulatory authorities. Do not use these drawings for daily working purposes and make the set available for periodic inspection by the Engineer.

.3 Accurately record the location of concealed mechanical services and electrical main feeders, junction boxes and pull boxes. Do not conceal critical Work until its location has been recorded.

.4 Dimension the installed locations of concealed service lines on the site or within the structure by reference from the centre line of the service to structure column lines or other main finished faces or other structural points easily identified and located in the finished Work.

.5 Make records in a neat and legibly printed manner with a non-smudging medium.

.6 Identify drawings as "Project Record Copy". Maintain in good condition and make available for inspection on site by Engineer at all times.

.7 At completion of operational testing, neatly transfer notations to second set of prints and submit both sets of record drawings to Engineer.

.8 The record drawings will be reviewed monthly prior to acceptance by the Engineer of the monthly payment certificate. Failure to maintain the record drawings will result in a 10 percent reduction in payment to the Contractor for that month. The amount will be returned to the Contractor on the next payment as long as the record drawings are brought up to date.

.9 Failure to provide acceptable "Record Drawings" may delay acceptance of the project by the Owner. The Owner may assess against the Contract a sum based on their calculations of costs to prepare such plans.

.10 Contractor to provide separate "As-built" drawings for all Control Panel and Wiring Diagrams.

.11 All Drawings related to Vendor supplied equipment and products to be updated at project completion, based on actual materials supplied and installed, and included in the final Operations and Maintenance Manuals.

1.6 Procedures

.1 The Contractor shall, if required by the Engineer, submit for the review of the Engineer method statements which describe in detail, supplemented with drawings where necessary, the methods to be adopted for executing any portion of Work.

.2 These statements shall also include details of constructional plant and labour to be employed. Acceptance by the Engineer shall not relieve the Contractor of any of his responsibilities, nor shall reasonable refusal to approve entitle the Contractor to extra payment or an extension of time.

2. PRODUCTS

Not Applicable

3. EXECUTION

Not Applicable

END OF SECTION

1. GENERAL

1.1 Daily Record of Work Progress

.1 Maintain at the site a permanent written record of progress of the Work. Make the record available to the Engineer upon request and provide him with a copy if requested. Include in the record each day:

.1 The weather conditions with maximum and minimum temperatures.

.2 The conditions encountered during excavation.

.3 The commencement and the completion dates of the Work of each trade in each area of the Contract.

.4 The progress of each trade in each area of the work.

.5 The erection and removal dates of formwork in each area of the Contract.

.6 The dates, the quantities, and the particulars of each concrete pour.

.7 The dates, the quantities, and the particulars of reservoir base, wall and suspended slab construction.

.8 The dates and the particulars of pressure reducing station installation.

.9 The numbers and classifications of the Contractor's and the Subcontractor's tradesmen working at the site and the numbers and classifications of construction machinery and equipment and the number of hours each is operated.

.10 The visits to the site by the Owner, the Engineer, the regulatory authorities, the testing companies, the subcontractors and the suppliers.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 General

.1 This Section covers the work for the protection of the environment during construction. The provisions of this Section are in addition to the provisions of other Sections of this Contract.

1.2 Submittals

.1 Submit the following prior to construction:

.1 Temporary Erosion and Sediment Control Plan

.2 Spill Contingency Plan

1.3 Temporary Erosion and Sediment Control

.1 Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavation and site free from water

.2 Do not discharge water containing suspended materials into watercourse, sewer or drainage system.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Federal, Provincial and Municipal requirements.

.2 Work Adjacent to Watercourses

.1 Work around watercourses shall be done in accordance with the most recent version of the "Land Development Guidelines" published by the Provincial Ministry of Environment.

.2 Do not operate construction equipment in watercourse.

.3 Do not use watercourse beds for borrow material without approval from Federal, Provincial and Municipal authorities.

.4 Do not dump excavated fill, waste materials or debris in or adjacent to watercourses.

.3 Products for Temporary Erosion and Sediment Controls:

.1 Silt Barrier Fence:

.1 Silt fence to be manufactured from a woven, silt film geotextile material with a shiny to smooth surface texture designed to reduce velocity of runoff to point that suspended partials settle out due to reduction of hydraulic energy.

.2 Silt Barrier Fence Minimum Requirements:

Property	Value
Grab Tensile	500N
Mullen Burst	1900 kPa
Elongation and Break	25% Max
Opening	600µm Max
U.V. Rating @ 500 hours	90% Retained
Efficiency	>75% Min
Construction	Woven (tape)
Texture	Smooth, Shiny
Posts	4 x4 cm, treated
Post Spacing (centers)	2 meter Max
Permittivity	10 L/s/m^2

Above values are "Minimum Average Roll Values"

.4 Execution for Temporary Erosion and Sediment Controls:

.1 Silt Barrier Fence Placement:

.1 Place silt barrier in manner that will intercept runoff at or close to right angles to flow. In areas where problem is severe, erect two or more silt barriers parallel to each other, until requires degree of control is achieved.

.2 Position post in such a manner that Fence structure remains naturally taut and placed or driven in a minimum of 500mm into ground. Posts to always be positioned downstream.

.3 Where a 500mm depth is impractical or impossible to adequately secure or to brace posts to prevent overturning of fence due to sediment loading.

.4 Burry excess geotextile at bottom of silt fence minimum of 150mm in trench located upstream such that no flow can pass under fence.

.5 Splice subsequent lengths of barrier only at support post locations. Splice by wrapping geotextile fabric completely around each of two abutting support posts, such that the gap between abutting posts is completely covered by both sections of fabric.

.2 Silt Barrier Fence Quantities:

.1 Limit silt fence to handle area equivalent to maximum 100m^2 per 3m of fence.

.2 Do not use where site slope is steeper than 3:1, and water flow rates exceed 0.03m^2/s per 3m of fence.

.3 Silt barrier to have efficiency >75%. Employ successive, parallel fences to achieve required degree of control.

.3 Silt Fence Maintenance:

.1 Maintain integrity of silt fence as long as necessary to contain sediment runoff. Inspect all temporary silt fences immediately after each rainfall and at least daily during prolonged rainfall. Immediately correct any deficiencies.

.2 In addition, make daily review of locations of silt fences in areas where construction activities have changed natural contours and drainage runoff to ensure that silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fences. Should silt fence become damaged or otherwise ineffective while barrier is still necessary, repair or replace promptly.

.3 Remove sediment deposits when deposits reach approximately one-third of the height of the silt fence or installed second silt fence upslope.

.4 Do not remove silt fence until instructed by the Engineer.

1.4 Codes and Standards

.1 The Contractor shall follow the "Environmental Construction Guidelines for Municipal, Road, Sewage and Water Projects; 1987" by the Municipal Engineers Association. These Guidelines recommend construction procedures that are considered to be sound environmental practice for the following areas of concern:

.1 Construction Works Yard and Access Routes

.2 Equipment Fuelling, Maintenance and Storage

.3 Mud, Dust and Particulate Control

.4 Noise and Vibration Control

.5 Drilling and Blasting

.6 Protection of Land Features and Vegetation

.7 Clearing Right-of-Way/Disposal of Excess Material

.8 Site Drainage and Erosion Control

.9 Dewatering

.10 Water Crossings and Construction through Sensitive Areas

.11 Groundwater and Well Water

.12 Hydrostatic Testing and Disinfection

.13 Site Restoration

1.5 Construction Practices

.1 Notwithstanding the above general concerns, the following environmental construction practices are specific to this Contract:

.1 Control measures shall be provided to prevent silt-laden water from entering natural watercourses in accordance with the requirements of the Ministry of Environment.

.2 The velocity of discharge water shall be controlled to prevent unnecessary disturbance of natural watercourses.

.3 All equipment maintenance and re-fueling shall be carried out so as to prevent the entry of petroleum products into the ground or watercourses at all times.

.4 The Contractor shall ensure the immediate availability of the products with which to affect temporary repair to broken pipelines and other services so the spill or other emission of a pollutant is immediately controlled and stopped and to mitigate the damages.

.5 Maintain temporary erosion and pollution control features installed under this contract.

.6 Control noise emission from equipment and plant to local authorities' noise emission requirements.

.7 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.6 Spills Reporting

.1 In the event of a spill or other emission of a pollutant into the natural environment, every person responsible for the emission of who causes or permits it must forthwith notify:

.1 The Ministry of Environment

.2 The municipality or the regional municipality within the boundaries of which the spill occurred.

.3 The owner of the pollutant, if known.

.4 The person having control of the pollutant, if known.

.5 The Engineer: Of the spill, of the circumstances thereof, and of the action taken or intended to be taken with respect thereto.

1.7 Environmental Protection

.1 Fires

.1 Fires and burning of rubbish on site are not permitted.

.2 Site Clearing and Plant Protection:

.1 Protect trees and plants on site and adjacent properties where shown on Contract Drawings.

.2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.3 Minimize stripping of topsoil and vegetation.

.4 Restrict tree removal to areas indicated or designated by Engineer.

.3 Pollution Control

.1 Do not bury rubbish and waste materials on site without prior written authorization by the Owner.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

.3 Maintain temporary erosion and pollution control features installed under this Contract.

.4 Control emissions from equipment and plant to local authorities emission requirements.

.5 Prevent sandblasting and other extraneous materials from contaminating air beyond application areas, by provided temporary enclosures.

.6 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 Permits/Inspections

.1 The Owner will be responsible for obtaining and paying for the Building Permit.

.2 Refer to the General Conditions and Supplemental General Conditions for other requirements related to permits and other regulatory requirements.

.3 Arrange and pay for the regulatory submittals and inspections necessary for the completion of the Work in accordance with Federal, Provincial, and District laws, regulations, and by-laws.

.4 Within one week of receipt, provide one copy of all regulatory reports, permits, and other documents to the Engineer. Include any reports from WorkSafe BC related to Contractor operations on the site.

1.2 Applicable Codes/Standards

.1 Where specified codes/standards are not dated, conform to latest issue of specified codes/ standards as amended and revised to the Tender closing date.

.2 Maintain one copy of all specified and applicable codes and standards at the job site for ready reference.

.3 Confine apparatus, the storage of Products and the operations of workers to limits indicated by laws, ordinances, permits and by directions of the Engineer. Do not unreasonably encumber the premises with Products.

.4 In the event of discrepancies between codes, standards or other provisions, the most stringent shall apply.

.5 Conform to all Federal, Provincial, District and City Codes, regulations and by laws.

1.3 Visitors

.1 Ensure that visitors are provided safety orientation.

1.4 Working Limits

.1 Confine all deliveries and operations within the project property limits.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable

END OF SECTION

1. GENERAL

1.1 Codes and Standards

.1 In the case of a conflict or discrepancy between the Contract Documents and the governing standards, the more stringent requirements apply.

.2 Unless the edition number and date are specified, the reference to the manufacturer's and published codes, standards, and specifications are to the latest edition published by the issuing authority, current at the date of tender closing.

.3 Reference standards and specifications are quoted in the Specifications to establish minimum standards. Work in quality exceeding these minimum standards conforms with the Contract.

.4 Where reference is made to a manufacturer's direction, instruction, or specification it is deemed to include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the Products pertinent to their use and their relationship to the Products with which they are incorporated.

.5 Where reference is made to regulatory authorities, it includes all authorities who have, within their constituted powers, the right to enforce the laws of the Place of Work.

1.2 Testing and Quality Control

.1 Furnish to the Engineer, when requested and consistent with progress of the Work, test results and mix designs specified in the Contract Documents or required by by-laws, statutes and regulations relating to the Work and the preservation of public health, including the following:

.1 Inspection and testing performed exclusively for the Contractor's convenience;

.2 Testing, adjusting and balancing of process equipment and systems, conveying equipment and systems, mechanical, electrical, and instrumentation and control equipment and systems;

.3 Mill tests and certificates of compliance;

.4 Tests for reinforcing steel unidentified by mill test reports.

.2 The Contractor will pay for the services of a testing agency or laboratory for material quality control tests that are specified (e.g. concrete cylinder testing, asphalt testing). Tests required by by-laws, statutes and regulations applicable to the Work are also the responsibility of the Contractor.

.3 The Owner shall pay for geotechnical lab and field testing required for quality assurance including nuclear densometer testing services used for assessing compaction which shall be coordinated by the Contractor by proper notification to the Engineer. The Contractor shall be responsible to provide and pay for material sieves as required as submittals.

.4 Remove and replace Products indicated in inspection and test reports as failing to comply with the Contract Documents.

.5 Correct improper installation procedures reported in the inspection and test reports.

.6 Pay the costs for the re-inspection and re-testing of replaced work.

.7 If the Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such special tests, inspections or approvals are made, given or completed, the Contract Administrator may direct the Contractor to uncover such Work, in order that the inspections or tests may be satisfactorily completed and make good such Work at the Contractor's own expense, and the Contractor shall comply with such direction.

.8 It is not the responsibility of the inspection and testing agents to supervise, instruct in current methods or accept or reject a part of the Work, but only to inspect, test and to report conditions.

.9 Notify the Engineer and the appropriate inspection and testing agent not less than forty-eight hours prior to the commencement of the part of the Work to be inspected and tested.

.10 Ensure the presence of the authorized inspection and testing agent at the commencement of the part of the Work specified to be inspected or tested.

.11 Ensure the inspection and testing reports are issued promptly (normally within forty-eight hours), and that the Engineer is notified forthwith if the report indicates improper conditions or procedures.

.12 Co-operate with and provide facilities for the inspection and testing agents to perform their duties.

.13 Provide proper facilities for the storage of concrete specimens at correct temperature, free from vibration or damage in accordance with the instruction of the inspection and testing agent and the governing standard.

.14 Submit two copies of each laboratory test report, unless specified otherwise, each copy signed by a responsible officer of the inspection and testing laboratory. Each report is to include:

.1 Date of issue

.2 Contract name and number

.3 Name and address of inspection and testing company

.4 Name and signature of inspector or tester

.5 Date of inspection or test

.6 Identification of the Product and Specification section covering inspected or tested Work

.7 Location of the inspection or the location from which the tested Product was derived

.8 Type of the inspection or test

.9 The remarks and observations on compliance with the Contract Documents

.15 Correct defective work within the Contract Time; the performing of such work is not a cause for an extension of the Contract Time.

2. PRODUCTS

Not Applicable

3. EXECUTION

Not Applicable

END OF SECTION

1. GENERAL

1.1 Contractor's Offices

.1 Provide and maintain in clean condition during entire progress of the Work, a suitable office adequately lighted, heated, and ventilated.

.2 Ensure office is sufficiently large to allow for proper filing and examination of Contract Documents and regulatory documents.

.3 Provide within office space adequate safety provisions as recommended by the Ministry of Labour and Worker's Compensation regulations.

1.2 Subcontractors' Offices

.1 Subcontractors are to provide own offices as necessary. Locate in the area shown on the drawings or as directed by the Engineer.

1.3 Equipment and Tool Storage

.1 Provide and maintain in a clean and orderly condition adequate lockable storage sheds for tools and equipment. Locate where shown in the drawings.

1.4 Materials Storage

.1 Provide and maintain in a clean and orderly condition suitable weatherproof and lockable sheds for storage and protection of materials which require such protection.

.2 Allocate storage areas on site for materials which do not require weatherproof sheds. Maintain areas in clean and orderly condition. Limit storage of materials and items to storage areas only.

1.5 Sanitary Facilities

.1 Provide a portable washroom. Maintain facilities in clean and tidy condition.

1.6 Temporary Heating

.1 Provide all temporary heating required during construction period, including attendants, maintenance and fuel. Properly ventilate all heated areas.

.2 Provide exhaust vents to the exterior for all temporary heaters.

.3 Pay for all costs in maintaining and providing temporary heat.

.4 Be responsible for any damages to the Work due to failure in providing adequate heat and protection during construction.

1.7 Temporary Power and Light

.1 Provide temporary electric power for all construction needs. Locate receptacles so power is available to any part of the work within reach of a 30 m extension cord. Provide power at temporary storage sheds and field offices. Provide extension cords as required.

.2 Provide and pay for all temporary power required during construction period for temporary lighting and the operations. Contractor responsible for all equipment and requirements for hook-up.

.3 Wiring for temporary lighting is to be entirely separate from temporary power installation except for a common supply connection at either an electrical service or distribution centre.

.4 When the permanent electrical distribution system has been commissioned and energized, power receptacles may be used if warranty obligations are not affected. Do not overload any circuit beyond its rated capacity. Repair any damage caused during use.

1.8 Existing Services

.1 Maintain existing services in operation at all times during construction.

.2 Protect all existing services from damage. Repair services damaged by construction at no additional cost to the Owner.

.3 If service interruptions are necessary, such interruptions shall be made only at times approved by the Engineer.

.4 When breaking into or connecting to existing services or utilities, carry out work at times directed by local governing authorities, with a minimum of disturbance to the Work.

.5 Protect, relocate or maintain existing active services as required. When inactive services are encountered, cap off in a manner approved by local governing authorities having jurisdiction.

1.9 Ladders, Stairs

.1 Provide and maintain adequate temporary ladders and stairs required for construction.

.2 Secure to structure.

.3 Ladders and stairs are to comply with all safety requirements of governing authorities.

.4 Provide temporary wood treads on steel pan stairs for use prior to placement of permanent treads.

1.10 Protection for Off-Site and Public Property

.1 Protect adjacent private and public property from damage during the performance of the Work.

.2 During excavation, provide sheeting, piling or shoring as required to protect adjacent facilities from movement.

.3 Be responsible for all damages incurred due to improper protection.

1.11 Fire Protection

.1 Contractor to act as Fire Warden for the Contract.

.2 Comply with provincial and local fire prevention codes, laws, regulations, and by-laws.

.3 Be responsible for and enforce fire protection methods and procedures and adherence to local fire regulations, including requirements of the Occupational Health and Safety Act.

.4 Provide and maintain adequate temporary fire protection equipment during performance of the Work as required by insurance companies having jurisdiction.

.5 Whenever soldering, welding or any open-flame work is performed, ensure the area is suitable for such work, ensure the proper incombustible shields are provided to protect combustible Products and materials and have an observer present at all times to ensure adjacent Products and materials are not ignited and welding, soldering or open-flame work do not produce a hazardous condition.

.6 Ensure the existing fire protection and alarm systems are not obstructed, shut-off or made inactive at any time. Do not use any fire hydrant, standpipe or hose system for other than fire protection purposes.

.7 Open fires and burning of rubbish are not permitted on the site.

.8 Smoking is not permitted in hazardous areas or other areas as designated by the Owner. Post "No Smoking" signs as required.

.9 Provide minimum one fire extinguisher in each equipment and tool shed, temporary office, material storage shed workshop.

.10 Where subjected to low temperatures, extinguishers are to be anti-freeze type. In proximity to gas, oil, grease or paint storage locations they are to be #10 - carbon dioxide type. Extinguishers for all other locations are to be soda-acid type. All extinguishers are to be minimum 10 litre capacity and be ULC labeled.

.11 Remove combustible debris from site daily.

1.12 Protection of Finishes and Equipment

.1 Provide adequate protection for finished and partially finished reservoir items and equipment during the performance of the Work. Provide necessary screens, covers, hoardings, etc., as required. Be responsible for all damages incurred due to improper or lack of protection.

1.13 Site Lighting

.1 Provide and pay for temporary site lighting for night time hours. Install lamps in suitable locations to obtain unobstructed light at an average intensity of 50 lumens over the working areas during hours of operation. Provide temporary lighting that provides a minimum of 10 lumens over the entire site during the remainder of the day.

.2 Perform daily inspection of site lighting and replace burned out and missing lamps. Promptly relocate any lights that become obstructed by new work.

2. PRODUCTS

Not Applicable

3. EXECUTION

Not Applicable

END OF SECTION

1. GENERAL

1.1 General

.1 This Section addresses general requirements for temporary vehicle movement, site access and parking during construction both on and off site.

.2 During progress of the Work, make adequate provision to accommodate normal traffic along streets immediately adjacent to or crossing the Work so as to minimize inconvenience to the general public.

.3 Give minimum 48 hour notice or as otherwise required by local bylaws to local police, fire departments, emergency services and municipal works authorities prior to beginning construction and comply in all respects with their requirements.

.4 Inform all owners or occupants of properties where access is affected in the advance of proposed road and/or sidewalk closures.

1.2 Reference

.1 Regulate traffic in accordance with the Traffic Control Manual for Work on Roadways, Province of B.C., Ministry of Transportation and Highways, and the requirements of WorkSafe BC.

1.3 Administrative Requirements

.1 Coordinate with The Village of Lions Bay, Engineer and Owner on managing traffic during the Work.

1.4 Submittals

.1 Provide traffic management plan with the following:

.1 Traffic routing plan: show sequences of construction affecting use of roadways, time required for each phase of the work, plans for signage, barricading and striping to provide protection or passage for pedestrians and vehicles.

.2 Truck access routing plan: provide haul routes for Contractor's trucks. Include cleaning activities, daytime parking and methods to minimize impacts along existing roadways.

1.5 Protection of Public Control

.1 Comply with requirements of Acts, regulations and bylaws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul material or equipment.

.2 Working on travelled way:

.1 Place equipment in position to present minimum interference and hazard to travelling public. Do not use public roads as a holding/staging or cleaning area for vehicles.

.2 Keep equipment units as close together as working conditions will permit on same side of travelled way.

.3 Do not close any lanes of road with approval of the Engineer. Before re-routing traffic erect suitable signs and devices in accordance with applicable regulations.

.1 Keep travelled way well graded, free of potholes and of sufficient width that required number of lanes of traffic may pass.

.2 Provide and maintain reasonable road access and egress to property fronting along or in vicinity of the Work unless other reasonable means of road access exists.

1.6 Information and Warning Devices

.1 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from the Work which may impact normal road usage.

.2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in applicable regulations.

.3 Place signs and other devices in locations recommended in said regulations.

.4 Continually maintain traffic control devices in use by:

.1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

1.7 Control of Public Traffic

.1 Provide competent flag persons, properly equipped as specified in applicable regulations in the following situations:

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

.2 When it is necessary to institute one-way traffic system through the Work Site or other blockage where traffic volumes are heavy, approach speeds are high or traffic signal system is not in use.

.3 When workers or equipment are employed on travelled way at other locations where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

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

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

1.8 Roadways

.1 If authorized to use existing roads for access to Site, maintain such roads for duration of Contract and make good damage resulting from contractors' use of roads.

.2 Prior to final inspection, obtain and submit to Owner written signed releases from owners of all roads used for Site access, verifying that roads have been adequately restored and left in a satisfactory condition.

.3 Trim loads of trucks hauling excavated material, cement, sand, stone, gravel, debris or other loose material before leaving the site, and ensure that the bodies of such vehicles are tight so that no spillage of loads occurs.

1.9 Access to Utility Installations

.1 Do not obstruct hydrants, valve or control pit covers, valve boxes, curb stop boxes, fire or police call boxes, and all other utility controls, warning systems, and appurtenances.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 General

.1 Mobilization and demobilization shall include the Contractor's costs of mobilization at the beginning of the project and the cost of demobilization at the end of the project.

1.2 Mobilization

.1 Mobilization shall consist of preparatory work and operations including, but not limited to, those necessary to the movement of personnel, equipment, supplies and incidentals to the Site; and for all work and operations which must be performed or costs incurred prior to beginning work on the various items on the Site.

1.3 Demobilization

.1 Demobilization shall consist of cleanup work and operations including, but not limited to, those necessary for the removal of personnel, equipment, and incidentals from the Site.

1.4 Payment

.1 Refer to Section 01 20 01 – Measurement and Payment.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 General Requirements

.1 Field engineering survey services to be provided by the Contractor, to measure and stake the site, verify existing conditions, to lay out the Work for construction, obtain as-built information and for measurement of quantities.

.2 Provide pre- and post-construction surveys as indicated and specified.

1.2 Submittals

.1 Submit documentation in accordance with Section 01 32 19 to verify accuracy of field engineering work.

1.3 Quality Assurance:

.1 Perform all surveys affecting the line and elevation under the direction of a qualified surveyor licensed to practice in the Province of British Columbia.

.2 Provide surveys, checking of layout, measurement of quantities and compilation of record data as requested by the Engineer.

.3 Provide acceptable survey assistants to the Engineer to assist in measuring and checking the Work.

2. PRODUCTS

2.1 Reference Information

.1 Establish permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in project record documents.

.2 Provide all survey based upon NAD83 UTM co-ordinates.

.3 Engineer will provide the Contractor with the existing digital survey and AutoCAD files with reference points and bench mark information.

2.2 Survey Requirements

.1 Perform all surveying, establish lines and levels, locate and layout, by instrumentation.

.2 Provide pre-construction and as-built survey as reasonably applicable of the following:

.1 All above ground and underground utilities, including inverts, and structures.

.2 Bottom of tank excavation and top of prepared subgrade elevations.

.3 Provide survey over entire site on a maximum 3 metre by 3 metre grid.

.3 The location of each elevation shall be described in detail in words and located on the plan. Contours shall be provided with intervals of 0.5 metres and shall be careful to include appropriate breaklines and site features in accordance with best practice for accurate earthwork quantities.

3. EXECUTION

3.1 Survey Reference Points and Legal Survey Markers

.1 Existing survey control points are designated on Drawings.

.2 Locate, confirm and protect control points and legal survey markers prior to starting Work. Preserve permanent reference points during construction.

.3 Replace legal survey markers lost or destroyed as a result of construction activities at no cost to the Owner.

.4 Make no changes or relocations without prior written notice to the Engineer.

3.2 Records

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major siteworks, prepare and submit to the Owner a certified digital survey showing dimensions, locations, angles, and elevations of the work.

.3 Submit a certificate signed by a registered surveyor certifying that the elevations and locations of completed Work are in conformity with the Contract Documents.

3.3 Sequencing and Scheduling:

.1 Dates for Pre- and Post-Construction Survey at the site shall be coordinated with the Owner’s Representative.

END OF SECTION

1. GENERAL

1.1 Description

.1 This section describes administrative procedures preceding preliminary and final inspections of Work.

1.2 Inspection and Declaration

.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Engineer in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Engineer Inspection.

.2 Engineer Inspection: Engineer and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, commissioned, and are fully operational.

.4 Certificates required by regulatory authorities have been submitted.

.5 Operation of systems have been demonstrated to Owner's personnel.

.6 Work is complete and ready for Final Inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Owner, Engineer, and Contractor. If Work is deemed incomplete by Engineer, complete outstanding items and request reinspection.

.5 Declaration of Substantial Performance: when Owner and Engineer consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance. Refer to General Conditions Clause 5.4 - Substantial Performance of the Work and Section 00 73 00 - Supplementary Conditions.

.6 Commencement of Lien Period: date of Owner's acceptance of submitted declaration of Substantial Performance shall be date for commencement of lien period.

.7 Commencement of Warranty Period: date of completion of all acceptance tests (Total Performance) shall be date for commencement of warranty period.

.8 Final Payment: When Owner and Engineer consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. Refer to General Conditions Clause 5.7 for specifics to application. If Work is deemed incomplete by Owner and Engineer, complete outstanding items and request reinspection.

.9 Payment of Holdback: After issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount in accordance with General Conditions Clause 5.5.

1.3 Warranty Inspection

.1 The Engineer will arrange and conduct with the Owner and the Contractor a warranty inspection at the site prior to expiration of the warranty period.

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 Description

.1 This section supplements the requirements for the provision of operation and maintenance manuals as described in Section 01 32 19.

.2 Furnish complete operations manuals and maintenance information as specified in this section for installation check-out, operation, maintenance, and lubrication requirements for each unit of mechanical, electrical, and instrumentation equipment or system and each instrument.

.3 In some instances, this requirement is reinforced by additional references within individual technical specification sections, however, the inclusion or exclusion of additional references within the Contract shall not supersede or otherwise limit the generality of the foregoing and these requirements shall govern.

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

.5 Provide asset management information in Excel format for all equipment as required by the Owner.

1.2 Submittals

.1 The submission and acceptance of the "Equipment Operating and Maintenance Instruction" manual is a condition precedent to the certification of substantial performance.

.2 Submit operation manuals and maintenance information in accordance with Section 01 32 19. Submittals may be checked for general compliance with the requirements of this section.

.3 Submit complete operations manuals and maintenance information as soon as possible after review of project submittals but no later than 30 days before the Date of Substantial Performance.

.4 Submit a copy the operation and maintenance data in digital format. PDF file structure is suitable for this submittal.

.5 Provide four (4) complete sets of operating and maintenance manuals.

.6 Provide electronic copy of asset management information for all equipment in format provided by the Owner.

1.3 Binders

.1 Submit the complete operations manuals in an identified three-post, hard-covered, plastic-jacketed binder.

.2 For operations manuals and maintenance information smaller than the dimensions in Item 1.3.1, remove, punch, and insert the contents in a binder with the required dimensions. The contents do not have to be changed to accommodate the size of the binder.

.3 Label each binder to designate the system or equipment enclosed with reference to the equipment number, and Specification Section. Provide each binder with a table of contents.

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

1.4 General Requirements

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

.2 Provide materials suitable for photographic reproduction. If copies are used, they are to be of equal clarity and quality as the original.

.3 Provide drawings, diagrams, and manufacturer's literature which are legible. Provide drawings which are no larger than 280 mm x 432 mm bound into the documents as a fold out. Drawings which are larger than 280 mm x 432 mm shall be folded and inserted into pouches inside the manual and file folders.

.4 All instructions in these operations manuals and maintenance information to be in simple language.

.5 Mark manufacturer's standard documents to delete extraneous information not applicable to the equipment, assembly, subassembly or material supplied. Cross out or remove and eliminate any extraneous material for models, options, or sizes not furnished.

1.5 Operation Manual Contents and Organization

.1 Provide the manufacturer's standard operations and maintenance manuals for the equipment or instrument supplied. If the manufacturer's standard manuals do not contain all the required information, provide the missing information in supplementary documents and drawings inserted behind appropriate tabs in the manual binder.

.2 When more than one piece of identical equipment or instruments are supplied, provide only one set of operations manuals.

.3 Provide a cover sheet, bound as the first page of each manual, with the following information:

.1 Contract name and number.

.2 Functional title of the system, equipment, material, or instrument.

.3 Equipment number or, if more than one piece of equipment is provided, equipment numbers for equipment or instruments covered by the manual. Include functional description of equipment after each number.

.4 Relevant specification section number and drawing reference.

.5 Address and telephone number of the manufacturer and the nearest manufacturer's representative.

.4 Provide a table of contents listing the contents of the manual and identifying where specific information can be located.

.5 As a minimum, the operations manual must contain the following:

.1 Include the manufacturer's recommended step-by-step procedures for starting and stopping under normal and emergency operation. Include all specified modes of operation including recommended operation after the assembly or equipment has been in long-term storage.

.2 Provide control diagrams with data and information to explain operation and control of systems and specific equipment.

.3 Provide technical information on all alarms and monitoring devices provided with the equipment.

1.6 Field Changes

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

2. PRODUCTS

Not Applicable.

3. EXECUTION

Not Applicable.

END OF SECTION

1. GENERAL

1.1 Intent

.1 This section describes the Contractor's responsibilities in the commissioning and hand over of the process, electrical, and other systems to be installed as part of the Work.

1.2 Definitions

.1 System: For the purpose of this specification section, a System shall be defined as the equipment, piping, controls, ancillary devices, electrical power, etc. which together perform a specific function at the facility.

.2 Commissioning: For the purpose of this section, commissioning shall be defined as the successful operation of a System in accordance with its design requirements.

.3 Acceptance: For the purpose of the Specification, acceptance shall be defined as the formal turnover of a System to the Owner for operation and maintenance and shall occur after the end of commissioning of each System, once the Engineer, the Owner, and the Contractor have signed the "**Certificate of System Performance" (Form 104).**

1.3 Commissioning Team

.1 The work of commissioning will be conducted by teams comprised of personnel from the Contractor, the Owner and the Engineer.

.2 The Engineer shall be responsible for the direction of the commissioning work and shall have ultimate authority.

.3 The Contractor shall provide personnel representing the appropriate trades, including control and instrumentation personnel during the commissioning work. These personnel shall be skilled workmen, able to expedite any minor repairs, adjustments, etc. as are required to complete commissioning with as few delays as possible.

1.4 Commissioning Plan

.1 The Commissioning Team shall develop a detailed methodology for the commissioning of each System at least thirty (30) calendar days prior to planned start of commissioning work. The commissioning plan shall be drafted by the Contractor and include the following:

.1 Detailed schedule of events, including but not limited to the schedule for completion of testing of all component parts of the System.

.2 Planned attendance schedule for Manufacturer's Representatives.

.3 Contingency plans in the event of a process malfunction.

.4 Drawings and sketches as required to illustrate the planned sequence of events.

.5 List and provide details for all temporary equipment, pumps, etc. required to facilitate commissioning work.

.6 List of all personnel who the Contractor plans for the commissioning work and hand-over with information indicating their qualifications.

.2 The Commissioning Plan shall be reviewed and agreed by the Commissioning Team prior to its implementation. The Engineer shall be the final arbiter.

1.5 Equipment

.1 All process, mechanical, electrical, control and miscellaneous equipment related to a System shall be successfully installed and tested in with manufactures specifications.

.2 Staff training sessions shall be completed during the commissioning period.

1.6 Controls

.1 All controls which are the responsibility of the Contractor shall be installed and tested prior to commissioning.

.2 Every effort shall be made to ensure that the commissioning period provides for the full and comprehensive operation of the equipment under all anticipated normal and adverse operating conditions.

2. PRODUCTS

2.1 Manpower

.1 Supply all staff required during commissioning as necessary to assist the operations staff in the operation of the processes on a twenty-four (24) hour basis.

.2 Supply competent staff capable of maintaining, repairing and adjusting the equipment and controls to achieve the intended design functions during the commissioning period.

3. EXECUTION

3.1 Preparation

.1 Each item of equipment included in the System to be commissioned shall be satisfactorily tested. Piping, wiring, and other conduit systems shall be finished and tested.

.2 Services such as seal water, drains, etc. shall be completed and tested prior to the commissioning of any systems which require these services.

.3 Electrical connections shall be completed and inspected to the satisfaction of the governing authorities.

.4 Control systems shall be completed and the related control software debugged.

.5 Architectural finishes, heating and ventilation, and lighting shall be substantially complete.

3.2 Commissioning

.1 All components of the System shall be operated in the automatic / manual and the remote / local modes as required to prove proper operation.

.2 All minor and major alarm conditions will be induced to ensure that the process reacts as intended, the applicable alarms are enunciated.

3.3 Acceptance

.1 The commissioning of the System shall be considered acceptable when the process has operated in a stable manner, satisfying the design criteria for a period of fourteen (14) days, the last seven (7) of which shall be consecutive.

.2 When the System has been commissioned satisfactorily, the System shall be formally accepted for operation and routine maintenance by plant operations staff.

.3 The Contractor is advised that commencement of the one-year Warranty Period is tied to the issuance of the Notice of Acceptance and shall not commence until that milestone is achieved.

.4 The "**Certificate of System Performance" (Form 104)** will be granted when System has been commissioned and accepted, and all requirements of the General Conditions have been completed.

CERTIFICATE OF SYSTEM PERFORMANCE
FORM 104

We certify that the equipment listed below has been operated and tested as per the Specifications using water for at least fourteen (14) 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

END OF SECTION

DIVISION 02 – CIVIL

1. GENERAL

1.1 Description

.1 This section describes the requirements of monitoring of vibrations associated with blasting operations, if required.

.2 Furnish, install, maintain, monitor, and remove vibration monitoring equipment as indicated or as specified.

.3 Monitor vibrations, air blast overpressures and noise levels originating from construction operations as indicated or specified.

.4 Modify construction operation procedures if existing operations creates vibration, air blast overpressure, or noise exceeding specified amounts.

.5 Vibration monitoring for blasting shall conform to the requirements of this specification section and the requirements of all local authorities and applicable regulations.

1.2 Related Work

.1 Section 31 23 15: Blasting (if required).

1.3 Definitions

.1 Seismograph – device used to monitor ground vibration and air/water overpressures created by blasting and construction activities.

1.4 Submittals

.1 Submit the following in accordance with Section 01 32 19 – Submittals.

.1 The total number, arrangement, materials, location and monitoring plan and reporting for the instruments. Provide a plan showing layout and co-ordinates for each instrument.

.2 Vibration monitoring plan by an independent consulting firm.

.3 Readings and trending data with plots organized by date. Provide hard copy and electronic copy of the data in Excel format.

2. PRODUCTS

2.1 Equipment

.1 **Seismograph**

.1 Provide a low-frequency-sensitive, three-component seismic recording instrument with wave paper trace, variable trigger level setting, peak particle velocity memory operation

(in millimeters/second) and air blast overpressure and sound level readout capability that meets the following criteria:

.1 Seismic Frequency Range: 2 to 200 Hz (+/- 3 dB)

.2 Acoustic Frequency Range: 2 to 200 Hz (+/- 1 dB)

.3 Velocity Range: 0.5 to 100 millimeters per second.

.4 Sound Range: 90 to 140 dB linear.

.5 Transducer: Three mutually perpendicular axes: radial, transverse, and vertical.

.6 Recording: Time-history of waveform capability.

.2 Manufacturers:

.1 RST Instruments Ltd., Maple Ridge, BC;

.2 Slope Indicator Canada, Richmond, BC;

.3 or approved equal.

.3 All equipment to be fully operational and functioning as intended prior to any blasting.

3. EXECUTION

3.1 Quality Control

.1 Retain the services of an independent consulting firm to conduct the following required vibration monitoring services:

.1 Prepare, sign, and stamp the monitoring plan.

.2 Review daily reports as provided by field monitoring personnel, and provide oversight of the monitoring and of the interpretation of the monitoring equipment. This shall be performed by personnel with the following qualifications:

.1 Professional Engineer registered in the Province of British Columbia.

.2 Minimum of five (5) years experience in the vibration consulting field.

.3 Successfully completed at least five (5) projects with vibration-inducing operations, air blast overpressures, and noise levels equal to, or more severe than, those to be encountered.

.2 Installation, monitoring and interpretation of monitoring equipment in the field shall be performed by personnel with the following qualifications:

.1 Have at least three (3) years of experience in the operation of monitoring equipment proposed for use and interpretation of records produced by such equipment.

.2 Have installed, operated, monitored, and interpreted equipment and records on at least three (3) projects with vibration-inducing operations, air blast overpressures, and noise levels from similar construction activities.

.3 Perform and maintain calibration records on all instruments used to monitor the blasting, ground densification and piling programs.

.4 Engage a professional land surveyor acceptable to the Engineer, to carry out the survey readings to record data of positional instrumentation.

.5 Establish datum for readings based on an approved control point for instrument monitoring.

3.2 Preparation

.1 Before installing, repairing, or replacing any geotechnical instrumentation, the Engineer is to be informed a minimum of two (2) working days prior to commencement of work to allow any necessary measurements and readings to be made.

.2 The Contractor is responsible to conduct a pre-construction survey of the general condition of all structures within a 120 m radius of the vibration source areas.

.3 Confirm all instrument locations with the Engineer prior to installation.

3.3 Installation

.1 Vibration monitoring for structures should consist of a geophone firmly attached to the structure, or as recommended in the vibration monitoring plan.

.2 Vibration monitoring for utilities may consist of a geophone placed on the ground surface above the utility location and covered with sandbag or equivalent, or buried and covered at the location in suitable ground conditions at a depth as indicated in the vibration monitoring plan.

3.4 Monitoring

.1 Peak particle velocity measurements shall be carried out with an accuracy of 5 mm/s.

.2 Monitor vibrations and record the entire particle velocity wave train, not just peak velocities. Obtain accurate, legible seismometer records of monitored vibrations.

.3 Monitor vibrations by measuring the peak particle velocity in the vicinity of work. Peak particle velocity is defined as a maximum vector sum of three velocity components, measured concurrently in mutually perpendicular directions at any point by an instrument.

.4 The peak particle velocity for each blast shall be designed to achieve a maximum peak particle velocity of 12.5mm/s and shall not exceed 20mm/s as measured by the vibration consulting firm's personnel on, or at, the location as specified in the submitted vibration

monitoring plan, at any location identified within the vibration monitoring plan. The blast design shall be submitted to the Engineer prior to each blast.

.5 Air blast overpressures resulting from the blasting shall be recorded. Operate the instruments to make a permanent record for each blast.

.6 No person shall carry out or cause to be carried out Blasting which results in an Air Overpressure measured at the closest inhabited building to the blast which exceeds 120 dB(L), measured on the linear scale, unless otherwise specified or approved by the Engineer.

.7 In the event any recordings indicate that vibration (20mm/s) or air over pressure limits (120 db(L)) are being exceeded, immediately suspend all blasting and other vibration-inducing operations and submit a report to the Engineer. Revise operations to reduce vibrations and submit a copy of the revised procedure to the Engineer at no additional cost to the Owner.

.8 Restore or replace utilities, equipment, or structures damaged by vibrations or air blast overpressures at no additional cost to the Owner.

.9 Submit printed monitoring results to Engineer daily.

.10 The Engineer may request the Contractor to take additional readings or monitor additional locations dependent upon recorded vibrations.

.11 Provide routine monitoring of adjacent neighborhoods with respect to complaints of vibration and overpressure.

3.5 Protection of Instruments

.1 Take all necessary measures to protect the instruments from damage caused by equipment operators and others. Make all workers aware of the importance of the instrumentation and the necessity of taking special care to protect them from damage.

.2 Immediately repair or replace, at no expense to the Owner and as directed by the Engineer, any instrumentation that is damaged or destroyed during the period of this Contract.

3.6 Monitoring Locations and Frequency

.1 The Contractor shall prepare a vibration monitoring plan and shall carry out the Work at the locations identified in the vibration monitoring plan.

.2 The frequency of vibration monitoring may be adjusted based on the construction activity, equipment, methods and initial results.

END OF SECTION

1. GENERAL

1.1 References

.1 Canadian Federal Legislation.

.2 Canadian Environmental Protection Act (CEPA).

.3 Canadian Environmental Assessment Act (CEAA).

.4 Transportation of Dangerous Goods Act (TDGA).

.5 Motor Vehicle Safety Act (MVSA).

1.2 Description of Work

.1 Undertake demolition work in the following areas:

.1 Harvey tank site.

.2 Existing underground piping and electrical to the extent shown on the Drawings.

.3 Existing piping, valves, fittings, and appurtenances to the extent shown on the Drawings.

.4 Miscellaneous site civil, structural and electrical to the extent shown on Design Drawings.

.2 Refer to Drawings and Specifications for location and scope of demolition work including that noted in Item 1.2.1 above.

.3 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

.4 The Contractor shall complete the required assessment to conduct the demolitions including a Hazardous Building Material Assessment, if applicable.

1.3 Definitions

.1 Demolish: Remove existing structure to point below finish grade as specified or noted on Drawings.

.2 Remove: Remove portions of existing structure or utility above and below grade as specified or noted on Drawings.

.3 Abandon: Remove existing utility from service. Fully disconnect from portions of utility remaining in service. Remove portions of utility being abandoned from influence zones of structures, manholes or underground piping. Plug or cap ends of piping being abandoned as specified.

1.4 Submittals

.1 Demolition Plan:

.1 Schedule and operational sequence.

.2 If applicable, the location of local disposal including depth and finishing.

1.5 Protection

.1 Perform all work in accordance with Section 01 35 35 - Environmental Protection.

.2 Protect in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling.

.3 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of the Engineer and at no cost to the Owner.

.4 In all circumstances, ensure that demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

2. PRODUCTS

Not Applicable

3. EXECUTION

3.1 General

.1 Structures to be Demolished:

.1 Harvey Tank;

.2 Miscellaneous manholes, utility structures, and other structures shown on Drawings.

.2 Structures to be Removed:

.1 Harvey PRV Chamber Walls and Associated Piping.

.2 Portions of structures within influence zone of proposed potable water main and storm drainage pipes.

.3 Utilities and underground piping within influence zones of proposed structures.

.4 Abandoned utilities and underground piping within influence zones of proposed underground piping.

.5 Miscellaneous manholes, inlets, sidewalks, light poles, fencing, piping, paving, utilities, utility structures, underground piping, and other structures shown on Drawings.

.3 Piping and Equipment to be Abandoned:

.1 As shown on Drawings.

3.2 Preparation

.1 Inspect the site with the Engineer and verify extent and location of items designated for removal, disposal and salvage.

.2 Locate utilities to be disconnected before start of work.

.3 Notify, coordinate with, and obtain approval of utility companies before starting demolition.

.4 If applicable, prepare local disposal area including the separation and stockpile of organics and woody debris from soils for reuse in site finishing.

3.3 Post-Tensioned Concrete Tanks

.1 The existing Harvey Tank is understood to be constructed from Post-Tensioned Cast-In-Place Concrete. Post-tensioned concrete contains tendons that have been tensioned after the concrete has hardened.

.2 Tensioned tendons require controlled removal because the high level of potential energy stored in the tendons poses a risk to health and safety and can cause damage to property. It is also important that structural stability is retained during and after tendon removal, prior to the final demolition of the concrete element.

.3 The tendons can be subject to corrosion that weakens them and decreases the structural integrity of the building. Damage is not usually evident externally, even if strand breakage is extensive and conditions can vary widely even within an individual structure.

.4 Before demolishing post-tensioned concrete elements, review all available documentation on the building or structure including:

.1 Building plans, designs and specifications to understand the type of tensioning used, the load carried, anchorage points and number of tendons;

.2 Any construction photographs to obtain information on anchorage details, the construction sequencing, and any other measures may affect moisture access.

.5 The condition of the concrete and tendons should be considered before and during demolition including the following as applicable:

.1 Conducting a visual inspection to confirm loads, obvious deviations from the original design and waterproofing details;

.2 Assessing conditions throughout the building, as well as utilizing selective testing in representative areas to assess any weakening or breakage of tendons;

.3 Measuring humidity within tendon sheathing and analyzing any sheathing contaminants;

.4 Removing, inspecting and testing a small number of tendons to assess their condition;

.5 Continuing to monitor tendon tension.

.6 Suitable control measures should be implemented, which may include using steel plates or other restraint measures, at locations adjacent to pedestrian areas or where concrete cover is reduced. This will help to minimize the risk of personal injury or property damage arising from the unexpected release of stored energy in tendons.

3.4 Demolitions Operations

.1 Demolish existing structures including superstructure, foundation, footings, piles, utility drains, and other piping 450 mm below finished grade in landscaped areas, 900 mm below finished grade in pavement areas unless shown on Drawings. Completely demolish structures within influence zone of new structures.

.2 Notify the Engineer prior to backfilling structure remaining.

.3 Plug or cap utility drains and other piping in accordance with specified abandonment procedures.

3.5 Removal Operations

.1 Remove existing concrete, steel and masonry to extent indicated on Drawings. Provide smooth, straight joint or cut line.

.2 Remove utilities and piping to elevations and location shown on Drawings and plug and seal permanently with steel cap, concrete plug or other approved method in accordance with specified abandonment procedures.

.3 Remove abandoned utilities and underground piping within influence zone of proposed underground piping and proposed structures.

.4 Provide temporary shoring and bracing to transfer loads of existing construction to remain from construction being removed where noted.

3.6 Abandonment Operations

.1 Abandon utilities and underground piping within limits noted.

.2 Provide compatible cap for pressurized type piping. Provide thrust.

.3 Provide concrete plugs for gravity type piping. Plug shall be a minimum of 600 mm thick.

3.7 Disposal

.1 Dispose of materials not designated for salvage off site at approved Regional disposal facilities.

.2 At the discretion of the Owner and in accordance with Section 01 20 01 – Measurement and Payment, Article 6.1, disposal of concrete may be permitted at the local locations approved by the Owner and shown on the Drawings.

3.8 Restoration

.1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

.2 Contractor shall cap and cover locations of local disposal with reuse of stockpiled materials. The minimum cover depth shall be 500mm. All organic and woody debris shall be placed nearest to the final surface.

3.9 Cleanup

.1 Upon completion of work, remove debris, trim surfaces and leave site clean.

END OF SECTION

DIVISION 03 – CONCRETE

1. GENERAL

1.1 Work Included

.1 Forms and supporting falsework design.

.2 Wood or steel forms for all cast-in-place concrete.

.3 Special forms for architectural concrete formed finished.

.4 Tubular column forms.

.5 Controlled Permeability Formworkliners (CPF)

.6 Shoring, bracing and anchorage.

.7 Taping of form joints for special finishes.

.8 Form openings for other trades.

.9 Coordinate installation of concrete accessories.

.10 Set anchor bolts, anchors, sleeves, frames and other items supplied by other trades.

.11 Clean erected formwork prior to concrete placement.

.12 Remove forms and supporting falsework.

.13 Reshoring.

1.2 Related Work

.1 Concrete Reinforcement: Section 03 20 00

.2 Concrete Accessories: Section 03 25 00

.3 Cast-in-Place Concrete: Section 03 30 00

1.3 Reference Standards

.1 Design, construct and erect supporting falsework in accordance with the current National Building Code of Canada, CSA CAN3-A23.1 23.2, ACI 347 and applicable construction safety regulations.

.2 Design to be done by a Professional Structural Engineer registered in the Province of British Columbia. Same Professional Structural Engineer to inspect the erected formwork and certify, in writing, that it is in accordance with the design.

1.4 Submittals

.1 Submittals will comply with the provisions of Section 01 32 19.

.2 Submit for information to the Construction Manager shop and erection drawings for formwork and falsework for suspended slabs and walls greater than 2 metres high, at least 30 days prior to the start of construction. Submission will include the following items:

.1 Method and schedule of construction, shoring, stripping, and reshoring procedures; materials; arrangement of joints, ties, and liners; and locations of any temporary embedded parts. Formwork and falsework drawings will comply with CSA S269.1.

.2 Sequence of erection and removal of formwork/falsework.

.3 Formwork design data, such as permissible rate of concrete placement and temperature of concrete, in forms.

.4 Stamp and signature of a qualified Professional Engineer registered in British Columbia on each drawing for each submission.

.3 Where required by WorkSafeBC regulations, submit inspection report bearing the seal of the Professional Engineer registered in the Province of British Columbia who is responsible for the formwork and falsework. Submit reports prior to each concrete pour.

.4 Submit samples of waterstop products together with manufacturer's data sheets and recommended installation procedures.

.5 Certificate from an accredited certifying body indicating that wood for nonrented formwork plywood and dimensional lumber meets requirements of one or more of the following:

.1 Forest Stewardship Council (FSC).

.2 CSA Z809 – Sustainable Forestry Management.

.3 SFI 2015–2019 Standards and Rules.

2. PRODUCTS

2.1 Materials

.1 For Exposed Cast-in-place Surfaces: square-edged, smooth surfaced panels true in plane, free of holes, surface markings or defects.

.2 For Exposed Shotcrete Surfaces: refer to specification 33 6 13.16.

.3 For Unexposed Surfaces: square-edged T&G lumber, plywood or other material suitable to retain concrete without leakage or distortion.

.4 For liquid retaining cast-in-place concrete structures exterior and interior faces: Controlled Permeability Formwork Liners (CPF): Zemdrain Classic or Zemdrain MD, as manufactured By Max Frank, Inc., or equal.

.5 Wood Materials

.1 Plywood: Douglas Fir, conforming to CSA 0121-M, solid one side select sheathing tight face grade. Sound, undamaged sheets with clean true edges.

.2 Lumber: conforming to CSA 0141-M.

.3 Nails, Spikes and Staples: galvanized or phosphatized; conforming to CSA B111.

.6 Prefabricated Forms

.1 Steel Type: minimum 1.6 mm steel thickness; well matched, tight fitting and adequately stiffened to support the weight of concrete without deflection detrimental to structural tolerance and appearance of finished concrete surface.

.2 Tubular Column Type: round, spirally wound laminated fibre material, internally treated with release agent; sizes indicated on the Drawings.

.7 Accessories

.1 Form ties: suitable for water retaining structure construction. Form ties shall have no metal or other material within 40 mm of the concrete surface. The form tie assembly shall be provided with cone-shaped depressions at the concrete surface at least 25 mm in diameter and 40 mm deep. Portions of form ties that are to remain in place shall have an integral water barrier at or near the midpoint of the tie.

.2 Form Release Agent: colourless mineral oil which will not stain concrete or impair natural bonding or colour characteristics of coating intended for use on concrete. Form release agent shall be non-toxic.

.3 Corner or Chamfer Fillets: extruded plastic or mill finish pine, 20 mm width, maximum possible lengths, mitre ends.

.4 Sealing Tape: reinforced, self-adhesive polyvinyl-chloride.

3. EXECUTION

3.1 Examination

.1 Before starting the Work examine work done by others which affects the Work.

.2 Rectify all conditions which would prejudice proper completion of the Work.

.3 Commencement of the Work implies acceptance of existing conditions.

3.2 Erection

.1 Verify lines, levels and centers before proceeding with formwork. Ensure dimensions agree with the Drawings.

.2 Construct formwork and falsework to meet design and regulatory requirements and to produce finished concrete conforming to surfaces, shapes, lines and dimensions indicated on

the Drawings. Ensure visible lines of the curbs, walls and walks follow a smooth profile both vertically and horizontally.

.3 Arrange and assemble formwork to permit removal without damage to concrete. Set shores supporting forms for beams, slabs and other horizontal members on wedges or other approved adjustable supports.

.4 Install Controlled Permeability Formwork on all vertical concrete surfaces exposed to potable water in accordance with manufacture's written instruction.

.5 Align joints and make watertight to prevent leakage of cement paste and disfiguration of concrete. Keep form joints to a minimum. Where joints are shown on drawings, Contractor shall ensure that joint layout matches drawings. Tape form joints as necessary.

.6 Do not use earth surfaces to form concrete without written approval of the Engineer.

.7 Arrange forms to allow removal without removal of principal shores where these are required to remain in place.

.8 Obtain the Engineer's permission before framing openings in concrete slabs, beams and columns not shown on drawings.

.9 Provide falsework to ensure stability of formwork. Prop or strengthen all previously constructed parts liable to be overstressed by construction loads.

.10 Position form joints to suit any expressed lines required in exposed concrete. Arrange form board panels in a regular symmetrical pattern to the approval of the Engineer.

.11 Provide 25 mm chamfer on all internal and external corners and edges of exposed concrete.

.12 Form chases, slots, openings, drips and recesses as detailed on the Drawings.

.13 Set screeds with top edge level to required elevations.

.14 Check and re-adjust formwork to required lines and levels during placing of concrete.

.15 If form sheathing is to be re-used, remove nails and clean surfaces in contact with concrete before re-using.

3.3 Tolerance

.1 Construct formwork, falsework and all supporting or bracing members to provide concrete with dimensions, lines and levels within tolerances specified in CAN/CSA A23.1, latest edition.

.2 If tolerances are exceeded, remove, replace or modify placed concrete as directed by the Engineer at no cost to the Owner.

.3 Provide for settlement, closure of joints and elastic shortening of forms and shoring. Camber slabs and beams as shown on the Drawings. Maintain beam depth and slab thickness from cambered surface.

3.4 Construction Joints

.1 Locate joints not indicated on the Drawings so as to least impair the strength of the structure. Obtain the Engineer's approval before proceeding.

.2 Construct joints in accordance with CSA CAN3-A23.1-M. Provide waterstops for full length of joint and joint sealant as per standard details on drawings.

.3 Roughen surface of hardened concrete and thoroughly clean roughened surface to remove any foreign matter and laitance. Wet surface with water and ensure forms are tight against face of hardened concrete.

3.5 Inserts/Embedded Items/Openings

.1 Provide formed openings where required for pipes, conduits, sleeves and other work to be embedded in and passing through concrete members.

.2 Accurately locate and set in place items which are to be cast directly into concrete.

.3 Coordinate work of other sections and cooperate with trades involved in forming openings, slots, recesses, chases, and setting sleeves, bolts, anchors and other inserts.

.4 Coordinate installation of concrete accessories specified in Section 03 25 00 - Concrete Accessories.

.5 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

.6 Close temporary ports or openings with tight fitting panels, fit flush with inside face of forms, neatly

3.6 Form Ties

.1 Submit tie patterns form tie specifications to the Engineer for review prior to construction. Arrange ties in a uniform pattern; horizontally and vertically.

.2 Coat ties with cup grease or other approved material if ties are to be removed. Loosen ties twenty four hours after concrete has been placed. Ensure sufficient numbers of ties remain to hold form in place. Cutting ties back from the face of the wall is not permitted.

.3 Remove all cones from both interior and exterior concrete surfaces to permit grouting. Fill cone holes with small amount of grey sealant to cover metal rod.

.4 In water retaining structures, channels, tunnels or surfaces requiring waterproofing of removable ties; ties to be constructed of a single element with an integral waterstop at mid-length. Fill the holes and patch form ties as per waterproofing written instructions.

.5 The holes left by withdrawal of rods or the holes left by removal of ends of ties shall be filled solid with mortar after first being thoroughly wetted. For holes passing entirely through the wall a plunger-type pressure gun or other device shall be used to force the mortar through the wall starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside and when the hole is completely filled, the excess mortar shall be struck off with the cloth flush with the surface. Holes not passing entirely through the wall shall be filled with a small tool that will permit packing the hole solid with mortar. Any excess mortar at the wall shall be struck off flush with the surface.

.6 Do not use multi-element ties.

.7 Taper bolts may be used if holes are acceptably sealed.

3.7 Embedded Items

.1 Provide formed openings where required for pipes, conduits, sleeves and other work to be embedded in and passing through the concrete members.

.2 Accurately locate and set in place, items which are to be cast directly into concrete.

.3 Coordinate the work of other Sections and cooperate with trades involved in forming openings, slots, recesses, chases and setting sleeves, bolts, anchors and other inserts.

.4 Coordinate installation of concrete accessories specified in Section 03 25 00- Concrete Accessories.

.5 Set anchor bolts, sleeves and inserts accurately at the positions designated. Secure in position by means of wooden templates and ties to prevent shifting and floating during concrete placement.

.6 Do not set anchor bolts, sleeves and inserts into placed concrete.

.7 Core holes and grout anchor bolts for bearings.

3.8 Quality Control

.1 Inspect and check complete formwork, falsework, shoring and bracing to ensure that the work is in accordance with formwork design and that supports, fastenings, wedges, ties and parts are secure.

.2 Inform Engineer when formwork is complete and has been cleaned to allow for inspection. Engineer's inspection will be for verification that forms are clean and free from debris.

.3 For all exposed concrete surfaces. Do not patch formwork.

.4 Allow the Consultant to inspect each section of formwork prior to reuse. Formwork may be re-used if approved by the Engineer.

3.9 Cleaning

.1 Clean forms as erection proceeds to remove foreign matter. Remove cuttings, shavings and debris from within the forms. Flush completely with water to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

.2 During cold weather, remove ice and snow from within the forms. Do not use de-icing salts. Do not use water to clean out completed forms unless formwork and concrete construction proceed within a heated enclosure. Use compressed air or other means to remove foreign matter.

3.10 Preparations

.1 Apply form release agent in accordance with the manufacturer's recommendations prior to placing reinforcing steel, anchoring devices and embedded parts. Any embedded item to be cast in concrete, on which form release agent has been applied, shall be thoroughly cleaned prior to placing concrete.

.2 Do not apply form release agent where concrete surfaces are to receive special finishes or applied coverings which are affected by the agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces moist prior to placing the concrete.

.3 Do not apply form release agent where wood graining characteristics are required on finished concrete surfaces.

3.11 Form Removal

.1 Notify Engineer prior to removing formwork.

.2 The following table is to be used as a guide for the removal of forms and supports:

	Minimum Period of Time	Minimum Concrete Strength (based on 28-Day Strength)
Beams and slabs	14 days	80%
Columns	7 days	70%
Walls and critical vertical faces	7 days	70%
Prestressed tank reservoir walls only	12 hours with an ambient temperature above 10 °C	-
Footings	1 day	-

.3 Remove falsework progressively in accordance with regulatory requirements and ensure that no shock loads or imbalanced loads are imposed on the structure.

.4 In Winter Concreting: the forms for walls and suspended slabs shall remain in place for a minimum for seven days after placing concrete. The concrete must be wetted down immediately and be covered tightly with a 10 mil polyethylene sheet or suitable new tarpaulin. If the temperature differential between the concrete and the ambient air is greater than 10°C, the forms shall be in place until the temperature deferential is less than 10°C.

.5 Loosen forms carefully. Do not apply tools to exposed concrete surfaces. Concrete surface shall be kept continuously wet during the curing.

.6 Leave forms loosely in place for protection until complete removal is approved by the Engineer.

.7 Store removed forms for exposed architectural concrete in a manner that surfaces to be in contact with fresh concrete will not be damaged. Marked or scored forms will be rejected.

.8 Removal of forms subject to approved on-going curing procedures.

3.12 Reshoring

.1 Prepare a schedule of reshoring and submit to the Engineer for review.

.2 Reshore structural members where required due to design requirements or construction conditions or where subject to additional loads during construction.

.3 Install reshoring as required to permit progressive construction.

END OF SECTION

1. GENERAL

1.1 Work Included

.1 Reinforcing steel bars, welded steel wire fabric or fabricated steel bar for cast-in-place concrete, complete with tie wire and epoxy coating where shown on the drawings.

.2 Support chairs, bolsters, bar supports and spacers for reinforcing.

1.2 Related Work

.1 Cast-in-Place Concrete: Section 03 30 00.

1.3 Quality Assurance

.1 Perform concrete reinforcing work in accordance CAN / CSA-A23.1 latest edition.

.2 Submit two certified copies of mill test report of reinforcement supplied, indicating physical and chemical analysis.

.3 Submit samples and specifications of accessory materials prior to use.

1.4 Shop Drawings

.1 Concrete reinforcement will be inspected “in place”: Shop drawings for concrete reinforcement are not to be submitted to the Engineer for review.

1.5 Delivery and Storage

.1 Deliver, handle and store reinforcement in a manner to prevent damage and contamination.

.2 Deliver bars in bundles, clearly identified in relation to bar lists.

2. PRODUCTS

2.1 Reinforcing Materials

.1 Reinforcing Steel: 400 MPa yield grade; deformed new billet steel bars conforming to CSA G30. 18-M.

2.2 Accessory Materials

.1 Tie Wire: minimum 1.6 mm diameter annealed type, plastic coated for epoxy-coated reinforcement.

.2 Chairs, Bolsters, Bar Supports, Spacers: adequately sized for strength and support of reinforcing steel during construction and meeting cover requirements.

.3 Concrete Bricks: acceptable for support of bottom layer of bars in foundations on grade. Broken concrete blocks and wood supports are NOT acceptable.

.4 Mechanical Couplers: shall develop at least 125 percent of the specified yield strength of the bars, conforming to CSA A23.3M, ACI 318, ACI 349, complete with temporary cap, sizes as shown on drawings, as manufactured by Bar Grip Canada or approved equal. Couplers which require threads to be cut into the bar are not allowed.

3. EXECUTION

3.1 Examination

.1 Before starting the Work examine work done by others which affects the Work.

.2 Review any conditions which would prejudice proper completion of the Work.

.3 Commencement of the Work implies acceptance of existing conditions.

3.2 Fabrication

.1 Fabricate reinforcing steel in accordance with CAN / CSA-A23.1 latest edition and Drawings.

.2 Locate reinforcing splices not indicated on drawings at points of minimum stress. Lap splices are calculated in accordance with A23.3, refer to construction drawings for splice lengths.

.3 Fabricate within the following tolerances:

.1 Sheared length: ±25 mm.

.2 Depth of truss bars: plus 0, minus 10 mm.

.3 Stirrups, ties and spirals: ±10 mm.

.4 Other bends: ±25 mm.

.4 Welding of reinforcing bar is not permitted. Use of mechanical couplers is permitted if required.

.5 All bending shall be done cold with a suitable machine accurately producing all lengths, depths and radii shown on the bending details.

.6 After initial fabrication, reinforcing steel shall not be rebent or straightened unless so indicated on the drawings.

.7 Heating of reinforcing steel will not be permitted.

3.3 Installation

.1 Place reinforcing steel in accordance with reviewed placing drawings and CAN / CSA-A23.1. Chair slab reinforcing not further apart than 1.2 m in either direction.

.2 Adequately support reinforcing and secure against displacement within tolerances permitted.

.3 Unless noted otherwise on the drawings, place reinforcing steel to provide concrete cover, as follows:

.1 Surfaces in cast against earth: 75 mm

.2 All other: 50 mm

.4 Maintain alignment within the tolerances noted in CAN / CSA-A23.1.

.5 Do not disturb or damage vapour barrier while placing reinforcing steel.

3.4 Cleaning

.1 Ensure concrete reinforcing is clean and free from oil and deleterious matter.

.2 Remove all loose scale, loose rust and other deleterious matter from surfaces of reinforcing.

END OF SECTION

1. GENERAL

1.1 Work Included

.1 Premoulded joint fillers.

.2 Waterstops.

.3 Joint sealants.

.4 Surface Sealers.

1.2 Related Work

.1 Concrete Formwork: Section 03 10 00

.2 Cast-in-Place Concrete: Section 03 30 00

1.3 Submittals

.1 Submittals will comply with the provisions of Section 01 32 19.

.2 Submit samples of waterstop products together with manufacturer's data sheets and recommended installation procedures.

.3 Submit all concrete accessories to be used if they are not in the proved product list for approval to engineers 7 days in advance.

2. PRODUCTS

2.1 Pre-moulded Joint Fillers

.1 Asphalt-impregnated vegetable or cane fibreboard, conforming to ASTM D1751, sizes indicated on drawings.

.1 Approved products:

.1 W. R. Meadows Sealtight Fibre Expansion Joint

.2 Sika Canada, SikaSweel S-2

2.2 Backer Rod for Joint Sealant

.1 Backer Rod: closed cell vinyl foam.

2.3 Waterstops

.1 Gasket waterstops: provide a bentonite free rubber waterstop. Waterstop shall expand by a minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast. Provide minimum concrete cover as

recommended by the waterstop manufacturer. Provide manufacturer's pre-fabricated fittings at intersections.

.1 Approved products:

.1 Adeka; Ultraseal MC-2010MN

.2 Greenstreak; Hydrotite

.2 PVC Waterstops: provide PVC waterstops extruded from PVC compound and shall be flat ribbed type for 150mm wide with a minimum thickness of 12mm. Waterstop shall comply with CSGB-41-6P-35M or Corps of Engineers Specification CRD-C-572. Provide manufacturer's pre-fabricated fittings at intersections.

.1 Approved products:

.1 Greenstreak Model 679

.2 BoMetal, Inc. model FR-638

.3 Vinylex; Model R638.

2.4 Joint Sealants

.1 Provide watertight joint sealants at all vertical construction joint interior face (liquid side) and all horizontal construction joint both exterior and interior face with waterproofing admixture manufacturer recommended details.

.1 Approved joint sealant systems:

.1 Krystol Leak Repair System, Kryton.

.2 Xypex Repair of Cracks & Faulty Construction Joints, Xypex.

2.5 Surface Sealers:

.1 Provide concrete surface sealers on exposed liquid retaining concrete roof exterior surface and exposed exterior concrete stair and walk way surfaces, Sika Canada Sikagard 701W, W.R. Meadows Intraguard.

3. EXECUTION

3.1 Examination

.1 Before starting the Work examine work done by others which affects the Work.

.2 Review any conditions which would prejudice proper completion of the Work.

.3 Commencement of the Work implies acceptance of existing conditions.

3.2 Installation

.1 Coordinate the Work of this Section with other construction.

.2 Install all concrete accessories in accordance with drawings and manufacturer's recommendations; straight, level, and plumb.

.3 Construction joints shall be placed in accordance with drawings. Joint surface (vertical and horizontal) shall be roughened to a minimum of -6mm..

.4 Ensure embedded items are not disturbed during concrete placement.

.5 Install waterstops continuous in accordance with manufacture written instructions. Use manufacturer’s pre-fabricated fittings for intersections. Use manufacturer’s recommended accessories for installation and provide protection during concrete placement.

.6 When installing sealants, clean contact surfaces free from dirt, water, oil, rust, frost, and any other loose foreign matter. Follow product manufacturer’s instruction for installation.

.7 Install protective boards over joint covers when potentially damaging construction activities are not complete. Protect wall joint sealants from bituminous dampproofing with a fibreboard protection board, minimum 300 mm wide.

3.3 Joint Sealants

.1 After concrete has been allowed to dry, apply sealer to specified locations. Concrete shall be at least 28 days old.

.2 Apply all coats within 1½ hours of preceding application.

END OF SECTION

1. GENERAL

1.1 Work Included

.1 All plain and reinforced cast-in-place concrete shown on drawings.

.2 Cast-in-place concrete core wall for prestressed post tensioned circular tank

.3 Setting anchors, inserts, frames, sleeves and other items supplied by other Sections.

.4 Repairing concrete imperfections.

.5 Finishing formed concrete surfaces.

1.2 Related Work

.1 Section 03 10 00 – Concrete Formwork and Falsework

.2 Section 03 20 00 – Concrete Reinforcement

.3 Section 03 25 00 – Concrete Accessories

.4 Section 33 16 13.16 – Strand-Wound-Prestressed Concrete Tank

1.3 Quality Assurance

.1 Cast-in-place concrete to conform to CAN / CSA-A23.1 and ACI 350 M latest Edition.

.2 Testing shall conform to CAN/CSA-A23.2.

Cracking of concrete in the structure is generally considered to be detrimental to the long term performance. Contractor shall produce test results from an independent agency documenting compliance with the maximum allowable drying shrinkage of -0.040% that is classified as low shrinkage per CSA 23.1 for 100mm cross section concrete prism tests. Even though “low shrinkage concrete” is specified, cracking will occur and all cracks resulting in any visible leakage must be repaired by the contractor at no cost to the Owner.

1.4 Measurement and Payment

.1 Refer to Section 01 20 01.

1.5 Submittals

.1 Submittals will comply with the provisions of Section 01 32 19.

.2 Submit a copy of the Contractor’s Quality Control Program in accordance with Section 01 45 10 to the Construction Manager a minimum of 30 days before concrete production is scheduled to commence.

.3 Submit the concrete mix design for the various types of concrete as shown on the Contract Drawings and specified in this Section for review and acceptance at least 14 days in advance of when concrete production is scheduled to commence. The mix design(s) will include:

.1 Letter signed and sealed by a Professional Engineer registered in the Province of British Columbia confirming that the proposed materials and concrete mix design(s) will meet the strength, durability, and performance requirements of this Section and CSA A23.1.

.2 Cementitious content in kilograms per cubic metre or equivalent units for each type of cementitious material, maximum allowable water content in kilograms per cubic metre or equivalent units, design water/cement ratio, supplementary cementing material content, weights of aggregates in kilograms per cubic metre or equivalent units, slump limits, and air content limits.

.3 Quantity in millilitres per cubic metre or equivalent units and brand for each type of admixtures.

.4 Test data showing that the concrete supplied will meet the performance criteria stated in this Section for each concrete type. At a minimum, submit results from at least 5 sets of tests per concrete type proving that the minimum compressive strength, density, air content, temperature and slump of the concrete to be supplied meets or exceeds the performance criteria.

.5 Report on chloride ion penetrability test ASTM C1202 for concrete mixes with a specified exposure class of C-1. Perform one test per individual trial batch. Acceptance criteria will be in accordance with CSA A23.1. Further testing, during scheduled concrete pours may be required, as directed by the Engineer.

.6 Name and location of the proposed supplier, including distance and expected travel time from batch plant location to project site.

.7 Name and contact information of certified quality control testing independent laboratory and certified testing personnel. Certification will be in accordance with the requirements of CSA A23.1.

.8 Supplier’s certificate stating that the equipment for producing concrete meets CSA A23.1.

.9 Procedure for batching, transporting and placing concrete, in accordance with CSA A23.1. The intended method of placement will be taken into consideration in the development of the concrete mix design as concrete to be pumped must be designed accordingly.

.10 Material test reports for:

.1 Cementitious materials: Types and source of each material including mill test reports and manufacturer’s certificates of compliance. The Contractor will obtain, from the supplier, a mill test report and a manufacturer’s certificate of compliance representing each type of cementitious material for each month period representing the delivered shipment.

.2 Admixtures: Types and source of all admixtures, including expected dosage rates, point of addition to the mix, compatibility documentation and individual technical data sheets.

.3 Water: The source of mixing water.

.4 Miscellaneous: Documentation for all other materials proposed for the mix, showing conformance with applicable requirements and manufacturer/industry guidelines and standards.

.4 A concrete pour plan for review and discussion, 14 days prior to placing concrete, detailing for each type of concrete:

.1 Compressive strength, slump and air content of concrete;

.2 Quality control plan identifying type and frequency of tests, as well as action plan for dealing with non-conformances;

.3 Method of placement and any special considerations, including the proposed method for obtaining a roughened concrete surface;

.4 Location and details of construction joints, and sequencing requirements for placement of concrete in walls or structure units with heights in excess of 2.0 metres and lengths in excess of 20 metres;

.5 Formwork and shoring requirements;

.6 Curing methods, temperature control requirements and surface finish;

.7 Hot and cold weather concreting methods.

.5 Concrete material testing results will not be more than 12 months old at time of submission, except for CSA A23.2-2A and CSA A23.2-5A which will not be older than 90 days at time of submission.

.6 Any changes to the concrete mix design will be reviewed by the Engineer prior to the Contractor implementing the change.

1.6 Inspection and Testing

.1 Inspect complete formwork and concrete reinforcement prior to closing of forms or pouring concrete. Record inspections on Concrete Pour Release Form.

.2 Allow ample time for inspection and corrective work, if required, before scheduling concrete placement.

.3 Provide free access to all portions of the Work.

.4 Three concrete test cylinders will be taken for every 50m3 or less of each class of concrete placed.

.5 At least three test cylinders will be taken daily for each class of concrete placed. Atmospheric and concrete temperatures shall be recorded.

.6 One additional test cylinder will be taken during cold weather placement of concrete, and be cured on job site under same conditions as concrete it represents.

.7 One slump test and one air content test will be taken for each set of test cylinders taken. These tests shall be performed before the concrete from which the sample was taken is allowed to be incorporated into the concrete work.

.8 Verify quality of concrete with additional slump tests as required.

.9 Test concrete in accordance with CAN / CSA A23.2 latest edition. Test results will be issued to the Contractor, the Supplier, the Engineer and the Owner.

.10 For prestressed post tensioned circular concrete tank, follow inspection and testing procedure in Section 33 16 13.16.

2. PRODUCTS

2.1 Concrete Materials

.1 Cement: Type GU, General Use Hydraulic Cement to CAN/CSA A3001, latest Edition.

.2 Supplementary Cementing Materials: Pozzolan to CAN/CSA – A3001, Type F flyash.

.3 Fine Aggregate: Conforming to Normal Density Fine Aggregate, CAN / CSA-A23.1.

.4 Coarse Aggregate: Conforming to Normal Density Coarse Aggregate, CAN/CSA-A23.1, Group I, maximum size 20 mm, minimum size 5 mm. (Group II coarse aggregate may be used for concrete to be placed by pumping).

Ensure that no aggregates are used which may undergo volume change due to alkali reactivity, moisture retention or other causes. Suitability of aggregate may be confirmed with a petrographic analysis if deemed necessary.

.5 Water: All water to be used in the production of concrete shall be potable, clean and free from injurious amounts of oil, alkali, organic matter or other deleterious matter.

.6 Calcium chloride or admixtures containing calcium chloride shall not be used in concrete.

.7 Materials are to be obtained from the same source of supply or manufacturer for the duration of the project. All exposed concrete is to be consistent in colour.

.8 All other related concrete materials used for prestressed post tensioned circular tank shall comply with Section 33 16 13.16

2.2 Admixtures

.1 Air Entrainment: conforming to CSA A23.1

.1 Mid-range and super-plasticized concrete – use Micro-Air by Master Builders, where Master Builders water reducers are used or Darex AEA EH by Grace Canada Inc. where Grace water reducers are used.

.2 Concrete not super-placticized:

.1 MB-VR by Master Builders,

.2 Sternson NVR Sternson Ltd.,

.3 Darex AEA by Grace Construction Products,

.4 Or approved equal.

.2 Pozzolanic Material: conforming to CAN/CSA-A23.1, Type F.

.3 Concrete Waterproofing Admixture by Crystallization to maximum 2% of the cementitious material and shall be suitable for portable water application and approved by NSF 61. The waterproofing admixture shall be capable to seal cracks up to 0.4mm in width. Approved products: Xpypex Admix C-500 or Krystol internal Membrane K300 by Kryton.

.4 Supplemental flyash to a maximum of 40% of total cementitious material may be permitted.

.5 Chemical: conforming to ASTM C494 or C1017; water-reducing, strength increasing type, Super-plasticizing. Admixtures containing calcium chloride shall not be used.

.6 Ensure admixtures are compatible with each other and with construction materials.

.7 Silica fume shall meet all the requirements for Type “U” material as specified in CAN/CSA-A3001.

2.3 Accessories

.1 Epoxy Grout Injection: all epoxy used comply to the NSF-ANSI 61 requirements for use in portable water unless otherwise specified or approval by the Engineer. Epoxy grout injection shall be used for all crack repairs. Acceptable products include Sikadur 35 Hi-Mod LV, Sikadur 52, or an approved equal.

.2 Epoxy Bonding Agent: two component epoxy resin. Approved product: Sika Sikadur Hi-Mod or an approved equal.

.3 Flexible Polyurethane Grout Injection for portable water, NSF 61 acceptance products include: Sika Fix HH, Multiurethanes- Flexible, or an approved equal.

.4 Flexible Polyurethane Grout Injection for non-portable water, acceptable products include: Sika Fix PU LV, Sika Fix PU, or an approved equal.

.5 Polyurethane Sealant: Sikaflex 2 CNS, NSF 61 approved, or an approved equal.

.6 Curing Compound: for exterior slabs, and walls only, conforming to ASTM C309 Type 1 - clear or translucent. All concrete in contact with soil or water shall be moist-cured in conformance with CAN / CSA-A23.1.

.7 Moisture Retention Film: Master Builders Confirm or approved equal, for curing of slabs-on-grade only.

2.4 Concrete Mixes

.1 Supply concrete to meet the project performance requirement, structural Concrete specified herein is required to be "High Performance Concrete" for increased durability and watertightness, and reduced shrinkage and cracking, compared to regular structural concrete. The high performance mix shall be manufactured under the requirements of Clause 8.8 "Low Shrinkage Concrete" of CSA A23.1-09.

.2 The Contractor is responsible for the mix design.

.3 Proposed mix designs including complete details of product additives and certification that all additives are compatible with all other additives.

.4 All Concrete: minimum 28 day comprehensive strength, cement type, Class of exposure, water cement ratio, nominal coarse aggregate size, maximum slump and minimum slump and air content to be shown as detailed in Table A.

.5 Use High performance concrete grout for starting structural walls and columns, Class F1 exposure with reduced shrinkage.

TABLE A
PROPOSED CONCRETE MIXES

Type	Purpose	Minimum Compressive Strength (MPa) At 28 days	Cement Type	Max W/C Ratio	Nominal Size Coarse Agg. (mm)	Allowable Slump (max/min)	Air Entrainment (%)	Exposure Class	Concrete Waterproofing Admixture by Crystallization (% by wt. of Cementitious content.)
A	Structural Members in wet areas that retain liquid, including walls, slab and roof	35	GU	0.4	20-5 Group 1	70 ± 20	5 to 8%	C-1	Per manufacturer's recommendation
B	Concrete columns and other concrete not noted	35	GU	0.40	20-5 Group 1	70 ± 20	5 to 8%	F-2	-
C	Pipe encasement, equipment pads, benching	25	GU	0.45	20-5 Group 1	100 ± 20	4 to 7%	N	-
D	Mud mat	10	GU	NA	NA	NA	NA	N	-

Notes:

1. Grout mix for the start of wall pours will be the Mix as in Item 1 and 2 (above) but without the coarse aggregate. Height of started pour is 50mm.
2. Concrete placed in walls deeper than 3m may have an increased slump of 100±20mm by the addition of superplasticizer.
3. Supplemental flyash to a maximum of 40% of the total cementitious material may be permitted at the discretion of the Engineer.
4. Type A and B applies only for cast-in-place concrete structures, for prestressed post tensioned circular concrete tank, follow section 33 16 13.16.

3. EXECUTION

3.1 Examination

.1 Before starting the Work examine work done by others which affects the Work.

.2 Review any conditions which would prejudice proper completion of the Work.

.3 Commencement of the Work implies acceptance of existing conditions.

3.2 Preparation

.1 Preconstruction Concrete Meeting

.1 Prior to concrete construction, hold a meeting to discuss all design requirements and any potential production or construction issues to avoid delays during the implementation of the work.

.2 Have representatives of every party involved in the concrete work attend the meeting, including but not limited to: Contractor's superintendent, concrete subcontractor's Foreman and Cement Finisher, Ready-mix concrete producer, Admixture manufacturer(s), Laboratory responsible for the concrete design mixes and trial mixes, and Concrete pumping subcontractor, if applicable.

.3 The representative of the intended procedures and Quality Assurance for: Concrete Owner, the Engineer and the Independent Laboratory responsible for field quality control will also attend the meeting. Coordinate with the Engineer at least 10 days prior to the scheduled date of the meeting.

.4 Provide a description of the intended procedures and quality assurance for: Concrete mix production, delivery and discharge, Concrete mix testing including storage facilities by the Contractor and procedures, Formwork construction and alignment, installation of formliners, Concrete handling, pumping, and placement, Concrete finishing, Curing procedures, Concrete protection in hot, cold or windy weather, and watertightness.

.5 Ensure that each party's interests are discussed, and procedures refined to provide optimum concreting practice for the project.

.6 Distribute minutes of the meeting to all parties present and with related individuals within five (5) days of the meeting.

.7 Ensure that procedures established and agreed at this meeting are carried out during construction.

.8 If additional procedures are required, meet again, discuss, develop, submit and follow the revised procedures.

.2 Pre-Planning Requirements

.1 Two weeks (14 calendar days) prior to placing of concrete, obtain Engineer's approval of the proposed method for the protection of the concrete during placing and during in adverse weather.

.2 Submit the proposed sequence of casting for review by the Engineer including the location of the proposed construction joints. Where possible sequence the casing schedule so that walls are placed as soon as possible after their supporting footing or slabs were placed.

.3 Complete and submit the Concrete Pour Release Form prior to placing any concrete.

.4 Provide three working days' notice of the proposed time of commencing of concrete placement. The Contractor will be responsible for the Engineer's testing companies standby time costs in the event a concrete pour does not commence within 90 minutes time indicated in the three days' notice.

.5 Obtain the engineer's approval prior to placing concrete.

.6 Coordinate with the concrete supplier with respect to the workability requirements for the concrete. Do not add water to the concrete after the initial batching unless approved by the Engineer, and the concrete supplier. If approval is granted, a record of the amount of water added must be kept and a copy submitted to Engineer within three days for their records.

.7 Establish and maintain accurate records of poured concrete items to indicate date, location and size of pour, air temperature, concrete temperature, previously placed concrete temperature, batch ticket and test samples taken.

3.3 Placing Concrete

.1 Place concrete in accordance with requirements of CAN/CSA-A23.1 and as indicated on drawings.

.2 Handling equipment shall be kept free from hardened concrete or foreign material, and cleaned at frequent intervals.

.3 Immediately before concrete is placed, all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and right, and that all reinforcing steel is in the correct position and secured against movement during the placing operation. All forms shall be thoroughly cleaned and all debris, snow, ice or other foreign material removed. Chemicals shall not be used to remove ice or hardened concrete from the forms. All forms shall be thoroughly soaked with water except in freezing weather.

.4 Handling equipment shall be kept free from hardened concrete or foreign material, and cleaned at frequent intervals.

.5 Ensure all anchors, seats, plates and other items to be cast into concrete are securely placed, and will not interfere with concrete placement.

.6 Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent the separation or loss of the ingredients. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling or flowing. Vibrators shall not be used to move concrete. Under no circumstances shall the concrete which has partially hardened by deposited in the forms.

.7 When concrete placement is started, it shall be carried on as a continuous operation until the placing of the section is completed. When shown on the Drawings, concrete shall be placed in the sections indicated and according to the sequence given.

.8 Maintain accurate records of cast-in-place concrete items. Record date, location of pour, quantity, air temperature and test samples taken.

.9 Ensure reinforcement, inserts, embedded parts, formed expansion and control joints are not disturbed during concrete placement.

.10 Prepare set concrete by removing all laitance and loose materials and applying bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.

.11 Vibrate concrete using the appropriate size equipment as placing proceeds in strict accordance with CAN / CSA-A23.1. Check frequency and amplitude of vibrations prior to use. Provide additional standby vibrators in the event of equipment failure.

.12 Where placing operations would involve dropping the concrete more than 1.5 metres, it shall be placed through “canvas elephant trunks” or galvanized iron chutes. Concrete levels shall not be raised at a rate greater than that for which proper vibration may be affected.

.13 The concrete surfaces shall be protected from rain until the final set occurs.

.14 A minimum of 72 hours shall elapse between adjacent pours separated by construction joints or expansion joints, for prestressed concrete tank, a minimum of 36 hours shall be used.

.15 Do not place concrete in the interior of a building if carbon dioxide producing equipment has been in operation inside the building during the 12 hours preceding the pour. Such equipment shall not be used during placing or for 24 hours after placing. During placing and curing concrete, surfaces shall be protected by formwork or an impermeable membrane from direct exposure to carbon dioxide, combustion gases or drying from heaters.

.16 Honeycomb or embedded debris in concrete is not acceptable; correct defects.

.17 Remove and replace defective concrete in accordance with Clause 3.16 – Defective Concrete of this section.

3.4 Construction Joints

.1 Joints not indicated on the Drawings shall be located so as to least impair the strength of the structure. The location of these joints shall be subject to the prior approval of the Engineer. Joints shall be in accordance with CAN/CSA-A23.1, or as indicated on Drawings or directed by the Engineer.

.2 Where the Contractor elects to employ construction joints other than shown and the Engineer so approves, waterstops shall be provided for the full length of the joint if required by the Engineer and without additional compensation to the Contractor.

.3 The surface of hardened concrete shall be roughened and thoroughly cleaned of foreign matter and laitance, and shall be thoroughly wetted with water but not saturated and the forms re-tightened against the face of the hardened concrete before depositing additional concrete. Epoxy bonding agents may be required as directed by the Engineer.

3.5 Vibrator

.1 The use of mechanical vibrators is required.

.2 A sufficient number of vibrator shall be employed so complete compaction is ensured.

.3 At least one extra gasoline powered vibrator shall be on hand for emergency use.

.4 Vibration shall not be continued to the extent that water forms on the surface.

.5 Avoid any disturbance to concrete that has become too stiff regain plasticity when vibrated.

.6 Vibration shall not be applied directly to steel which extends into partially hardened concrete.

.7 Vibration is intended as a method to consolidate the concrete and is to be used for that purpose. Therefore all floor slabs, walls and roof must be Adequately vibrated to consolidate the concrete around the reinforcement.

3.6 Cold and Hot Weather Concreting

.1 Conform to requirements of CAN / CSA-A23.1.

.2 Protect slabs being finished during drying conditions above 25 °C and / or during high winds with moisture retention film.

3.7 Concrete Protection for Reinforcement

.1 Ensure reinforcement is placed to provide minimum concrete cover in accordance with CAN / CSA-A23.1 and with Section 03200 of this Specification.

3.8 Screeding

.1 Screed concrete for slabs in accordance with CAN / CSA-A23.1 and ACI 117. Screed to maintain a Class A surface flatness, measured by the straightedge method. Slope to drain as shown on drawings.

3.9 Conduits and Pipes

.1 Conduit and pipe shall not be embedded in water retaining concrete structures unless it is indicated on the Drawings or approved by the Engineer.

.2 Conduit and pipe embedded in concrete shall not be of a material harmful to the concrete and shall:

.1 Not displace more than 4% of the area of the cross section of a column on which stress is calculated, including the area of concrete displaced by the bending of the conduit or exit path of the conduit out of the column.

.2 Not exceed one-third the solid portion of the slab thickness.

.3 Not be spaced closer than three diameters on centre.

.4 Have a concrete covering of not less than 40 mm.

.3 Be so installed that it will not require cutting, bending or displacement of the reinforcement or impair the structural strength of the system. .

3.10 Install Items Specified Under Other Sections

.1 Install hangers, sleeves, anchors, etc. specified under other Sections.

.2 Pour concrete after other trades have satisfactorily installed their materials.

.3 Do not eliminate or displace reinforcement to accommodate hardware. Consult Engineer prior to relocation of hardware.

3.11 Equipment Pads

.1 Provide concrete pads for equipment where and as indicated on drawings. Adjust dimensions of pads to reviewed shop drawings. Unless shown otherwise on drawings, height of pads to be minimum 100 mm and extend 100 mm beyond equipment base.

.2 Insert bolts and sleeves and pack solidly with non-shrink grout, in accordance with setting details and templates.

.3 Steel trowel surface smooth: as per Section 03 10 00 – Concrete Formwork and Falsework.

3.12 Curing and Protection

.1 Cure and protect freshly placed concrete in accordance with CAN / CSA-A23.1 and as specified.

.2 Surfaces of concrete which are protected by formwork which is left in place for 7 days shall not require any additional curing except as specified for hot weather. If the formwork is removed or loosened (so as to allow moisture to escape from the concrete surface) in less than 7 days, the concrete shall receive moist curing as above i.e. in conformance with CAN/CSA-A23.1 until 7 days have elapsed since the concrete was placed.

.3 No concreting will be allowed until all materials required for curing are on-site and ready for use.

3.13 Formed Concrete

.1 Inspect concrete surfaces immediately upon removal of forms.

.2 Treat imperfections in formed surfaces in accordance with CAN/CSA A23.1.

.3 Modify or replace concrete not conforming to qualities, lines, details and elevations specified herein or indicated on drawings.

3.14 Finishing Formed Surfaces

.1 Finish all exposed formed concrete surfaces, including interior wall surface submerged in water, with a smooth-form finish conforming to CAN/CSA-A23.1. Concrete exposed to potable water shall be cast against forms using controlled permeability formwork liners (CFP) and all bug holes, form ties, and honeycombing shall be patch to provide a smooth finish.

.2 All surfaces 500 mm below soil can be finished with rough-form finish conforming to CAN/CSA A23.1.

3.15 Finishing Walks, Curbs, Ramps, Stairs

.1 Finish edges to smooth radius.

.2 On walks, platforms and ramps, tool control joints across at 1.8 m on centre, unless otherwise noted in the Specifications or on the drawings.

.3 Broom finish surface of steps, walks, curbs and ramps.

.4 Apply curing compound to manufacturer's directions.

3.16 Grouting

.1 Install non-shrink grout under equipment bases as shown on drawings and in accordance with the manufacturer's recommendations.

3.17 Defective Concrete

.1 Concrete not meeting the requirements of the Specifications and Drawings shall be considered defective concrete.

.2 Concrete not conforming to the lines, details or grades specified herein or as shown on the drawings shall be modified or replaced. Finished lines, dimensions and surfaces shall be correct and true within tolerances specified herein and in Section 03 10 00 – Concrete Formwork and Falsework.

.3 Concrete placed which results in excessive honeycombing or other defect in critical areas of stress shall be repaired or replaced.

.4 To conform to the strength requirements, the average of all tests shall exceed the specified strength. When five or more tests of the same class of concrete are available, the average of any five consecutive tests shall be equal to, or greater than the specified strength, and no strength test shall fall more than 3.5 MPa below the specified strength. Implement corrective measures if tests are below specified strength:

.1 Changes in mix proportions for the remainder of the Work, for which mix designs shall be submitted in accordance with the Submittal secion.

.2 Cores drilled and tested from the areas in question in accordance with CAN/CSA-A23.2. The test results shall be indicative of the strength of the in-place concrete.

.3 Load testing of the structural elements. The changes in the mix proportions and the testing shall be at the Contractor's expense.

.4 Concrete failing to meet the specified strength requirements shall be repaired or replaced.

3.18 Patching

.1 Inspect concrete surfaces immediately upon removal of all formwork.

.2 No patching or repairing shall be carried out without the approval of the Engineer.

.3 Patch imperfections when concrete is green.

.4 Remove all exposed metal form ties, nails and wires, break off fins and remove all loose concrete.

.5 Thoroughly wet all form tie pockets and patch with patching mortar followed by proper curing.

.6 Honeycombing shall be chipped out to sound concrete. The edge around the perimeter of the area shall be sawcut to a depth of 25mm minimum with the edges perpendicular to the surface to eliminate all “feather” edges. All repairs of honeycomb shall be a proprietary repair material. Thoroughly wet and patch with patching mortar followed by proper curing. If honeycombing extends to the depth of the reinforcement, the chipping shall be continued to a depth of 1.4 times the diameter of the largest reinforcing bars or 40 mm minimum beyond the layer of reinforcement.

.7 The sheet shall be continuously covered with a 6 mil polyethylene sheet and heated to above 15°C for 14 days.

.8 Chip and edge breaks in the concrete shall be repaired as noted above.

.9 All visibly cracks in liquid retaining structures shall be repaired. Submit a detailed plan and details for review by Engineer before beginning any repair or injection. As the standard repair methodology, unless otherwise approved by the Engineer, cracks shall be injected with epoxy until leaking stops. Clean face of concrete after injection is complete. If the injection fails for the existing structure the crack shall:

.1 For leaking cracks in the reservoir wall, inject cracks with polyurethane grout in accordance with manufacturer's recommendations.

.2 Be routed out square to a depth and width of 20mm.

.3 Be thoroughly cleaned.

.4 Have a bond breaker placed in the bottom of the routed slot.

.5 Be primed in accordance with the manufacture's recommendation.

.6 Be sealed with a polyurethane sealant such as Sikaflex 2C NS EZ Mix (NSF61 Approved) by Sika Canada, or an approved equal.

.7 Sealant shall be allowed to cure in accordance with manufacture's written procedures.

3.19 Finish Types

.1 Class 1- Rubbed Finish. Finish all formed concrete exposed to view with a rubbed finish to CAN/CSA A23.1.

.2 Class 2- Common Finish. Finish all formed concrete exposed inside valve chamber or interior surface of non-water holding structures. Common finish to consist of smooth form finish to CAN/CSA A23.1 plus the filling, repair or removal of all imperfections, defects or holes exceeding 3 mm in any dimension.

.3 Class 3- Rough Form Finish. Finish all formed concrete in contact with backfill with a rough form finish to CAN/CSA A23.1.

3.20 Finishing of Unformed Surface

.1 Finish slabs to CAN/CSA A23.1 and finishing schedule detailed on Architectural drawings.

.2 Do not sprinkle dry cement or dry cement/sand mixture over concrete surfaces.

.3 Tolerance to be by Straight Edge method to CAN/CSA A23.1

3.21 All exterior surfaces expected to view to receive sealer

3.22 Water Tightness Test

.1 Test in compliance with ACI 350.1 and as specified below.

.2 On completion of construction of water retaining structures, notice engineer for visual inspection on concrete surfaces. Repair any through cracks in the wall greater than 0.3mm from the interior of the structure.

.3 Conduct leakage tests after the repair of cracks are cured as per manufacture's instruction. Test structures prior to backfilling. Test each cell and chamber independently.

.4 Reservoir roof shall be flood tested 3 days for leakage by flooding or constant sprinkling of the surface. Any leakage or visible cracking shall be repaired.

.5 Fill the structure to the maximum liquid level shown on the Drawings and keep it filled for an absorption period of 3 days, by the addition of water as required. Use only potable water for testing.

.6 Repair all visible leaks at cracks and form ties. Removal all efflorescence on the wall surfaces after the leaks are sealed.

.7 If repairs require the water level to be lowered, carry out a further 3-day absorption period after the water level has been raised again to the maximum level.

.8 At the expiration of the absorption period, record the level of the water surface and record further measurements 24 hours, 48 hours, 72 hours and 96 hours thereafter. For open structures, place an evaporation tray in the open in a protected location during this period. The structures will be deemed watertight and acceptable if, after due allowance for evaporation and rainfall, the total leakage does not exceed 0.1% of the water volume per 24-hour period.

.9 Contractor to propose repair materials and method for engineer's approval. Carry out a further 3-day period leak test after the repair is completed for engineer's inspection.

3.23 Clean-up

.1 As work on placing concrete progresses, remove from site all debris and excess materials. Work area shall be kept continuously clean, so as not to interfere with proper inspection or the work of other Trades.

.2 At completion of the Work, remove from site all debris, excess materials and equipment.

END OF SECTION

1. GENERAL

1.1 Work Included

.1 Finish concrete floors.

.2 Sealer for roof of water reservoir.

1.2 Quality Assurance

.1 Perform work to requirements of CAN/CSA-A23.1 and ACI 117 - Proposed Floor Flatness and Levelness Specification.

2. PRODUCTS

2.1 Curing Compound

.1 Curing Compound: moisture retention requirements to conform to ASTM C309, clear Sternson Florseal or Master Builders Masterseal. Not to be used on surfaces that are in contact with potable water or to be sealed.

.2 Sealer: Shall be a deep penetrating solvent free silane or silane/siloxane sealer.

.1 Hydrostop Sealer by Kryton Product

.2 Sikagard 705L by SIKA.

.3 Or Approved Equal

3. EXECUTION

3.1 Examination

.1 Before starting the Work examine work done by others which affects the Work.

.2 Notify the Engineer of any conditions which would prejudice proper completion of the Work.

.3 Commencement of the Work implies acceptance of existing conditions.

3.2 Bull Floating

.1 Immediately after screeding, bull float floor surfaces to remove ridges and fill voids.

.2 Complete bull floating before any excess moisture or bleed water is visible on surface.

3.3 Mechanical Floating

.1 Mechanical float floor surfaces when bleed water has disappeared and surfaces are sufficiently hard to prevent working excess mortar to surface.

.2 Continue floating as necessary to produce surfaces of uniform texture, free from hollows, bumps and screed marks.

.3 For surfaces to be trowelled, continue floating as necessary to embed coarse aggregate particles firmly below surface mortar.

.4 Hand float in restricted areas, corners, etc.

3.4 Trowelling

.1 Trowel floor surfaces with mechanical trowelling machines fitted with steel blades.

.2 Commence trowelling when surfaces are sufficiently hard to prevent working excess fine material to surface.

.3 Perform additional trowelling at intervals so final trowelling is done just before concrete becomes so hard that further trowelling is ineffective.

.4 Finished trowelled surfaces to be hard, dense and free from blemishes and other imperfections.

.5 Hand trowel in restricted areas, corners, etc.

.6 Cure concrete as specified under Section 03 30 00 – Cast-in-Place Concrete.

.7 Protect, all hardened floors from damage during construction.

3.5 Sealer

.1 Sealer is applied on roof exterior surface only.

.2 Ensure concrete is at least 28 days old and has passed the leak test before applying sealer

.3 Remove all laitance, dirt, dust, debris, grease and other substances from concrete surfaces.

.4 Prepare sealer in accordance with manufacturer's directions.

.5 Apply sealer, using quantities and coverage to manufacturer's directions.

3.6 Curing Compound

.1 Apply curing compound on all concrete floors not exposed to potable water or sealed.

.2 Coverage to be 0.1 L/m2 using short nap rollers, brushes or low pressure spray equipment.

.3 Apply after final trowelling when concrete surfaces are sufficiently hardened to prevent marring, and before surfaces start to dry.

3.7 Floor Finishing

.1 Class A- Steel Trowel Finish: Not used

.2 Class B - Float Finish. Finish tank bottom, and valve chambers floors: Finishing tolerance: moderately flat.

.3 Class C - Exposed Aggregates: Not used.

.4 Class D- Non-Slip Surface: Finish with non-slip boomed finish. Corrugation to be square across the slab with a uniform pattern and depth not exceeding 3 mm. Finish edges and form control joints with approval tools. Finishing tolerance: flat.

.5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

3.8 Floor Finish Tolerances

.1 Surfaces of finished suspended floor slabs shall conform to design grade as follows:

Final elevation to fall between:

Elevation	D	-	d + 10 mm
and elevation	D	-	d – 10 mm
where	D	=	the design elevation of the finished floor surface
	d	=	deflection of the base at the point of measurement occurring as a consequence of the slab's (or topping's) dead weight.

The alternative Straight Edge Method in A23.1 provides that the gap at any point under a 3m straight edge shall not exceed:

Conventional	12 mm
Moderately Flat	8 mm
Flat	5 mm
Very Flat	3 mm

.2 Finished floor slabs on grade to conform to 3 mm in 3 m and be within + 10 mm of design grade.

.3 Finished floors not meeting the specified requirements will be rejected and must be repaired.

END OF SECTION

1. GENERAL

1.1 Description

.1 This section specifies Portland cement based grout for general applications such as equipment bases, and which are not specified in other Sections.

1.2 Reference Standards

.1 Conform to the following reference standards:

.1 CAN/CSA A23.1, Concrete Materials and Methods of Concrete Construction.

.2 CAN/CSA A3001, Cementitious Materials for use in Concrete.

2. PRODUCTS

2.1 Acceptable Products

.1 For equipment bases: Masterflow 713 or 928 by Masterbuilders; M-Bed grout by Sternsons; Horngrout by Tamms; Sikagrout 212 HP by Sika Products.

.2 For general use: Set grout by Masterbuilders M-Bed Standard by Sternsons.

2.2 Materials

.1 Cement: to CAN/CSA A23.1, Type GU.

.2 Supplementary cementing materials to CAN/CSA A3001.

.3 Water to CAN/CSA A23.1.

.4 Chemical admixtures to ASTM C494 or C1017.

.5 Shrinkage compensating grout. Premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents. Compressive strength to be minimum 50 MPa at 7 days.

3. EXECUTION

3.1 Preparation

.1 Maintain surfaces and ambient air temperature of minimum 10 □C for a minimum period of 24 hours prior to, during, and 72 hours after application.

.2 If grouting in exposed conditions, provide and maintain temporary weatherproof enclosures from inclement weather during preparation, grouting and curing.

3.2 Mixing

.1 Mix grout dry and add water to bring mix to the correct consistency in a mechanical rotary mixer.

.2 Mix premix grout in accordance with manufacturer's instructions.

3.3 Inspection

.1 Notify Engineer 24 hours before commencing grouting operations.

3.4 Placing

.1 Roughen and clean contact surfaces and thoroughly wet with water prior to grouting.

.2 Prepare grout no earlier than 10 minutes before use and place in final position within 30 minutes.

.3 Ram dry pack against suitable back-up blocker.

.4 Grout using procedures in accordance with manufacturer's recommendations which results in 100% contact over grouted area.

.5 Grout under base plates to be installed to provide for full bearing. Remove all air pockets.

.6 Finish and tool grout exposed to view in a workmanlike manner consistent with the finish of adjacent materials.

.7 Continuously moist cure at temperature above 5 degrees Celsius for seven days and in accordance with manufacturer's recommendations.

END OF SECTION

DIVISION 05 – METALS

1. GENERAL

1.1 Description

.1 This section includes metal fabrications not specifically included in other Sections and required for completion of work as shown on Contract Drawings and in accordance with Contract Documents.

.2 Furnish labor, materials, equipment and incidentals necessary to install the products specified.

1.2 References

.1 ASTM International (ASTM)

.1 ASTM F1325M Specifications for High Strength Steel.

.2 ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-dip Galvanized Coatings

.3 A276: Standard Specification for Stainless Steel Bars and Shapes.

.4 F593: Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.5 F594: Standard Specification for Stainless Steel Nuts.

.2 National Association of Architectural Metal Manufacturers (NAAMM)

.1 MBG 533: Welding Specifications for Fabrication of Steel, Aluminum and Stainless Bar Grating.

.3 Aluminum Association

.1 Aluminum Design Manual–Specifications and Guidelines for Aluminum Structures.

.1 AA M31C22A41

.1 M31: Mechanical Finish, Fine Satin

.2 C22: Finish, Medium Matte

.3 A41: Clear Anodic Coating, Class I

.4 National Sanitation Foundation (NSF)

.1 61: Drinking Water System Components – Health Effects

.5 Canadian Standards Association (CSA):

.1 CAN/CGSB 1-GP-181 Ready Mixed, Organic Zinc

.2 CSA S16 Design of Steel Structures

.3 CAN/CSA-G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel.

.4 CSA G164 Hot Dip Galvanizing of Irregularly Shaped Articles.

.5 CSA W47.1 Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W59 Welded Steel Construction (Metal Arc Welding).

1.3 Submittals

.1 Submit the following shop drawings in accordance with Section 01 32 19.

.1 Submit shop drawings and product data showing materials of construction and details of installation for all items furnished under this Section. Shop drawings shall show sizes of members, method of assembly, anchorage and connection to other members.

.2 Test Reports

.1 Submit certified copies of mill test reports on each steel, stainless steel, or aluminum proposed for use showing the physical properties and chemical analysis.

.3 Product Data

.1 Manufacturer's catalogue sheets on pre-manufactured items.

1.4 Quality Assurance

.1 Comply with the requirements specified in Section 01 45 10.

.2 Test and inspect structural assemblies in accordance with Section 01 45 10.

.3 Aluminum

.1 Weld with gas metal arc (GMA) or gas tungsten arc (GTA) processes in accordance with AWS.

.4 Adhesive Anchors

.1 Adhesive Anchor Installers shall be trained and certified by manufacturer.

1.5 Delivery, Storage and Handling

.1 Insofar as practical, factory assemble items specified herein. Package, ship and tag unassembled materials in a manner that will protect materials from damage and will facilitate identification and field assembly.

.2 Package stainless steel items in a manner to provide protection from carbon impregnation.

.3 Protect painted coatings and hot-dip galvanized finishes from damage due to metal banding and rough handling. Use padded slings and straps.

.4 Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.

.5 Store fabricated items in a dry area, not in direct contact with ground.

1.6 Field Measurements

.1 The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of the work.

.2 The Contractor shall review the Contract Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

2. PRODUCTS

2.1 Miscellaneous Metal Shapes, Castings, Bolts and Accessories

.1 Stainless Steel Shapes

.1	Exterior and Submerged Uses:	AISI, Type 316
.2	Industrial Uses:	AISI, Type 316
.3	For Welding:	AISI, Type 316L
.4	Shapes and Bars	ASTM A276
.5	Plate, Sheet and Strip	ASTM A240

.2 Aluminium Shapes

.1	Structural Shapes	ASTM B308, Alloy 6061-T6
.2	Extruded Pipe	ASTM B429, Alloy 6063-T6
.3	Aluminium Sheet and Plate	ASTM B209, Alloy 6061-T6

.3 Stainless Steel Bolts and Nuts: F593 and F594, AISI Type 316

2.2 Post Installed Anchor

.1 Adhesive Anchors

.1 Products:

.1 Hilti Corporation, HIT-RE 500-SD or HIT-HY 200

.2 Power Fasteners, PE1000+Epoxy Adhesive Anchoring System

.3 Simpson Strong Tie, SET-XP Epoxy Tie or Acrylic-Tie

.2 General

.1 Adhesive anchors shall be Stainless Steel Type 316.

.2 Epoxy adhesive shall be ANSI/NSF approved for use in contact with potable water.

2.3 Neoprene Gasket

.1 Provide soft, closed-cell neoprene gasket material suitable for exposure to sewage and sewage gases conforming to ASTM D1056, Type 2, Class C, and Grade 1.

.2 Unless otherwise shown on Contract Drawings, provide neoprene gaskets with a minimum thickness of 6mm unless noted otherwise.

.3 Furnish neoprene gaskets without skin coat.

2.4 Vertical Ladders

.1 Fabricate ladders as shown in the drawings. Ladders shall be welded steel construction and 316L stainless steel.

.2 Minimum diameter of rungs shall be 20mm. The distance between rungs, cleats, and steps shall not exceed 300mm and shall be uniform throughout the length of the ladder.

.3 The minimum clear length of rungs or cleats shall be as shown on drawings.

.4 Coat rungs with coarse grain nonskid epoxy coating No. 6901T44 as supplied by McMaster-Carr Supply Company or acceptable equivalent product. Color of coating shall be yellow. Apply nonskid coating per manufacturer's recommendations.

.5 Ladder Safety Post

.1 Install ladder safety post on fixed ladders below hatch cover and design with a telescoping tubular section that locks automatically when fully extended. Completely assemble the unit with fasteners for securing to the ladder rungs in accordance with the manufacturer’s instructions.

2.5 Access Hatch

.1 Supply and install access hatch as shown in the drawings. All access hatches shall be stainless steel construction.

.2 Products:

.1 MSU Mississauga Type MG – Safety Hatch Drainage Frame. Stainless steel type 316 construction.

.2 Or approved equal.

2.6 Fall Prevention Anchor

.1 Supply and install fall prevention anchor as shown in the drawings. It shall be stainless steel construction and embedded in concrete reservoir roof.

.2 Products:

.1 Atlas Anchor System Type C Stainless Steel “Pour-in-place” pedestal roof anchor Model # CSP-9100-4R.

.2 Or approved equal

2.7 Fabrication

.1 Connections and Workmanship

.1 Fabricate details and connection assemblies in accordance with Contract Drawings and Specifications, with projecting corners clipped and filler pieces welded flush.

.2 Fit work together in fabrication shop and deliver complete or in parts, ready to be set in-place or assembled in field.

.3 Provide work true to detail; with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture free from defects impairing strength or durability.

.4 Provide clips, lugs, brackets, straps, plates, bolts, nuts, washers, and similar items, as required for fabrication and erection.

.5 Provide castings of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion; smooth and well cleaned by shot blasting.

.6 Welding

.1 Provide rigid and continuous welds or spot welded as specified and as shown on Contract Drawing. Dress the face of welds flush and smooth. Close fit exposed joints and locate where least conspicuous.

.2 Weld aluminum work on the unexposed side when possible in order to prevent pitting or discoloration.

.3 Weld aluminum in compliance with the latest edition of AWS D1.2. Support and clamp component parts of built up members in proper position for welding.

.4 Weld shop connections and bolt or field weld connections, unless otherwise specified.

.5 Grind exposed edges of welds to 3mm minimum radius. Grind burrs, jagged edges, and surface defects smooth.

.6 Prepare welds and adjacent areas so there is:

.1 No weld spatter on or adjacent to weld or other area to be painted or coated.

.2 No sharp peaks or ridges along weld bead.

.7 Bolting

.1 Use bolts of lengths required so bolts do not project more than 6mm beyond face of nut. Do not use washers unless specified. Provide hexagonal head bolts with hexagonal nuts.

.2 Provide holes required for connection of adjacent or adjoining work wherever noted on Drawings. Locate holes for bolting equipment to supports to tolerance of +/ 2 mm of dimensions indicated.

3. EXECUTION

3.1 Examination

.1 Upon receipt of material at job site, inspect all materials for shipping damage. Replace damaged items at no cost to Owner.

.2 Examine supports for size, layout and alignment.

.3 Correct defects considered detrimental to proper installation.

3.2 Installation

.1 Provide items such as bolts, shims, blocks, nuts, washers, and wedging pieces to complete installation.

.2 Erect to lines and levels, plumb and true, and in correct relation to adjoining Work. Secure parts using concealed connections when practicable.

.3 Plumb and true vertical members to tolerance of 0.1 percent. Level horizontal members to tolerance of 0.1 percent.

.4 Use steel bolts to connect structural steel members. Use stainless steel bolts to connect structural aluminum members.

.5 Anchor Bolts and Concrete Anchors

.1 Preset anchor bolts using templates. Do not use concrete anchors in place of anchor bolts.

.2 After anchor bolts are embedded, protect projecting threads by applying grease and having the nuts installed until the time of installation of equipment or metalwork.

.3 Do not install concrete anchors until concrete has reached specified minimum compressive strength.

.4 Install concrete anchors in accordance with anchor manufacturer recommendation. Embedment depth of anchor shall be as recommended by the anchor manufacturer, but not less than as shown on Contract Drawings.

.5 Locate concrete anchors to clear reinforcing bars in concrete.

.6 Do not place new holes or enlarge unfair holes by use of cutting torch.

3.3 Ladders

.1 Anchor uprights to wall with angles or bent plates welded to uprights and anchored to wall. Grind welds smooth where required. Provide assemblies with no sharp or rough surface.

.2 Secure interior ladders as shown on drawings.

.3 Provide safety post as shown on drawings.

.4 Provide stainless steel angles, struts, rod hangers, closure plates, and brackets indicated.

3.4 Painting, Repair and Protection

.1 Under no circumstances shall aluminum contact dissimilar metal, provided gasketed or coating between aluminum and dissimilar metals. Coat or provide gasket between concrete and aluminum surfaces.

.2 Apply an anti-seize compound on all stainless steel fasteners to prevent galling.

END OF SECTION

DIVISION 13 – SPECIAL CONSTRUCTION

1. GENERAL

1.1 Scope of Work

.1 Design, furnish and erect a glass-fused-to-steel, bolted-steel water storage tank, including foundation, tank structure and tank appurtenances as shown on the contract drawings and described herein.

.1 Tank to be installed by supplier in accordance with AWWA D103.

.2 Tank supplier to design, supply and install/erect:

.1 Concrete foundation

.2 All pipes as noted on drawings excluding underdrain system

.3 Tank and peripheral equipment.

.3 Tank supplier's professional engineer registered in the province of British Columbia to sign and seal installation of tank.

.4 Contractor responsible for:

.1 Underdrain

.2 Supply and installation of monitoring equipment and controls

.3 All work beyond approximately 1.0 m horizontally from limit of tank as shown on the drawings.

.2 All required labour, materials, equipment and construction services shall be included.

1.2 Qualifications of Tank Supplier

.1 The tank manufacturer shall have specialized in the design and fabrication of factory coated Glass-Fused to Steel bolted tanks for at least ten years prior.

.2 The tank supplier shall provide a reference list of five tanks presently in potable water service of equal or greater size than that described herein in service for a minimum of 10 years.

.3 The Engineer's selection of factory applied glass-fused-to-steel bolt together tank construction for this facility has been predicated upon specific criteria, construction methods, and optimum coating for resistance to internal and external tank corrosion. Deviations from the specified design, construction or coating details will not be permitted.

.4 The bidder shall offer a new tank structure as supplied from a manufacturer specializing in the design, fabrication and erection of factory applied glass-fused-to-steel, bolt together tank systems.

.5 Erection of the structure is to be by the bidding contractor who must be licensed in the Province of British Columbia. The contractor shall be fully responsible for the entire installation including concrete foundation, tank erection, and the ultimate water tightness of the complete installation.

.6 Strict adherence to the standards of design; fabrication, erection, product quality, and long term performance, established in this Specification will be required by the Owner and Engineer.

1.3 Submittal Drawings and Specifications

.1 Construction shall be governed by the Owner's drawings and specifications showing general dimensions and construction details, after written approval by the Engineer of detailed erection drawings prepared by the tank bidder. There shall be no deviation from the drawings and specifications, except upon written order from the Engineer.

.2 The bidder is required to furnish, for the approval of the Engineer and at no increase in contract price, four (4) sets of complete specifications and construction drawings for all work not shown in complete detail on the bidding drawings. A complete set of structural calculations shall be provided for the tank structure and foundation. All such submissions shall be stamped both by a Licensed Professional Engineer or Structural Engineer employed on the tank manufacturer's engineering staff and an engineer licensed in the province of British Columbia.

.3 When approved, two sets of such prints and submittal information will be returned to the bidder marked "**APPROVED FOR CONSTRUCTION**" and these drawings will then govern the work detailed thereon. The approval by the Engineer of the tank supplier's drawings shall be an approval relating only to their general conformity with the bidding drawings and specifications and shall not guarantee detail dimensions and quantities, which remains the bidder's responsibility.

.4 The tank manufacturer's standard published warranty and installation manual shall be provided to the Engineer. The tank manufacturer's standard Operation and Maintenance Manual shall be provided to the Engineer upon receipt of approved drawings.

1.4 Tank Design Criteria

.1 Bolted steel storage tank design to AWWA D103.

.2 Tank Size - The factory glass-fused-to-steel, bolted-steel water storage tankshall have a nominal diameter of 16.00 meters with a nominal sidewall height (to roof eave) of 12.150 meters.

.3 Tank Capacity - Usable Tank capacity shall be 2.33 million liters at 11.65 meters liquid depth.

.4 Floor Elevation - Finished floor elevation shall be set at Elevation 100.04 m.

.5 Tank Design Standards

.1 The materials, design, fabrication and erection of the bolt together tank shall conform to the AWWA Standard for "Factory-Coated Bolted Steel Tanks For Water Storage" – ANSI/AWWA D103.

.2 The tank coating system shall conform solely to Section 12.4 Glass Coatings of ANSI/AWWA D103.

.3 All materials furnished by the tank manufacturer which are in contact with stored water shall be certified to meet ANSI/NSF Additives Standard No. 61. Certification of a coating type alone will not be sufficient to meet this requirement. Certification of a distributor, and not the tank or coating manufacturer, will not be accepted.

.4 Design Loads

.1 Specific Gravity 1.0 (Min. design shall be 1.0)

.2 Design Freeboard: 0.5 meters.

.3 Tank Roof Live Loads: 1.0 kPa

.4 Seismic Load:

.1 Site Class: Class C

.2 Importance Category: Post Disaster

.3 Importance Factor: $I_E = 1.5$

.4 Standard: AWWA D103 using values from NBCC 2010

.5 Wind Velocity 100 mph (AWWA D103 Std. 100 mph)

.6 Allowable Soil Bearing Capacity:

.1 As per Geotechnical Assessment Report prepared by EXP., November 2017.

.1 Serviceability Limit State (SLS): 150 kPa

.2 Factored Ultimate Bearing Limit (ULS): 225 kPa

.3 Modulus of Subgrade Reaction: 48,000 kN/m3

1.5 Tank Manufacturer's Warranty

.1 The tank manufacturer shall include a warranty for the tank materials and coating. As a minimum, this warranty shall provide assurance against defects in material or workmanship for the minimum period specified.

.2 Structure

.1 The tank manufacturer shall warrant the tank will be free from defects in workmanship and materials, under normal and proper use, maintenance and operation, during the period expiring on the earlier of (i) five years after liquid is first introduced into the tank or (ii) 62 months after a substantial portion of the tank sheets is delivered to site where the tank is erected, if the tank is purchased with the tank manufacturer's cathodic protection system.

2. PRODUCTS

2.1 Bolted Steel Storage Tank

.1 Tank shall include:

.1 Tank complete with knuckle roof, roof access hatch and walkway, shell manway access, all complete with security locks.

.2 Stainless steel pipes to latest edition of AWWA C220 – Stainless Steel Pipes 100 mm and larger. Latest edition. Stainless steel pipes to be Type 316 L, Schedule 10S.

.3 Mounting hardware to be stainless steel.

.4 Coating to be Vitrium™ glass-fused to steel or approved alternative.

.5 Electrical controls

.2 Supplier's structural engineer to seal and sign off on tank design drawings.

2.2 Plates and Sheets

.1 Plates and sheets used in the construction of the tank shell, tank floor (when supplied) and tank roof, shall comply with the minimum standards of AWWA 2009.

.2 Design requirements for mild strength steel shall be ASTM A570 Grade 30 with a maximum allowable tensile stress 18,000 psi.

.3 Design requirements for high strength steel shall be ASTM A607 Grade 60 with a maximum allowable tensile stress of 30,000 psi.

2.3 Rolled Structural Shapes

.1 Material shall conform to minimum standards of ASTM A36 or AISI 1010.

2.4 Horizontal Wind Stiffeners

.1 Intermediate horizontal wind stiffeners shall be of the "web truss" design with extended tail to create multiple layers of stiffener, permitting wind loads to distribute around tank.

.2 Web truss stiffeners shall be of steel with hot dipped galvanized coating.

.3 Rolled steel angle stiffeners are not permitted for intermediate stiffeners.

2.5 Bolt Fasteners

.1 Bolts used in tank lap joints shall be ½" – 13 UNC-2A rolled thread, and shall meet the minimum requirements of AWWA D103, Section 4.2.

.2 Bolt Material

.1 SAE Grade 2 (1" bolt length)

.1 Tensile strength – 74,000 psi Min.

.2 Proof Load – 55,000 psi Min.

.3 Allowable shear stress – 18,163 psi (AWWA D103).

.2 SAE grade 8/ASTM A490 (> 1" bolt length) heat treated to:

.1 Tensile Strength – 150,000 psi Min.

.2 Proof Load – 120,000 psi Min.

.3 Allowable shear stress – 36,818 psi (AWWA D103).

.3 Bolt Finish – Zinc, mechanically deposited.

.1 2.0 Mils Minimum – under bolt head, on shank and threads, in accordance with the latest edition of ASTM B695, class 50, type 1.

.4 Bolt Head Encapsulation

.1 High impact polypropylene copolymer encapsulation of entire bolt head up to the splines on the shank.

.2 Resin shall be stabilized with an ultraviolet light resistant material such that the colour shall appear black. The bolt head encapsulation shall be certified to meet the NSI/NSF Standard 61 for indirect additives.

.5 All bolts on the vertical tank wall shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior.

.6 All lap joint bolts shall be properly selected such that threaded portions of the bolts will not be exposed to the "shear plane" between tank sheets.

.7 Bolt lengths shall be sized to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torquing will not be permitted.

.8 All lap joint bolts shall include a minimum of four (4) splines on the underside of the bolt head at the shank in order to resist rotation during torquing.

2.6 Sealants

.1 The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall be suitable for contact with potable water and shall be certified to meet ANSI/NSF Additives Standard 61 for indirect additives.

.2 The sealant shall be used to seal lap joints and bolt connections and edge fillets for sheet notches and starter sheets. The sealant shall cure to a rubber-like consistency, have excellent adhesion to the glass coating, low shrinkage, and be suitable for interior and exterior use.

.3 Sealant curing rate at 730 F and 50% RH

.4 Tack-free time: 6 to 8 hours

.5 Final cure time: 10 to 12 days

.6 Neoprene gaskets and tape type sealer shall not be used.

.7 Sidewall connections shall be by overlapping flat panels and shall not be flange style connection using gasket material to seal.

2.7 Foundation

.1 The tank foundation design shall be provided by the tank supplier, based on AWWA 103, CSA 23.3, and the soil bearing capacity as detailed in the geotechnical report.

.2 Foundation shall include:

.1 Design of concrete and reinforcing steel:

.1 Section 03 20 00 – Concrete Steel Reinforcement

.2 Section 03 30 00 – Cast-in-Place Concrete.

.2 Foundation, granular base, subbase, and subgrade to be approved and certified by geotechnical engineer.

2.8 Appurtenances

.1 Pipe Connections

.1 The pipe connections shall be designed to enter the water tank though the tank bottom, including.

.1 250 mm diameter 316L schedule 10S stainless steel water inlet pipe complete with Tidelex variable orifice inlet nozzle (typ.3);

.2 250 mm diameter 316L schedule 10S stainless steel water outlet pipe;

.3 250 mm diameter 316L schedule 10S stainless steel drain pipe;

.4 250 mm diameter 316L schedule 10S stainless steel overflow pipe.

.2 Outside Tank Ladder

.1 An outside tank ladder shall be furnished and installed as shown on the contract drawings.

.2 Ladders shall be fabricated of aluminum and utilize grooved, skid-resistant rungs.

.3 Safety cage and step-off platforms shall be fabricated of galvanized steel. Ladders shall be equipped with a hinged lockable entry device.

.3 Access – Roof Openings

.1 One roof top access hatch shall be provided as shown on the contract drawings in accordance with AWWA D103.

.2 The hatch opening shall be a minimum of 1.065 meters by 1.065 meters.

.4 Roof Vent

.1 A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level of sufficient capacity so that at maximum design rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.12 kPa.

.2 The overflow pipe shall not be considered to be a tank vent.

.3 The vent shall be constructed of aluminum such that the hood can be unbolted and used as a secondary roof access.

.4 The vent shall prevent the entrance of birds and/or animals by including an expanded aluminum screen (13 mm) opening. An insect screen of 0.7 – 0.8 mm shall be provided and designed to open should the screen become plugged by ice formation.

.5 Identification Plate: A manufacturer's nameplate shall list the tank serial number, tank diameter and height, and maximum design capacity. The nameplate shall be affixed to the tank exterior sidewall at a location approximately 1.5 meters from grade elevation in a position of unobstructed view.

.6 Tank Insulation

.1 The tank shell and steel roof shall have rigid insulation, complete with pre-painted metal cladding.

.2 The dome roof shall have rigid insulation on the underside of the roof.

2.9 Cathodic Protection

.1 A passive cathodic protection system shall be designed and supplied by the tank manufacturer if required.

2.10 Geodesic Dome Roof

.1 All structural frame members shall be made from AA6005A-T6, or AA6061-T6.

.2 Roof panels shall be made from AA3003-H16.

.3 Fasteners shall be AA2024-T4 aluminum or series 300 stainless steel as required by the manufacturers.

.4 Design sealant will be silicone, conforming to Federal Specification TT-S-0023.

.5 Gaskets shall be silicone, conforming to Federal Specification ZZ-R-765, Class 2, Grade 50 or equal, or neoprene, conforming to ASTM C509-.

3. EXECUTION

3.1 Foundation

.1 The tank foundation is a part of this contract and shall be installed by the tank supplier.

.2 The tank foundation shall be designed by the manufacturer to safely sustain the structure and its live loads.

.3 Tank footing design shall be based on the soil bearing capacity given in Section 2.5.4 as determined by geotechnical analysis performed by a licensed geotechnical engineer. The cost of this investigation and analysis is not to be included in the bid price. Copies of the soil report are to be provided to the bidder prior to bid date by the Owner or Engineer.

.4 Footing designs for soil bearing strengths less than that specified, and those designs deviating from tank manufacturers standard shall be the responsibility of the Owner and his Engineer based on tank live and dead loading data provided by the tank manufacturer.

3.2 Glass-Fused-to-Steel Coating

.1 All structural sheet steel shall be glass coated per the following guidelines.

.1 Sheets shall be media blasted on both sides to the equivalent of SSPC SP-10 (Near White Metal Blast Cleaning). After fabrication and prior to application of the coating, all sheets shall be thoroughly cleaned by washing and hot rinsing followed immediately by hot air drying.

.2 A base coat of glass frit containing nickel oxide shall be applied to both sides of the sheet.

.3 A second coat of milled cobalt blue glass shall be applied to both sides of the sheets.

.4 A third coat of glass shall be applied to all interior shell and floor sheet surfaces which must be a titanium dioxide reinforced mixture, white glass.

.5 The sheets shall be fired at a minimum temperature of 816 °C.

.6 Edge Coat: Prior to sheet glassing, sheet edges shall be rounded in profile per Porcelain Enameling Institute Technical Manual to enable the same glass coating to be applied to all four edges of the sheet and ensure full encapsulation of the sheet edges with a minimum thickness of 5 mils. Sealer or glass overspray as edge coating shall not be an acceptable alternative. As proof, tank supplier shall provide its edge coating procedure with bid for owner approval.

.7 Frits shall be individually tested in accordance with the latest revision of ISO 28706.

.8 Holiday Testing: A volt test is performed on every sheet. Any sheet registering a discontinuity on the interior surface or floor shall be rejected.

.9 Glass Thickness: Minimum glass thickness on the inside surface of the sheet shall be 10.0 mils. Glass thickness shall be measured using a calibrated magnetic induction type electronic dry film thickness gauge.

.10 Adherence: The coating shall be tested in accordance with ISO 28765 Class 2 or better. Any sheet that has poor adherence shall be rejected.

.11 Fish Scale Testing: The coating shall be tested for fish scale by placing full size production sheets in an oven at 204 °C for one hour. The sheets will then be examined for signs of fish scale. Any sheet exhibiting this characteristic will be rejected and the entire lot tested.

.12 Qualified glass coating: Aquastore Vitrium™ or approved alternative.

3.3 Tank Floor

.1 Concrete Floor

.1 The floor design is of reinforced concrete with an embedded epoxy coated steel starter sheet per the manufacturer's design and in accordance with AWWA D103, Sec. 13.4, Type 6.

.2 Levelling of the starter ring shall be required and the maximum differential elevation within the ring shall not exceed 0.125 millimeters (one-eighth (1/8) inch), nor exceed 0.0625 millimeters (one-sixteenth (1/16) inch) within any three (3) meters of length.

.3 A levelling plate assembly consisting of two 460 millimeters (8") long foundation bolts, 19 millimeters (3/4") in diameter and a slotted plate 90 millimeters x 280 millimeters x 9.5 millimeters thick (3 ½" x 11" x 3/8" thick) shall be used to secure the starter ring, prior to encasement in concrete. Installation of the starter ring on concrete blocks or bricks, using shims for adjustment, is not permitted.

.4 Place one butyl rubber elastomer waterstop seal on the inside surface of the starter ring below concrete floor line. Place one bentonite impregnated water seal below the butyl rubber seal. Install materials in accordance with tank manufacturer's instructions.

3.4 Sidewall Structure

.1 Field erection of the glass-fused to steel, bolted steel tank shall be in strict accordance with the procedures outlined by the manufacturer and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks, using factory trained and certified erectors.

.2 Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.

.3 Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to a liquid test, the Engineer shall visually inspect all surface areas.

.4 An electrical leak test shall be performed during erection using a wet sponge low voltage (max. 9 volt) leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturer's published touch up procedures.

.5 The placement of sealant on each panel may be inspected prior to placement of adjacent panels. However, the Engineer's inspection shall not relieve the bidder from his responsibility for liquid tightness.

.6 No backfill shall be placed against the tank sidewall without prior written approval and design review of the tank manufacturer. Any backfill shall be placed according to the strict instructions of the tank manufacturer.

3.5 Roof

.1 Geodesic Dome Roof

.1 Tank shall include a radially sectioned roof fabricated from aluminum, as produced by the tank manufacturer, and shall be assembled in a similar manner as the sidewall panels utilizing the same sealant and bolting techniques, to assure a weather/air tight assembly. The roof shall be clear-span and self-supporting or centre supported. Both live and dead loads shall be carried by the tank walls and any centre supports.

.2 The manufacturer shall furnish a roof opening which shall be placed near the outside tank ladder and which shall be provided with a hinged cover and a hasp for locking. The opening shall have a clear dimension of at least 1064 meters in one direction and 1064 meters in the other direction. The opening shall have a curb at least 100 millimeters inches in height, and the cover shall have a downward overlap of at least 50 millimeters inches, or a gazetted weather-tight cover in lieu of the 100 millimeter curb and 50 millimeter inch overlap.

.3 The dome and tank shall be designed to act as an integral unit. The tank shall be designed to support an aluminum dome roof including all specified live loads.

.4 The dome shall be clear span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring.

.2 Roof Vent

.1 A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level to the specifications in Section 2.8.4.

3.6 Field Testing

.1 Hydrostatic

.1 Following completion of erection and cleaning of the tank, the structure shall be tested for liquid tightness by filling tank to its overflow elevation.

.2 The erector in accordance with the manufacturer's recommendations shall correct any leaks disclosed by this test.

.3 The Owner shall furnish water required for testing at the time of tank erection completion, and at no charge to the tank erector. Disposal of test water shall be the responsibility of the owner.

.4 Labour and equipment necessary for tank testing is to be included in the price of the tank.

.2 Roof watertightness

.1 Following completion, test dome for water leaks according to procedure detailed in API-650, Appendix G.

3.7 Disinfection

.1 Standards

.1 The tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA Standard C652 “Disinfection of Water Storage Facilities” as modified by the tank manufacturer.

.2 Disinfection shall not take place until tank sealant is fully cured.

.3 Acceptable forms of chlorine for disinfection shall be:

.1 Liquid chlorine as specified in AWWA C652.

.2 Sodium hypochlorite as specified in AWWA C652.

.3 Calcium hypochlorite (HTH) is not acceptable.

.4 Acceptable methods of chlorination per AWWA C652:

.1 Section 4.1.1.

.2 Section 4.1.2 – chemical feed pump only (4.1.2.1.)

.3 Section 4.3

.5 Section 4.2 is not acceptable.

END OF SECTION

DIVISION 31 – EARTHWORKS

1. GENERAL

1.1 Scope

.1 This Section specifies the products and procedures to be used for the restoration of the Work Site.

1.2 References

.1	Master Municipal Construction Documents (MMCD Edition 2009)	The Master Municipal Contract Documents Association
.2	ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft- lb/ft^3 (2,700 kNm/m^3))
.3	British Columbia Landscape Standard	BC Society of Landscape Architects
.4	BCSLA/BCNLS	Landscape Standard Canadian System of Soil Classification

1.3 Definitions

.1 Travelled Roadways are defined as paved roads, road shoulders and gutters, sidewalks, paved or gravelled walkways, and other gravelled or paved surfaces used by vehicular or pedestrian traffic.

.2 Untravelled Areas are all areas not normally subjected to vehicle loading or pedestrian traffic and include open fields, easements, boulevards, and landscaped areas.

2. PRODUCTS

2.1 Concrete Walks, Curbs and Gutters

.1 Concrete mixes and materials for use in concrete walks, curbs and gutters shall conform to MMCD Section 03 30 20, Concrete Walks, Curbs and Gutters.

2.2 Topsoil and Finish Grading

.1 The properties and qualities of native topsoil, imported topsoil, and any other matter used as a growing medium for vegetation and finish grading shall conform to Section 32 91 19.13, Planting Soil and Finish Grading.

2.3 Seeding

.1 Grass seed and grass sod to be used in the application of seeding and sodding shall conform to MMCD Section 32 92 20 Seeding.

2.4 Trees, Shrubs and Groundcover

.1 Trees, shrubs and groundcover for use in restoration work shall be nursery grown stock or approved equal and shall conform to MMCD Section 32 93 01, Planting of Trees, Shrubs and Groundcover.

3. EXECUTION

3.1 Surface Restoration

.1 The Contractor shall restore all damaged travelled roadways and untravelled areas of the Work Site as the work progresses.

.2 The Contractor shall be responsible for maintaining temporary patched asphalt surfaces in good condition until permanent asphalt repairs are completed. If the Contractor fails to carry out any necessary maintenance within twenty-four (24) hours of receipt of notice from the Owner to do so, the Owner will do the necessary work at the Contractor's expense in terms of the General Conditions of Contract.

3.2 Granular Base Course

.1 Unless otherwise noted, a 300 mm thick layer of granular base shall be placed above the compacted backfill material in all trenches under travelled roadways. The granular base shall be compacted to at least 95% of Modified Proctor Density when tested in accordance with ASTM Specification D 1557.

.2 In the case of gravel surfaced travelled roadways and road shoulders, the granular base course shall be brought up to the road surface. The granular base shall be compacted to 95% Modified Proctor Density and shall be finished to match the adjacent existing road surface.

3.3 Temporary Restoration of Asphalt Surfaces

.1 At the end of each day's construction, and with the prior approval of the Engineer, the Contractor may temporarily repair the damaged pavement above the trench with cold mix asphalt, asphalt millings, or road gravel, to a level flush with that of the existing pavement.

.2 Asphalt millings and road gravel may only be used in low trafficked roads and only over a distance not exceeding the equivalent of one (1) city block. Cold or hot-mix asphalt repairs shall be used once this limit is reached.

.3 Depending on traffic conditions, the standard of maintenance, weather, and any complaints received, a temporary cold-mix asphalt repair may be left in place for a period of up to one

month. After the allotted period, the Contractor shall remove the temporary repair and apply a 50 mm minimum thick hot-mix asphalt patch and maintain it for at least three (3) months.

.4 The Owner shall have the right to determine which temporary repair materials can be used and how long they can be left in place, or whether the trench shall be patched with a 50 mm thick hot-mix asphalt layer immediately after backfilling and compaction. The Contractor shall have no claim against the Owner as a result of any such decision.

3.4 Permanent Restoration of Asphalt Surfaces

.1 After three (3) months, or as directed by the Engineer, the Contractor shall remove all temporary asphalt patches. The temporary asphalt, together with some existing original asphalt if necessary, shall be removed to produce a clean cut or full depth milled straight line edge on both sides of the trench. If the thickness of the existing pavement permits, an additional area of surface asphalt shall be removed by grinding out a 35 mm deep by 200 mm wide strip beyond the cut edges on both sides of the trench. Any residual asphalt and unsuitable base course material within the cut or milled lines shall also be removed.

.2 Where breaks and cracks have formed in the existing pavement as a result of the construction work, or there have been trench wall collapses and undermining resulting in a wider than usual trench outline, a new saw-cut line shall be made around these. In such cases, the cut lines shall be turned out at an angle of 45º to the trench line, pass the wider damaged areas along an alignment parallel to the trench line, and then turn back at an angle of 45º. The use of excessive deviated cut-outs shall be avoided.

.3 Where a saw-cut line is less than 750 mm from the edge of the existing pavement, that portion of the existing pavement shall be either entirely removed, or be milled over the whole width to a depth of 35 mm.

.4 The Contractor shall reinstate the underlying granular base course, or import new granular base material, to bring the granular pavement base to the specified thickness of 300 mm and to permit the placement of the specified thickness of new permanent asphalt pavement above it. Any disturbed base course material shall be re-compacted to a minimum 95% Modified Proctor Density.

.5 The exposed cut or milled edge of the existing pavement shall be cleaned, dried and coated with hot asphalt tack coat or emulsion to ensure a good bond between the existing pavement and the new hot-mix asphalt. The emulsion must be allowed to break (cure) before the asphalt mix is placed.

.6 The permanent hot-mix asphalt concrete shall be placed and compacted at a minimum temperature of 140°C in two lifts (base lift and surface lift) to a total minimum compacted pavement thickness of 100 mm or to the thickness specified on the Drawings.

.7 All other aspects of hot-mix asphalt concrete paving including mixing, equipment to be used, preparation, transportation, placement, compaction, joins and quality of finish shall comply with the relevant sections of the MMCD Specifications.

3.5 Concrete Walks, Curbs and Gutters

.1 The Contractor shall reinstate all concrete walks, curbs and gutters damaged by construction as soon as practicable after backfilling and compaction of the trench.

.2 Base preparation, formwork, concrete placement, jointing, tolerances, finishing, curing, and acceptance of concrete work for the reinstatement of concrete walks, curbs, and gutters shall conform to the relevant sections of the MMCD Specifications.

3.6 Road shoulder, pavement, Easements and Ditches

.1 Road shoulder, pavements, and easements shall be restored to a condition equal to or better than that which existed prior to construction. All surfaces shall be restored to a depth of not less than 100 mm.

.2 The Contractor shall restore unimproved boulevard or easement surfaces with material equivalent to that removed from the surface.

.3 The Contractor shall restore improved road shoulder, pavement or easements to match the existing conditions. Gardens shall be restored with topsoil or bark mulch, lawns with an approved topsoil followed by seed or sod to match existing lawn, and gravel surfaces with matching granular materials.

.4 Ditches that are removed or disturbed by construction shall be reshaped to the correct lines and grades and their surfaces restored with a minimum 300 mm layer of matching or specified material to ensure stability of sides and bottom against erosion.

3.7 Landscaping

.1 The Contractor shall promptly restore fields, cultivated areas, landscaping, retaining walls, rockwork, rockeries, lawns, gardens, fences, shrubs, trees and other improvements to at least their original condition, excepting that, with the approval of the Engineer, replanting, returfing or reseeding may be deferred until favourable weather conditions prevail.

.2 Topsoil shall be replaced to its original depth, but in no case shall be less than 150 mm deep. If hauled from elsewhere, it shall be of good quality approved by the Engineer.

.3 If restoration is not completed within two (2) weeks of backfilling, the Owner reserves the right to carry out or complete the restoration and charge the cost of such work to the Contractor.

.4 The execution of restoration activities related to topsoil placement, finish grading, seeding or sodding, planting of trees, shrubs and groundcover, and any other matters related to landscaping, shall conform to the relevant sections.

END OF SECTION

1. GENERAL

1.1 DESCRIPTION

.1 This section refers to those portions of the work that are unique to the supply and processing of aggregates. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.2 Related Work

.1 This section includes specifications for aggregates and granular materials referred to in the following sections:

.1	Excavating, Trenching and Backfilling	Section 31 23 01
.2	Manhole and Catch Basins	Section 33 49 15
.3	Waterworks	Section 33 11 13
.4	Granular Base and Sub-base	Section 32 11 10

.2 This section does not include specifications for aggregates to be incorporated into controlled density fill, hot-mix asphalt concrete paving, pavement crack filling, ready-mixed concrete backfilling of structures or granular materials for landscaping purposes. These specifications are specified as follows:

.1	Planting Soil and Finish Grading	Section 32 91 19.13

1.3 Approvals

.1 Inform Engineer of proposed source and provide particle size distribution tests and moisture-density relationships for each material, as applicable 2 weeks prior to commencing production.

.2 If materials from proposed source do not meet specified requirements, locate alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Should a change of material source be proposed during work, advise Engineer 2 weeks in advance of proposed change to allow sampling, testing and submission of data.

.4 Acceptance of material does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified.

1.4 Inspection and Testing

.1 Refer to Section 01 45 10 – Quality Control.

2. PRODUCTS

2.1 Materials – General

.1 Gravel to be composed of inert, durable material, uniform in quality and free from soft or disintegrated particles, clay, organics or other unsuitable material. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM C88 or latest revised issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.

.2 All crushed gravel when tested according to ASTM C136 and ASTM C117, or latest revised issue, to have a generally uniform gradation and conform to following gradation limits and 60% of the material passing each sieve must have one or more fractured faces.

2.2 Native Material

.1 All native soils excavated at Site are to be completely removed from Site.

2.3 Pit Run Gravel

.1 To be well-graded granular and free-draining material, substantially free from clay lumps, organic matter and other extraneous material, screened to remove all stones in excess of maximum diameter specified in material description (300 mm Pit Run Gravel, 200 mm Pit Run Gravel, 100 mm Pit Run Gravel). Material gradation to conform to MMCD 31 05 17 Section 2.3. to compact to specified density and conform to following gradations:

.1 Underslab material should consist of Granular Base (19 mm minus) conforming to MMCD 31-05-17 Section 2.10

.2 Backfill for below-grade walls should be well graded free draining Pit Run Sand confirming to MMCD 31-05-17 Section 2.4, and with a cu greater than 6 and a cz between 1 and 3.

.3 Drain Rock should conform to MMCD 31-05-17 Section 2.6

.2 Pipes should be supported on backfilled with Granular Pipe Bedding and Surround Material Type 1 conforming to MMCD 31-05-17 Section 2.7

2.4 Pit Run Sand

.1 To be well graded pit run sand, free from organic materials and conform to MMCD 31 05 17 Section 2.4.

2.5 Drain Rock

.1 To consist of clean round stone or crushed rock conforming to MMCD 31 05 17 Section 2.6

.2 Drain rock to be used only where specified on Contract Drawings. Use of drain rock other than as specified requires approval of Engineer after examination of soils against which drain rock will be placed.

2.6 Granular Pipe Bedding and Surround Material

.1 Crushed or graded gravel. Gradation to conform to MMCD 31 05 17 Section 2.7

2.7 Select Granular Sub-base

.1 To be well graded granular material, substantially free from lumps and organic matter, screened if required to conform to gradations specified on MMCD 31 05 17 Section 2.8.

2.8 Crushed Granular Sub-base

.1 To be 75 mm crushed gravel conforming to gradations specified on MMCD 31-05-17 Section 2.9

2.9 Granular Base

.1 To be 19 mm crushed gravel conforming to gradations specified on MMCD 31-05-17 Section 2.10.

3. EXECUTION

3.1 Handling

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.2 Do not use intermixed or contaminated materials. Remove and dispose rejected materials within 48 h of rejection.

END OF SECTION

1. GENERAL

1.1 Section Includes

.1 Materials and installation of geotextiles used in drainage structures and roadbeds for the purpose to:

.1 Separate and prevent mixing of granular materials of different grading.

.2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.

1.2 Related Sections

.1 Section 31 23 01 – Excavating, Trenching and Backfilling.

1.3 Measurement and Payment

.1 Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.4 References

.1 The most recent version of the following standards adopted by the relevant authorities having jurisdiction will be used at the commencement of work.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM D 4491M, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.2 ASTM D 4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.3 ASTM D 4716M, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

.4 ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

1.5 Submittals

.1 Submit samples in accordance with Section 01 32 19 - Submittals.

.2 Submit to Engineer copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 01 32 19.

1.6 Delivery, Storage and Handling

.1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

2. PRODUCTS

2.1 Products

.1 Nilex 4516 non-woven geotextile, or approved alternate.

2.2 Material

.1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.

.1 Width: 4.5 m minimum.

.2 Length: As appropriate

3. EXECUTION

3.1 Installation

.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.5 Join successive strips of geotextile as per manufacturer's recommendation.

.6 Pin successive strips of geotextile with securing pins as per manufacturer's recommendation.

.7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.8 After installation, cover with overlying layer within 4 h of placement.

.9 Replace damaged or deteriorated geotextile to approval of Engineer.

.10 Place and compact soil layers in accordance with Section 31 23 01 – Excavating, Trenching and Backfilling.

3.2 Cleaning

.1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

3.3 Protection

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

1. GENERAL

1.1 Definitions

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than a specified depth below existing ground surface.

1.2 Protection

.1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, Work Site appurtenances, water courses and root systems of trees which are to remain.

.2 Do not commence tree cutting until the Owner confirms that any required permits have been received.

.3 Repair any damaged items to approval of Contract Administrator.

.4 Replace any trees designated to remain, if damaged, as directed by Contract Administrator.

2. PRODUCTS

Not Applicable.

3. EXECUTION

3.1 Preparation

.1 Inspect Work Site and verify with Contract Administrator, items designated to remain.

.2 Locate and protect utility lines. Preserve in operating condition active utilities traversing Work Site.

.3 Notify utility authorities before starting clearing and grubbing.

3.2 Clearing

.1 Clear as indicated or as directed by the Contract Administrator, by cutting at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.2 Cut off branches, down trees overhanging area cleared as directed by the Contract Administrator.

.3 Cut off unsound branches on trees designated to remain as directed by the Contract Administrator.

3.3 Grubbing

.1 Grub out stumps and roots to not less than 200 mm below ground surface.

.2 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.5 m^3.

3.4 Removal and Disposal

.1 Remove and dispose cleared and grubbed materials off-site.

3.5 Finished Surface

.1 Leave ground surface in condition suitable for immediate grading operations or stripping of topsoil.

END OF SECTION

1. GENERAL

1.1 Protection

.1 Protect and/or transplant existing fencing trees, landscaping, natural features, bench marks, structures, pavement, surface or underground utility lines which are to remain as directed by the Contract Administrator. If damaged, restore to original, pre-construction or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

2. PRODUCTS

2.1 Materials

.1 Fill material: In accordance with of Section 31 05 15 - Aggregates & Granular Materials

.2 Excavated or graded material existing on site may be suitable to use as fill for grading work if approved in writing by the Engineer. Silty soils, if encountered should not be re-used as backfill.

3. EXECUTION

3.1 Stripping of Topsoil

.1 Do not handle topsoil while in wet or frozen condition or in any manner which soil structure is adversely affected as determined by the Engineer and Contract Documents.

.2 Commence topsoil stripping after area has been cleared of brush, weeds and grasses and removed from site.

.3 Strip topsoil where indicated and avoid mixing topsoil with subsoil.

.4 Stockpile and keep separated from other excavated material if to remain on site. Provide vegetative or man-made cover over stockpile as directed by the Engineer.

3.2 Grading

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Slope rough grade away from structures as directed.

.3 Grade ditches to depth as directed.

.4 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.5 Compact filled and disturbed areas to corrected maximum dry density to ASTM D1557, as follows:

.1 90% under landscaped areas

.2 95% under paved and walk areas

.6 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 Surplus Material

.1 Remove and dispose of surplus material and material unsuitable for fill, grading or landscaping off site.

END OF SECTION

1. GENERAL

1.1 Definitions

.1 Rock is defined as all solid rock in the form of bedrock, masses, ledges, seams or layers and includes igneous rock of any sort, conglomerate, sandstone or shale, that requires breaking by continuous drilling and blasting before excavation and removal. Rock also includes rocks having individual volumes in excess of 1.0 m^3, removed by blasting or other methods.

.2 Common excavation: Excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.3 Unclassified excavation: Excavation of deposits of whatever character encountered in work.

.4 Topsoil: Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.

.5 Waste material: Excavated material unsuitable for use in work or surplus to requirements.

.6 Borrow material: Material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

.7 Unsuitable materials:

.1 Weak and compressible materials under excavated areas.

.2 Frost susceptible materials under excavated areas.

.3 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45

.3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

.8 Unshrinkable fill: Weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.2 Protection of Existing Features

.1 Existing buried utilities and structures:

.1 Size, depth and location of existing the utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.2 Prior to commencing excavation work, notify applicable authorities having jurisdiction, establish location and state of use of buried utilities and structures. The authorities having jurisdiction are to clearly mark such locations to prevent disturbance during work.

.3 Confirm locations of buried utilities.

.4 Maintain and protect from damage, water, sewer, gas, electric, telephone, and other utilities and structures encountered as indicated.

.5 Where utility lines or structures exist in area of excavation, obtain direction of the Contract Administrator before excavating.

.6 Record location of maintained, re-routed and abandoned underground lines.

.2 Existing buildings and surface features:

.1 Conduct, with the Contract Administrator, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by work.

.2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to the approval of the Contract Administrator.

.3 Where required for excavation, cut roots or branches as approved by the Contract Administrator.

1.3 Shoring, Bracing and Underpinning

.1 Comply with applicable local regulations and protect existing features.

.2 Where required by Workers' Compensation Board, engage services of qualified professional engineer who is registered in the Province of British Columbia to design and inspect shoring, bracing, underpinning and temporary excavation slopes required for Work.

.3 At least 5 days prior to commencing Work, submit design and supporting data to the Contract Administrator.

.4 Design and supporting data submitted to bear the stamp and signature of qualified professional engineer registered in the Province of British Columbia.

.5 Professional Engineer responsible for design of temporary structures to submit proof of insurance coverage for professional liability except where engineer is employee of Contractor, in which case Contractor shall submit proof that work by Professional Engineer is included in Contractor's insurance coverage.

1.4 Samples

.1 At least 5 days prior to commencing Work submit to the Engineer gradation of the proposed fill materials.

.2 Submit samples in accordance with Section 01 32 19 - Submittals.

1.5 Testing

.1 Refer to Section 01 45 00 – Quality Control.

1.6 Materials

.1 Refer to Section 31 05 15 – Aggregates & Granular Materials

2. EXECUTION

2.1 Site Preparation

.1 Remove obstructions, ice, and snow from surfaces to be excavated within limits indicated.

.2 Strip topsoil from within limits of the excavation and stockpile separately, for re-use.

.3 Dispose of unused topsoil as directed by Contract Documents.

2.2 Stockpiling

.1 Stockpile fill materials in areas designated in the Contract Documents. Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

2.3 Shoring, Bracing and Underpinning

.1 Construct temporary works to depths, heights and locations as indicated.

.2 During backfill operation:

.1 Unless otherwise indicated or directed by the Engineer, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.

.3 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.4 Upon completion of substructure construction:

.1 Remove shoring and bracing.

.2 Remove excess materials from site as directed by the Engineer.

2.4 Dewatering

.1 Dispose of water in accordance with Section 31 23 19 Dewatering and in manner not detrimental to public and private property, or any portion of work completed or under construction.

2.5 Excavation

.1 Advise the Contract Administrator at least 7 days in advance of excavation operations.

.2 Excavate to lines, grades, elevations and dimensions required for construction.

.3 Excavation must not interfere with normal 45 degrees splay of bearing from bottom of any footing.

.4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.5 For trench excavation, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.6 Dispose of surplus and unsuitable excavated material.

.7 Do not obstruct flow of surface drainage or natural watercourses.

.8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.9 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of the Engineer.

2.6 Fill Types and Compaction

.1 Use fill of types as indicated below.

.1 Backfill for excavation and trenches:

.1 75mm minus pit run gravel and sand as per gradation in Section 31 05 15 Article 2.3 and 2.4.

.2 Backfill material to be placed in 300 mm loose lifts and compacted to achieve at least 95% Modified Proctor Maximum Dry Density (MPMDD).

.3 If the work is to commence in winter, the fines content (% passing through 0.075 mm sieve) for granular soils to be limited to a maximum of 5%.

.2 Pipe bedding

.1 Type 1 pipe bedding as per the gradation in Section 31 05 15, Article 2.6 and MMCD Section 31 05 17 Item 2.8.

.2 A minimum bedding thickness equal to at least one quarter of the pipe diameter and not less than 150 mm shall be allowed for beneath the pipe. Where bedrock or cobbler/boulder soil is encountered, the bedding layer should be at least 300 mm thick with any pinnacle in bedrock and protracting cobbles/bounders removed pror to placing the bedding.

.3 Compacted to 95% of Standard Proctor Density.

.3 Structural Fill under base of concrete structures:

.1 Refer to EXP Services Inc. Geotechnical Assessment Report – Village of Lions Bay Water Storage Facility Replacement, November 15, 2017.

.2 Granular Base (19 mm crushed gravel) as per MMCD Section 31 05 17 Article 2.10.

.2 Selected granular material from excavation with less than 0.075 mm sieve, screened to remove oversized particles larger than 150 mm, unfrozen and free from cinders, ashes, sods, refuse or other deleterious materials. Re-use of granular soils are subject to the review and approval of the Engineer at time of construction.

.3 Silty soils if encountered should not be re-used as backfill.

2.7 Bedding and Surround of Underground Services

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

2.8 Backfilling

.1 Do not proceed with backfilling operations until the Engineer has inspected and approved installations.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer. Within 1,000 mm of structures, use light compacting equipment.

.5 Backfill around installations.

.1 Do not backfill around or over cast-in-place concrete within 48 hours after placing of concrete.

.2 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 1 m.

.3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 7 days at a minimum temperature of 10 °C or until it has sufficient strength to withstand earth and compaction pressure.

2.9 Inspection and Testing

.1 Testing of materials and compaction will be the responsibility of the Contractor.

.2 Refer to Section 01 45 10 – Quality Control.

END OF SECTION

1. GENERAL

1.1 Description

.1 This section describes the requirements of Blasting Operations, which may be required to complete the Works, all of which shall mean Controlled Blasting Operations.

.2 Controlled blasting techniques shall be used at all times to minimize overbreak beyond the designed boundary of an excavation.

.3 The objective of controlled blasting is to reduce and distribute the explosive charges, to minimize rock breakage behind the final excavation line, and to leave a stable, undamaged final rock face where possible.

1.2 Related Work

.1 Section 02 22 14: Vibration Monitoring.

.2 Section 31 23 16.26: Rock Removal.

.3 Section 31 23 19.10: Rock Scaling.

1.3 Definitions

.1 Controlled Blasting Operations are all activities related to Controlled Blasting, including collaring and drilling holes; preparing, loading and firing of explosive charges; handling of misfires; and the removal and disposal of unused blasting material as well as blasted rock.

.2 In this specification, "Blasting" shall at all times mean "Controlled Blasting", and refers to the use of explosive charges to fragment rock. The specification calls for utilizing procedures and techniques to limit ground vibration, flyrock, air concussion, and overbreak so as to prevent damage to the rock mass outside the design lines or to buried services, adjacent buildings, structures and property.

.3 Ground Vibration is movement of the ground in response to energy imparted by firing explosive charges.

.4 Flyrock is the throw of fragmented material after the firing of explosive charges.

.5 Air Concussion is the propagation of pressure waves through the atmosphere imparted by firing explosive charges.

.6 Overbreak is the fragmentation of material beyond the design lines of the Excavation.

.7 Final Line Holes are closely spaced holes carefully drilled parallel to each other on the final design line which, when appropriately loaded and fired, will produce a relatively smooth final wall. They will usually be drilled vertically from the upper surface of the rock face.

.8 Buffer Holes are holes with intermediate spacing separating the final line holes from the production holes. Their function, when moderately loaded in relation to the production

holes, is to protect the final face area by more uniformly distributing the blasting agent within the rock mass adjacent to the final face.

.9 Production Holes are holes drilled in the main body of rock to be blasted. The spacing and charging is related to the drilling equipment, the specific rock conditions, and the degree of fragmentation or rock breakage desired.

.10 Maximum Charge per Delay is the maximum weight of explosive agent that may be detonated by a single detonation impulse.

.11 Blasting Delays are devices used in the firing sequence to delay the detonation of subsequent holes, or rows of holes.

1.4 Jobsite Conditions

.1 Refer to the Geotechnical Report provided as an Appendix to the Contract Documents.

.2 Conduct preconstruction and post-construction surveys of structures and utilities within 25 metres of the planned excavation.

.3 Protect structures, underground utilities and other construction from damage caused by blasting.

.4 Contractor is responsible for the installation and monitoring of geotechnical instrumentation as per Section 02 22 14 – Vibration Monitoring.

1.5 Submittals

.1 Submit the following in accordance with Section 01 32 19 – Submittals:

.1 Qualifications as per Paragraph 1.6 of this Section.

.2 Blasting Control Plan and Schedule as per Paragraph 1.7 of this Section.

.3 Blasting Safety Plan as per Paragraph 1.8 of this Section.

.4 Vibration and Air Blast Monitoring Plan as per Section 02 22 14 – Vibration Monitoring.

.5 Copies of all approved permits.

.6 Copies of all Blast Reports and Records of each blast.

1.6 Qualifications

.1 Blasting Contractor:

.1 The Blasting Contractor shall have undertaken at least five previous rock excavation projects, similar to the required work, in the preceding two years.

.2 The Blasting Contractor shall provide at least one person thoroughly trained and experienced in the use of explosives who shall be present at all times during the execution of any Blasting Operation and who shall direct such work.

.3 The Blasting Contractor shall ensure that no person be allowed to conduct any task related to a Blasting Operation unless the blasting Contractor maintains a valid Blaster's Certificate issued by the Workers' Compensation Board of the Province of B.C., or unless the blasting Contractor is under the direct supervision of a Certificate holder and only as permitted by the authorities having jurisdiction.

.2 Blast Consultant:

.1 Contractor shall employ an independent Blast Consultant for the project.

.2 The Blast Consultant shall be a licensed Professional Engineer specializing in explosives and geotechnical engineering.

.3 The Blast Consultant shall have not less than ten years' experience related to predicting and controlling ground vibration and air overpressure.

1.7 Blasting Control Plan and Schedule

.1 Submit a Blasting Control Plan and Schedule to the Engineer, three weeks prior to the work. The Blasting Control Plan shall contain the details of the drilling and blasting patterns and controls proposed for the blasting. The Blasting Control Plan shall be reviewed and signed by the Blast Consultant, Blast Control Specialist, Contractor's Site Superintendent and any other party involved in the blasting work. The Blasting Plan shall contain the following minimum information:

.1 Site drawings showing a scaled map of the blast areas and cross-sectional view and indicate stations, free face location, bench heights, hole spacing, hole diameter, hole depth, burden, hole inclination and subdrill.

.2 Methods of drilling, including equipment descriptions and hole placement and alignment techniques.

.3 Loading details including trade names, types and size of explosives.

.4 Indicate explosive types, typical charge weights and amounts, priming method, initiator types sequencing, delay periods and locations, charge firing times, stemming type and quantities.

.5 Details of controlled blasting techniques.

.6 Manufacturer's data on material and equipment including type of explosive, cartridge size, detonator, blasting monitors (both air and vibration), and other equipment required to perform the blast.

.7 Provisions to ensure that fly rock does not result from the blasting operations.

.8 Methods to prevent destabilization of slopes and the over-blasting and loosening of blocks of rock not indicated to be removed or disturbed.

.9 Description of the preblast inspection procedure.

.10 Methods for preventing spills or losses of explosives, drilling fluids, oil, or any other pollutants to ground during handling and hole charging operations. Include details of containment and contingency plans for quickly and effectively cleaning up any spilled materials.

.11 Description of the methods of monitoring for blast-induced ground vibration and air-blast overpressure.

.12 Anticipated vibration levels and peak particle velocities at locations identified or specified.

.13 Anticipated decibel level at nearest dwelling.

.14 Details on the reuse and/or disposal of excavated rock.

.2 The Blasting Control Plan submittal is for quality control and record-keeping. Review of the Blasting Plan by the Engineer shall not relieve the Contractor of their responsibility for the accuracy and adequacy of the plan when implemented in the field.

.3 No drilling or blasting work shall be done until after the Contractor's Blasting Control Plan has been submitted and reviewed by the Engineer.

.4 Final authority to proceed with Blasting shall be given by the Engineer only when the Engineer is satisfied that all necessary precautions to prevent damage to structures, buried services, above ground utilities, adjacent structures and property are in place. The authority to proceed shall in no way remove the obligation or responsibility of the Contractor for all aspects of safety associated with Blasting.

1.8 Blasting Safety Plan

.1 The Contractor shall submit a Blasting Safety Plan for review a minimum of two weeks prior to the commencement of any work involving explosives, including drilling. The Blasting Safety Plan shall at a minimum include:

.1 Emergency contact telephone numbers.

.2 Site safety meeting and training requirements.

.3 Copies of blasting permits, licenses of blasters, and commercial driver's licenses of the explosives transporters with their Hazmat endorsements.

.4 Copies of required blasting permits regarding explosive use and storage.

.5 Working procedures and safety precautions for storing, transporting, handling and detonating explosives.

.6 Procedures that will be used to ensure personnel, staff, visitors and other persons are at safe locations during blasting.

.7 Manufacturer's Material Safety Data Sheets for all explosives, primers, initiators and other blasting devices.

.8 Emergency evacuation plans.

.9 Detailed contingency plans for handling of misfires caused by cutoffs or other causes.

.2 The Blasting Safety Plan submittal is for informational purposes only. The safety of the Contractor's personnel is strictly the responsibility of the Contractor. The review of the Blasting Safety Plan by the Engineer does not relieve the Contractor of his responsibility to ensure the safety of all personnel during blasting.

.3 No drilling or blasting work shall be done until after the Contractor's Blasting Safety Plan has been submitted and reviewed by the Engineer.

1.9 Permits, Regulations and Safety Requirements

.1 The Contractor shall obtain all necessary permits from, and shall comply fully with the laws, rules and regulations, of Municipal, Provincial and Federal agencies in connection with the use, transport, storage and safe handling of all explosives. The Contractor shall be familiar with the WorkSafe BC Occupational Health and Safety (OHS) Regulations Part 21 – Blasting Operations.

.2 Explosives shall be stored in a magazine in accordance with the requirements of all Federal or Provincial inspectors having jurisdiction, and the requirements of the Explosives Act, c. E-17, as amended.

.3 The Contractor shall notify the Owner, Engineer, local fire department, utility companies and residents in the general blast area before the blast event, or as indicated in the permits. Mailed notifications shall be sent a minimum of two weeks prior to blasting and again at 24 hours before blasting.

1.10 Insurance Coverage

.1 Blasting shall only be conducted after the Engineer has received the Certificates of Insurance required by the Contract. The Certificates shall verify that the Contractors' General Liability and Property Damage Coverage contain no specific exclusions for Work related to Blasting.

1.11 Limitation and Liability

.1 The Contractor shall bear full responsibility for ensuring that all Blasting Operations are conducted in a satisfactory manner and in accordance with these specifications. Approval by the Engineer of the Blasting Plan shall in no way relieve the Contractor from this obligation, nor shall the District assume any responsibility for the adequacy of the Blasting to achieve adequate breakage or acceptable results.

.2 The Contractor shall be held responsible for all costs resulting from any damage or injury related to Blasting.

1.12 Co-Operation

.1 The Contractor shall provide the Engineer and Owner with complete cooperation throughout the course of any Blasting Operation. The Contractor shall cease Work at the direction of the Engineer if continued work poses a hazard to property or adjacent structures. In the event of an emergency involving damage to services or property, the Contractor shall direct all equipment and labour at the site towards mitigating the emergency.

2. PRODUCTS

2.1 Explosives and Related Products

.1 All products and materials used in Blasting shall be products of a company regularly engaged in the manufacture of explosives and related products and shall be from a recognized supplier.

.2 Explosives with an expired shelf life shall not be used.

.3 ANFO (ammonium nitrate and fuel oil) shall not be used unless specifically approved by the Contract Administrator. Note that approval will not be given if blasting near water.

3. EXECUTION

3.1 General

.1 The Contractor shall use Controlled Blasting in order to fragment rock to the final line of the designed excavation. Controlled Blasting shall combine the use of final line holes and buffer holes in the excavation process with suitable delays to ensure that the explosive charge is small enough to prevent excessive damage to the final wall.

.2 The responsibility for the design of all blast layouts and the quality of the final excavated rock mass shall rest with the Contractor.

.3 The Contractor shall provide the Contract Administrator with details of all blast hole patterns, charging design and initiation sequences 48 hours prior to excavation for review and approval.

.4 If, in the opinion of the Contract Administrator, the methods of excavation adopted by the Contractor are unsatisfactory in that they may result in an excessive amount of excavation and/or rock damage beyond the minimum lines and grades or that they fail to satisfy the requirements specified elsewhere in these specifications, then, notwithstanding the Engineer's prior review of such methods, the Contractor shall adopt such revised methods, techniques and procedures as are necessary to achieve the required results.

.5 The blaster shall control the blast so that the vibrations measured at adjacent structures fall below the "drywall" line as shown in the USBM RI8507 standard.

.6 Use blasting mats to prevent fly rock and debris from causing injury to personnel and damage to vehicles, structures, exiting improvements and vegetation.

.7 Equipment used for drilling of holes shall have a positive means of dust control. Clean site debris generated during drilling and blasting operations at the end of each work day.

.8 Do not perform blasting closer than 6 metres to existing water, gas, sewer or other buried utilities.

.9 Use controlled blasting techniques to keep the air blast overpressure, vibrations, and noise with the specified limits as specified. Refer to Section 02 22 14 – Vibration Monitoring.

.10 Minimize overbreak or fracturing of rock beyond the designated excavation boundaries. Excessive blasting is not permitted.

.11 The type, distribution and quantity of explosive detonated per delay period shall be such that existing rock fractures will neither be opened nor new fractures created outside of the minimum excavation limits. If blasting is liable to reduce rock stability or damage pipelines or other structures, cease blasting and excavate the rock by approved chemical or mechanical means.

.12 Provide pre-blast notifications to the Owner, Engineer, local fire department, utility companies and residents in the general blast areas as specified in Paragraph 1.9.

.13 Fifteen minutes prior to each blast, sound an audible siren or horn capable of being heard 500 m from the blasting site.

.14 Suspend blasting operations for any of the following reasons and do not resume blasting operations until modifications have been made to correct the conditions that resulted in the suspension:

.1 Ground motion vibration levels exceed specified limits of particle velocity or frequency.

.2 Existing structural conditions are aggravated or adjacent improvements are damaged as a result of blasting.

.1 Repair or replace any damage caused by blasting.

.2 Blasting methods endanger the stability of intact rock outside the prescribed limits of excavation.

.3 Skilled operators and/or licensed foreman or not present.

3.2 Final Line Specifications

.1 A row of closely spaced, small diameter, parallel holes shall be drilled along the plane of the final face.

.2 These holes shall be lightly charged and the charge de-coupled from the rock by leaving an air space between the explosive and the walls of the drill hole. This can be achieved by using an explosive charge with a smaller diameter than that of the drill hole and centering the explosive in the hole. Short lengths of explosive separated by spacers may also be used.

.3 The initiation of the final line of holes depends on the burden of rock in front of the design back line. When the burden exceeds three times the hole depth, pre-split blasting may be carried out in which the final line holes are initiated in advance of the main charge. In all other cases, trim blasting be carried out in which the final row shall be initiated last in the delay sequence (or subsequent to production excavation).

.4 The row of final line holes shall be spaced uniformly, at a spacing of about 10 to 15 times the hole diameter depending on the diameter used. The holes shall designed to the full depth of the excavation, or a maximum of 8 m. They shall be drilled parallel to each other with a minimum of deviation from the design orientation.

.5 The hole spacing and amount of explosive in the final line of holes may require adjusting, depending on rock conditions encountered during the progress of the work. Water-resistant explosives may be required for some of the work. In general, explosive charges shall be in the range 0.25 to 0.5 kg/sq.m of final wall area.

.6 Any blasting beyond the maximum lines specified by the Engineer which is performed by the Contractor for any purpose whatsoever, shall be at the expense of the Contractor, unless it has received prior approval of the Engineer. The Contractor is cautioned to ensure that the final line drill holes conform to the planned excavation limits.

3.3 Buffer Specifications

.1 Buffer blasting involves modifications to the burden, spacing and charge load for the back row of holes of the production blast.

.2 The row of buffer holes shall be drilled parallel to the final line. The burden and spacing shall be reduced by about 25 per cent and the charge by about 50 percent, of the production holes. The smaller charge shall be well distributed along the length of the drill holes by decking and/or de-coupling.

3.4 Blast Initiation

.1 Vibrations generated by detonation of charges in Production, Buffer and Final Line holes, shall be controlled through the maximum allowed weight of explosive charge per delay. If vibrations are considered to be excessive, or if vibration related damage is found to occur, then the Engineer may require reductions in the maximum charge per delay.

.2 The Contractor shall advise the Engineer in sufficient time ahead of each blast to provide the Engineer with an opportunity to monitor the blast for vibrations if desired.

3.5 Delays

.1 Delay sequencing for multiple shots may be accomplished through the use of short period (millisecond) delays of the type appropriate to the method of fusing adopted.

.2 Pre-split holes shall be fired before other holes in the same or adjacent rows. Buffer holes shall be fired in the delayed sequence of the production holes and cushion holes fired simultaneously two delay periods later, provided that cutoffs can be avoided.

.3 All sequences shall be delayed in such a manner that successive delays promote the movement of rock in the direction of a free face at all times. Choke blasting shall be avoided.

3.6 Field Monitoring

.1 Monitor vibrations, air blast overpressures and noise levels originating from construction operations, as indicated and specified in Section 02 22 14 – Vibration Monitoring.

.2 Modify construction operation procedures if existing operation creates vibration, air blast overpressure or noise exceeding specified amounts.

.3 If evidence of displacement or damage to utilities, equipment or structures is observed or reported, immediately notify the Engineer and discontinue operations creating the vibrations. Revise operation to reduce vibrations and submit a copy of the revised procedure to the Engineer.

.1 Restore or replace utilities, equipment and structures damaged by vibrations or air blast overpressures at no additional cost to the Owner.

END OF SECTION

1. GENERAL

1.1 Work

.1 Rock removal required for excavation and construction of the Work.

1.2 Related Sections

.1 Section 02 22 14: Vibration Monitoring.

.2 Section 31 23 00: Excavating, Trenching and Backfilling.

.3 Section 31 23 15: Blasting.

.4 Section 31 23 17.10: Rock Scaling.

1.3 Definition

.1 Rock is defined as all solid rock in the form of bedrock, masses, ledges, seams or layers and includes igneous rock of any sort, conglomerate, sandstone or shale, that requires breaking by continuous drilling and blasting before excavation and removal. Rock also includes rocks having individual volumes in excess of 1.0 m^3, removed by blasting or other means.

.2 Trench rock removal is defined as rock to be removed during excavation of utility trenches.

.3 Dense tills, hardpan, partially cemented material, clay or frozen materials which do not require breaking by continuous drilling and blasting before excavation and removal are not classified as rock.

1.4 Submittals

.1 Submit in accordance with Section 01 32 19 – Submittals.

.2 Refer to requirements of Section 31 23 15 – Blasting.

.3 Indicate proposed method of carrying out work.

.4 Submit records to Engineer at end of each shift. Maintain complete and accurate record of drilling and blasting operations.

1.5 Waste management and Disposal

.1 Place materials defined as hazardous or toxic in designated containers.

.2 Ensure emptied containers are sealed and stored safely.

1.6 Blasting Survey and Monitoring

.1 Contractor will visit property holders of adjacent buildings and structures to determine existing conditions and describe blasting and seismic recording operations.

.2 Conduct a pre-blast survey and undertake all vibration and seismic monitoring and reporting associated with the Work

.3 Refer to Section 31 23 15 – Blasting.

1.7 Blasting and Vibration Control

.1 Minimize ground vibrations to avoid damage to structures or remaining rock mass.

.2 Complete blasting before any structural elements are installed within 15 m from blast holes.

.3 Refer to Section 02 22 14 – Vibration Monitoring.

1.8 Measurement for Payment

.1 Quantities will be taken from cross section showing original rock surface and actual grade line set by Contractor and approved by the Engineer.

.2 Contractor to undertake pre-construction and post-construction rock surveys for measurement and payment purposes as verified by the Engineer.

2. PRODUCTS

.1 Not Applicable

3. EXECUTION

3.1 Protection

.1 Prevent damage to surroundings and injury to persons. Erect fencing, post guards, sound warnings and display signs when blasting to take place.

3.2 Rock Removal

.1 Remove rock to alignments, profiles, and cross sections as indicated.

.2 Explosive blasting is permitted at locations indicated on the Contract Documents.

.3 Do blasting operations in accordance with local bylaws.

.4 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.

.5 Excavate rock to horizontal surfaces with slope not to exceed that approved by Geotechnical Engineer.

.6 Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.

.7 Excavate trenches to lines and grades to minimum of 300 mm below structure or as indicated on Drawings.

.8 Cut trenches to widths as indicated.

.9 Use pre-shearing, cushion blasting or other smooth wall drilling and blasting techniques or directed by Engineer for all final exposed rock face surfaces.

.10 Remove boulders and fragments which may slide or roll into excavated areas.

.11 Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 00 - Excavating, Trenching and Backfilling.

3.3 Rock Disposal

.1 Dispose of surplus removed rock at an approved location off site.

.2 Contractor is responsible for all disposal costs.

END OF SECTION

1. GENERAL

1.1 Description

.1 The objective of scaling is to remove loose blocks of rock from a rock face using either hand scaling bars, trim blasting, hydraulic splitters or the bucket of an excavator, as appropriate.

.2 The Engineer shall determine the areas to be scaled.

1.2 Related Work

.1 Section 31 23 16.26 - Rock Removal.

.2 Section 31 23 15 - Blasting.

2. PRODUCTS

Not Applicable

3. EXECUTION

3.1 Preparation

.1 During scaling, all structures shall be protected from falling rock by covering the blast with blasting mats, reject ballast or similar material, or other approved method.

3.2 Execution

.1 Scaling shall be conducted as required by the Engineer.

.2 Hand scaling shall be employed except where other means, such as hydraulic splitters, or controlled blasting, are required by the Engineer.

.3 Scaling shall start at the top of the slope and work downwards, to ground level.

.4 After scaling, the new face shall be inspected by the Engineer to determine whether additional scaling is required.

.5 Rocks which hang up on the slope above a structure after scaling shall be removed.

.6 If blasting is required, refer to Section 31 23 15 - Blasting.

.1 Specifically, the charge used shall be sufficient to remove the block but not damage the surrounding rock. If drilling is required, the holes shall be parallel, drilled in straight lines, and have a spacing equal to about 10 to 15 times the hole diameter. Drill holes shall be loaded with sufficient explosive to break the rock between the holes but not damage the new face. All blasting shall be conducted by a blasting Contractor in accordance with the applicable Workers' Compensation Board regulations. Blasting designs shall be reviewed by the Engineer.

.7 The excavated material including rock, soil and vegetation shall be disposed of offsite.

END OF SECTION

1. GENERAL

1.1 Scope of Work

.1 Provide all labour, materials, tools and equipment to supply and install a dewatering system as required which will permit safe and proper execution of work and will result in obtaining a stable substantially dry sub-grade for execution of subsequent operations.

.2 Design a dewatering system which will prevent erosion and loss of soil and settlement of structures.

.3 Install dewatering system to effect efficient construction of excavations.

.4 Obtain any required permits to install and operate dewatering system. Comply with all applicable regulations and environmental requirements.

.5 Install all necessary sediment control ponds and other sediment control devices associated with the discharge of water from the dewatering system.

1.2 Reference

.1 Refer to the Geotechnical Report provided as an Appendix to the Contract Documents

1.3 Related Work

.1 Section 01 35 35: Environmental Protection.

.2 Section 31 23 01: Excavation, Trenching and Backfilling.

1.4 Submittals

.1 Submit a Dewatering Plan in accordance with Section 01 32 19 – Submittals.

1.5 Qualifications of Subcontractors

.1 Work of this Section shall be executed only by a Contractor or Subcontractor who has adequate equipment and skilled tradesperson with proven experience in this type of work.

1.6 Protection

.1 Protect existing installations, including buildings, structures, sewers, water lines, fences, service poles, wires, underground services or paving located on this or adjoining properties from damage while work of this Section is in progress. Make good all damage resulting thereto to the satisfaction of the Engineer.

2. PRODUCTS

2.1 Material

.1 All equipment and materials used in the dewatering system and in its construction, shall be in good condition and capable of trouble-free continuous operation. No marginal design or equipment showing excessive wear will be accepted.

3. EXECUTION

3.1 Examination

.1 Examine the site and determine the nature and extent of material which will be dewatered and other pertinent site conditions. Review site survey and geotechnical subsoil investigation reports.

.2 No allowances will be made by the Owner for difficulties encountered or expenses incurred due to any site condition visible or known to exist prior to tender closing.

3.2 Design and Installation of Dewatering System

.1 The dewatering system shall be capable of controlling the water level below the ground surface, by any means required, with all wells, connecting pipes, sumps, pumps and other equipment necessary to meet the dewatering requirements specified herein.

.2 The dewatering system shall be capable of lowering the water level in advance of excavation to a minimum of 1.0 m below the excavation level at all times.

.3 Accomplish method and operation of dewatering system in a manner which will preserve the strength of the foundation soils and structures, will not cause instability of the excavation slopes, prevent seepage boils, softening of the soil strata and will not result in damage to existing structures.

.4 Should any damage to the work, in the opinion of the Engineer, be due to the inadequacy or failure of the dewatering system in part or in total, then supply of all labour, materials, and the performance of all work necessary to carry out additional or remedial work resulting from such damage shall be undertaken at no additional cost to the Owner.

.5 Install dewatering system so that there will be no loss of fines from the soil strata.

.6 Provide all necessary piezometers and observation wells suitable for accurately monitoring ground water levels during dewatering operations. Piezometers shall be capable of monitoring ground water levels at least 1.5 m below the design low ground water level during dewatering.

.7 Dispose of water in such a manner so as not to be detrimental to public health, environment, public and private property, or any portion of work completed or under construction.

.8 Insulate piping and fittings and provide shelter and heating as necessary to maintain dewatering system in operation during cold weather.

3.3 Discharge and Control of Water

.1 Water shall be disposed of so as not to be injurious to public health or safety, to property, to the environment or to any part of the work completed or under construction. Pumped water shall not be discharged directly to water courses or local drainage channels. The pumped water shall be directed to a sediment control pond prior to discharge to the existing outfall chamber on site.

.2 Settling ponds, sediment basins and other sediment control devices shall be constructed and maintained in an effective, functioning and stable condition in accordance with local requirements.

3.4 Records

.1 Keep accurate records of the construction of the dewatering system.

.2 Keep records of piezometer water levels, quantity of water being pumped and number of pumps operating on a daily basis.

3.5 Maintenance and Removal of Dewatering System

.1 Maintain the dewatering system in good repair to perform its function at design capacity until the structure and related piping is complete to the satisfaction of the Engineer.

.2 Repair of damage done to structure or pipes and corrective measures necessary due to failure of the dewatering system or premature removal of the dewatering system shall be at the Contractors expense.

3.6 Cleaning

.1 Promptly as work proceeds and upon completion of work, remove all surplus materials, tools, equipment, and debris and leave place of work in a clean and tidy condition to complete satisfaction of Engineer.

END OF SECTION

1. GENERAL

1.1 Summary

.1 This Section describes methods that are to be used by the Contractor to confirm and provide quality control of compaction of fill and backfill.

1.2 Related Sections

.1 Section 31 23 01 – Excavation, Trenching and Backfilling.

.2 Section 31 05 15 – Aggregates and Granular Materials.

1.3 References

.1 The most recent version of the following standards adopted by the relevant authorities having jurisdiction will be used at the commencement of work.

.2 The following is a list of standards that will need to be complied with.

.1 ASTM C136/C136M Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.2 ASTM D75/D75M Standard Practice for Sampling Aggregates.

.3 ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.

.4 ASTM D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

.5 ASTM D2216 Standard Test Method for Laboratory Determination of Moisture Content of Soil and Rock.

.6 ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

.7 ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.8 ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

.9 ASTM D4718/D4718M Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.

1.4 Definitions

.1 Field Density

.1 Density of placed and compacted aggregate as measured by a nuclear densometer or other accepted industry standard and expressed as a ratio, in percent, of field density to reference density.

.2 Apply corrections for oversize material to either as-compacted field dry density or maximum dry density in accordance with ASTM D4718, as determined by Engineer.

.2 Lift

.1 Loose (uncompacted) layer of material.

.3 Field Moisture Content

.1 Value of moisture content of soil in percent as determined by nuclear densometer.

.4 Reference Density

.1 Laboratory test, per ASTM D698 or D1557, as applicable, used for comparison with field density values for compliance.

.5 Reference Moisture Content

.1 Determined in accordance with ASTM D698 or D1557, as applicable, used for comparison with field moisture content values for compliance.

1.5 Submittals

.1 Procedures: Section 01 32 19.

.2 Complete field density test reports on daily basis for the fill and backfill areas compaction testing. Provide field density reports to Engineer.

2. PRODUCTS

Not Applicable.

3. EXECUTION

3.1 Compaction

.1 Each lift shall be compacted to not less than the percentage of densities specified in Contract Documents.

.2 Fill to be compacted is to be placed in loose lifts not exceeding 300 mm thickness and compacted to required density below foundations and grade-supported slabs, behind below-grade walls, within pipe trenches, for subbase and base layers of pavement and elsewhere as required. Test each 300 mm thickness of fill placed following placement and compaction to confirm specified density is achieved.

.3 Control moisture content of the backfill material by adding water or drying the material, as required.

.4 Backfill evenly around structures to minimize unbalanced lateral earth pressure, where applicable.

.5 Do not use backfill material which is frozen or contains ice, snow or debris. Areas to be backfilled are to be free from debris, snow, ice, standing water and frozen ground.

3.2 Compaction Equipment

.1 Compaction equipment is to be capable of obtaining required field densities in materials placed.

3.3 Compaction Deficiencies

.1 The Engineer shall review all field density test results.

.2 Fills, embankments, backfills, trench backfills, or base courses that do not meet the specified requirements shall be removed or re-worked and re-compacted until the requirements are satisfied. Additional testing to evaluate the lateral extent of areas that do not meet the specified requirements and retesting after re-compaction will be paid for by the Contractor.

3.4 Field Quality Control

.1 Laboratory Tests Required:

.1 Standard Test Method for Laboratory Compaction Characteristics of Soil based on ASTM D1557 or ASTM D698.

.2 The following tests shall be performed for each principal type of material or combination of materials encountered or utilized.

.1 Compaction test;

.2 Liquid limit test;

.3 Plastic limit test (and determination of plasticity index);

.4 Gradation test.

.3 The tests listed above shall be performed on additional samples as directed by the Engineer.

.4 Results of these tests shall be the basis of control for compaction.

.2 Minimum Field Tests Required

.1 Project Site Grading: One field density test and field moisture content test per 100 m2 per lift, but not less than one of each test per day of fill placement.

.2 Test rates and frequencies shall be at the following minimum frequencies

.1 Pipe Zone (Bedding / Surround)

.1 Compaction: 1 test / 10 lm of trench (at top of pipe zone).

.2 Backfilling

.1 Compaction: 2 tests / 50 lineal metres / 0.3 m depth of fill.

.2 Sieve: 1 test / material source / 1000 m^3.

.3 Granular Base

.1 Compaction: 1 test / 500 m^2 (approximately 50 m length).

.2 Sieve: 1 test / material source / 1000 m^3.

.4 Granular Subbase

.1 Compaction: 1 test / 500 m^2 (approximately 50 m length).

.2 Sieve: 1 test / material source / 1000 $m^{3.}$

.3 Nuclear methods are to be used for determining field density and field moisture content. Site calibration of the nuclear densometer is to be carried out before each site visit to conduct density testing.

.4 All field density and moisture content tests are to be referenced to reference density for the soil being tested.

.5 Additional field density and field optimum moisture content tests are to be performed as directed by the Engineer.

END OF SECTION

DIVISION 32 – SITE IMPROVEMENTS

1. GENERAL

1.1 DESCRIPTION

.1 This Section specifies requirements for supplying, producing and placing crushed gravel or quarried stone as granular base and sub-base to lines, grades and typical cross-sections as indicated on Contract Documents.

2. PRODUCTS

2.1 MATERIALS

.1 Granular Base and Sub-Base:

.1 Granular materials in accordance to Section 31 05 15 – Aggregates and Granular Materials.

3. EXECUTION

3.1 INSPECTION OF UNDERLYING SUB-BASE OR SUB-GRADE

.1 Do not place granular sub-base until subgrade surface is inspected and approved by Engineer.

.2 Do not place granular base until finished sub-base surface is inspected and approved by Engineer.

3.2 PLACING

.1 Place material on clean unfrozen surface, properly shaped and compacted and free from snow and ice.

.2 Place granular base materials using methods which do not lead to segregation or degradation of aggregate.

.3 Place sub-base material to full width in uniform layers not exceeding 300 mm compacted thickness.

.4 Place base material to full width in uniform layers not exceeding 150 mm compacted thickness.

.5 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.6 Remove and replace that portion of layer in which material becomes segregated during spreading.

3.3 COMPACTION EQUIPMENT

.1 Use compaction equipment capable of obtaining required densities.

3.4 COMPACTING

.1 Compact granular sub-base and base material to density not less than 95% Modified Proctor Density.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base or base.

.3 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers acceptable to the Engineer.

3.5 FINISH TOLERANCE

.1 Finished compacted surfaces of base and sub-base to be within plus or minus 10 mm of established grade and cross-section but not uniformly high or low.

.2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.6 PROOF ROLLING

.1 For proof rolling use fully loaded single or dual axle dump truck.

.2 Engineer may authorize use of other acceptable proof rolling equipment.

.3 Proof roll top of base upon completion of fine grading and compaction.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of unsuitable subgrade:

.1 Remove base, subbase and subgrade material to depth and extent directed by Engineer.

.2 Backfill excavated subgrade and approved embankment material and compact in accordance to Section MMCD 31 23 01.

.3 Replace base and subbase material and compact in accordance with this Section.

.6 Where proof rolling reveals areas of unsuitable base or subbase, remove unsuitable materials to a depth and extent directed by Engineer and replaced with new materials in accordance with this Section at no extra cost.

3.7 MAINTENANCE

.1 Maintain finished sub-base in condition conforming to this Section until succeeding material is applied.

.2 Maintain finished base in condition conforming to this Section until succeeding material is applied.

3.8 INSPECTION AND TESTING

.1 Testing of materials and compaction will be carried out by testing laboratory designated by Engineer. Frequency of tests will be as determined by Engineer.

.2 Refer to Section 01 45 10 – Quality Control.

END OF SECTION

1. GENERAL

1.1 Description

.1 This section specifies requirements for chain link fences and gates.

1.2 References

.1 The most recent version of the following standards adopted by the relevant authorities having jurisdiction will be used at the commencement of work.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.

.2 ASTM A817 Standard Specification for Metallic-Coated Steel Wire for Chain Link Fence Fabric and Marcelled Tension Wire.

1.3 Location

.1 The location of the chain link fences and gates is shown on the Drawings.

1.4 Quality Assurance

.1 Fence erection shall be carried out by experienced fence construction personnel.

2. PRODUCTS

2.1 Fabric

.1 Fabric height of 1.8 m.

.2 Chain Link 50 mm x 50 mm mesh with 3.5 mm thick wire, galvanized with an average of 490 g of zinc per m^2 of surface area (Grade 1).

.3 Wire to conform to ASTM-A817.

2.2 Wire

.1 Tension wire - 5 mm galvanized.

2.3 Posts and Rails

.1 Terminal posts, line posts, braces and rails to ASTM-A53.

.2 Line Posts - 60 mm O.D. c/w tops.

.3 Terminal Posts - for ends, gates and corners - 90 mm with gate posts as specified in Article 2.5.

.4 Top Rail - 45 mm O.D. standard galvanized pipe.

.5 Bracing - 45 mm O.D. standard galvanized pipe.

.6 Posts heights to be suitable for hole depths specified.

.7 For installation of posts on lock block wall, provide minimum 200 square end plate c/w gussets and hilti connection to block.

2.4 Fittings

.1 Top rail ends, brace bands, tension bars, arms, tops, sleeves, hinges and latches in accordance with Frost fence details.

.2 All fittings to be hot dipped galvanized steel or cast aluminum.

.3 Terminal and gate posts to have dome tops.

.4 Fasteners - 5 mm aluminum or 3 mm steel.

.5 Stretcher Bars - min 5 x 20 steel.

2.5 Gates

.1 Gates to be framed with steel pipe, standard weight galvanized after welding. Use 45 mm O.D. pipe for outside frame and 35 mm O.D. pipe for bracing.

.2 Gate fabric to be the same as fence fabric.

.3 Gate posts to conform to the following:

Opening	Gate Post O.D.
Single to 3.0 m and Double to 6.0 m	90 mm
Single from 3.0 to 4.2 m double to 8.5 m	114 mm
Single from 4.3 m to 7.6 m and double from 8.5 m to 12 m	170 mm

.4 Gate hardware to include galvanized malleable iron hinges, lockable hatch and latch catch.

.5 Double gates to have centre rest with drop bolt for closed position and chain hold - open for open position.

.6 Gate braces to be 45 mm O.D. galvanized steel.

2.6 Concrete

.1 Compressive strength 20 MPa at 28 days.

.2 Use type 10 normal cement.

3. EXECUTION

3.1 Grading

.1 Remove debris and grade between posts to provide ground clearance between 40 mm and 70 mm.

3.2 Post Setting

.1 Line post holes to be 1000 mm deep, 250 mm diameter.

.2 Terminal post holes to be 1200 mm deep, 300 mm diameter.

.3 Line posts to be spaced maximum 3.0 m.

.4 Set posts in line and plumb so that the fence forms a straight line between corner posts.

.5 Set posts in concrete and extend concrete above grade for drainage.

.6 Install straining posts where required.

.7 Refer to site conditions for drilling and anchoring posts into rock. Drill holes into rock and set posts with not-shrink grout.

3.3 Fence Erection

.1 Allow concrete to cure sufficiently before erecting fence - minimum 5 days.

.2 Set braces between end posts, gate posts and line posts.

.3 Set fittings in place and stretch fabric in place.

.4 Install top rail and fasten to posts with caps.

.5 Secure fabric with tie wires at 450 mm intervals.

3.4 Gate Installation

.1 Locations and sizes of gates are shown on the Drawings.

.2 Set gate bottom 40 mm above ground surface.

3.5 Cleanup

.1 Touch up damaged galvanized by cleaning with a wire brush and applying two (2) coats of touch up paint for galvanized metal.

.2 Clean up debris and earth removed from posts holes and trim areas disturbed.

END OF SECTION

1. GENERAL

1.1 Work Included

.1 This Section includes supply and installation of precast "lock-block" wall as shown on Drawings.

1.2 Related Work

.1 Section 31 23 01 – Excavating, Trenching, Backfilling

1.3 Submittals

.1 Submit Shop Drawings for proposed precast concrete blocks.

.2 Submit manufacturers recommended installation procedures.

2. PRODUCTS

2.1 Materials

.1 Precast concrete blocks to be supplied smooth surface finish.

.2 Top block in wall to have flat top.

3. EXECUTION

3.1 Excavation and Backfill

.1 Excavation and backfill in accordance with Section 31 23 01 – Excavating, Trenching, and Backfilling

.2 Install base and subase in accordance with Contract Documents.

3.2 Precast Block Placement

.1 Place precast blocks in accordance with manufacturers installation instructions to heights specified on Contract drawings

END OF SECTION

1. GENERAL

1.1 Scope

.1 This Section specifies the products and procedures to be used for the restoration of the Work Site.

1.2 References

.1 The most recent version of the following standards adopted by the relevant authorities having jurisdiction will be used at the commencement of work.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft- lb/ft^3) (2,700 kNm/m^3)

.2 Master Municipal Construction Documents (MMCD) 2009 Edition.

1.3 Definitions

.1 Travelled Roadways are defined as paved roads, road shoulders and gutters, sidewalks, paved or graveled walkways, and other graveled or paved surfaces used by vehicular or pedestrian traffic. The paved areas shall be considered to extend 300 mm beyond their edges.

.2 Untraveled Areas are all areas not normally subjected to vehicle loading or pedestrian traffic and include open fields, easements, boulevards, and landscaped areas.

2. PRODUCTS

2.1 Topsoil and Finish Grading

.1 Planting soil for seeded areas: mixture of mineral particulates, micro-organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 50-70% sand and contain 3-8% organic matter by weight.

.2 Fertility: major soil nutrients present in following ratios:

.1 Nitrogen (N): 20-40 micrograms of available N per gram of topsoil.

.2 Phosphorus (P): 10-20 micrograms of phosphate per gram of topsoil.

.3 Potassium (K): 80-120 micrograms of potash per gram of topsoil.

.4 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.3 pH value 5.5 to 7.5.

.4 Contain no toxic elements or growth inhibiting materials.

.5 Free from:

.1 Debris and stones over 30 mm diameter such that 85-100% pass a 9.5 mm sieve.

.2 Course vegetative material 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.3 Crabgrass, couchgrass, equisetum or noxious weeds or seeds or parts thereof.

.6 Consistency: friable when moist.

.7 Planting soil and amendments to be mixed off-Site prior to placement.

.2 Peat moss:

.1 Horticultural grade.

.2 Derived from partially decomposed species of Sphagnum mosses.

.3 Elastic and homogeneous, brown in colour.

.4 Free of wood and deleterious material which could prohibit growth.

.5 Shredded particle minimum size 5 mm with 95-100% passing a 9.5 mm sieve.

.6 pH value not less than 3.5 and not greater than 4.5.

.7 Organic content to be no less than 90% based on dry weight as determined by ash analysis.

.3 Sand - washed coarse silica sand, medium to coarse texture:

.4 Limestone:

.1 Ground agricultural limestone containing minimum calcium carbonate equivalent of 85%.

.2 Gradation requirements - percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.5 Fertilizer:

.1 Lime to include coarse (60 mesh) dolomite lime.

.2 Fertilizer to uniform composition, free flowing and dry, granular, drill form, or pelleted commercial product with 50% of total nitrogen derived from natural organic material in a slowly available form.

.6 Mulch:

.1 Mulch shall be Answer Garden Products *Humus Builder* or approved equivalent; dark brown in colour and free from all growing medium, stones, roots or other extraneous matter; free of weeds, seeds and spores.

2.2 Seeding

.1 Grass seed and grass sod to be used in the application of seeding and sodding shall conform to MMCD Section 32 92 20 – Seeding.

3. EXECUTION

3.1 Surface Restoration

.1 The Contractor shall restore all damaged travelled roadways and untraveled areas of the Work Site as the work progresses.

.2 The Contractor shall be responsible for maintaining temporary patched asphalt surfaces in good condition until permanent asphalt repairs are completed. If the Contractor fails to carry out any necessary maintenance within twenty-four (24) hours of receipt of notice from the Corporation to do so, the Owner will do the necessary work at the Contractor's expense in terms of the General Conditions of Contract.

3.2 Concrete Walks, Curbs and Gutters

.1 The Contractor shall reinstate all concrete walks, curbs and gutters damaged by construction as soon as practicable after backfilling and compaction of the trench.

.2 Base preparation, formwork, concrete placement, jointing, tolerances, finishing, curing, and acceptance of concrete work for the reinstatement of concrete walks, curbs, and gutters shall conform to the relevant sections of the MMCD Section 03 30 20 – Concrete Walks, Curbs and Gutters.

3.3 Road Shoulder, Pavement, Easements and Ditches

.1 Road shoulder, pavements, and easements shall be restored to a condition equal to or better than that which existed prior to construction. All surfaces shall be restored to a depth of not less than 100 mm.

.2 Ditches that are removed or disturbed by construction shall be reshaped to the correct lines and grades and their surfaces restored with a minimum 300 mm layer of matching or specified material to ensure stability of sides and bottom against erosion.

3.4 Landscaping

.1 The Contractor shall promptly restore fields, cultivated areas, landscaping, retaining walls, rockwork, rockeries, lawns, gardens, fences, shrubs, trees and other improvements to at least their original condition, excepting that, with the approval of the Engineer, replanting, returfing or reseeding may be deferred until favorable weather conditions prevail.

.2 Topsoil shall be replaced to its original depth, but in no case shall be less than 150 mm deep. If hauled from elsewhere, it shall be of good quality approved by the Engineer.

.3 If restoration is not completed within two (2) weeks of backfilling, the Owner reserves the right to carry out or complete the restoration and charge the cost of such work to the Contractor.

3.5 Site Improvements

.1 Preparation of Existing Grade

.1 Verify that grades are correct. If discrepancies occur, notify the Engineer and do not commence Work until instructed by the Engineer.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage, and dispersion of surface flow of water, preventing concentration of flow and potential erosion. The Contractor is responsible for prevention and/or repair of areas eroded by surface water flow, including regrading, placing riprap, sediment control fencing, straw mat, hay bales, and the like placed to the satisfaction of the Engineer.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious Materials. Remove soil contaminated and petroleum products. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off-site or to a disposal site within the watershed area designated by the Engineer.

.4 Coarse cultivate entire area which is to receive topsoil to depth of 100 mm. Cross-cultivate those areas where equipment used for hauling and spreading has compacted soil.

.2 Placing and Spreading of Planting Soil

.1 Place planting soil after the Engineer has accepted subgrade.

.2 Spread planting soil in uniform layers not exceeding 100 mm, over unfrozen subgrade free of standing water.

.3 Spread planting soil as indicated to following minimum depths after settlement and 80% compaction:

.1 100 mm for lawn areas.

.2 150 mm for ground cover areas.

.3 300 mm for shrub areas.

.4 225 mm for bottom of root ball for tree pits.

.4 Manually spread planting soil around trees, shrubs and obstacles. Provide 450 mm planting soil depth for shrubs.

.5 Nutrimulch all planting areas with 50 mm continuous depth including 3.0 m diameter around trees.

.3 Finish Grading

.1 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by the Engineer. Leave surfaces smooth, uniform and firm against deep footprinting.

.4 Seeding

.1 As per MMCD Section 32 92 20.

3.6 Acceptance

.1 The Engineer will inspect and test topsoil in place and determine acceptance of Materials, depth of topsoil and finish grading. Approval of topsoil Materials subject to soil testing and analysis.

3.7 Restoration of Stockpile Sites

.1 Restore stockpile sites acceptable to the Engineer.

3.8 Surplus Material

.1 Dispose of materials not required off-Site.

END OF SECTION

DIVISION 33 – UTILITIES

1. GENERAL

1.1 Material Certification

.1 Submit manufacturer's test data and certification that pipe materials meet requirements of this Section at least 5 days prior to commencing Work. Include manufacturer's drawings, information and shop Drawings where pertinent.

1.2 References

.1 The most recent version of the following standards adopted by the relevant authorities having jurisdiction will be used at the commencement of work.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A36 – Standard Specification for Carbon Structural Steel.

.2 ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs and Threaded Rod 60,000 PSI Tensile Strength.

.3 ASTM A536 – Standard Specification for Ductile Iron Castings.

.4 ASTM B62 – Standard Specification for Composition Bronze or Ounce Metal Castings.

.5 ASTM B418 Rev A – Standard Specification for Cast and Wrought Galvanic Zinc Anodes.

.6 ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

.7 ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3; 600kN-m/m3)

.3 American Water Works Association (AWWA)

.1 AWWA B300 – Hypochlorites.

.2 AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.

.3 AWWA C105/A21.5 – Polyethylene Encasement for Ductile Iron Pipe Systems.

.4 AWWA C110/A21.10 – Ductile Iron and Gray Iron Fittings

.5 AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

.6 AWWA C151/A21.51 – Ductile-Iron Pipe Centrifugally Cast.

.7 AWWA C200 – Steel Water Pipe, 6 in (150 mm) and Larger.

.8 AWWA C207 – Steel Pipe Flanges for Waterworks Service, Sizes 4 in through 144 in (100 mm through 3,600 mm).

.9 AWWA C208 – Dimensions for Fabricated Steel Water Pipe Fittings.

.10 AWWA C-210 – Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings.

.11 AWWA C213 – Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings.

.12 AWWA C219 – Bolted Sleeve – Type Couplings for Plain End Pipe.

.13 AWWA C220 – Stainless Steel Pipe, ½ inch (12 mm) and Larger.

.14 AWWA C500 – Metal-Seated Gate Valves for Water Supply Service.

.15 AWWA C508 – Swing-Check Valves for Waterworks Service, 2-in Through 45-in (50-mm through 1,200-mm) NPS.

.16 AWWA C509 – Resilient-Seated Gate Valves for Water Supply Services.

.17 AWWA C512 – Air-Release, Air/Vacuum and Combination Air Valves for Water and Wastewater Service.

.18 AWWA C550 – Protective Interior Coatings for Valves and Hydrants – First Edition.

.19 AWWA C600 – Installation of Ductile-Iron Mains and their Appurtenances.

.20 AWWA C800 – Underground Service Line Valves and Fittings.

.21 AWWA C900 – Polyvinyl Chlorine (PVC) Pressure Pipe and Fabricated Fittings 4 in though 60 in.

.22 AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, ¾ in (19 mm) through 3 in (76 mm), for Water Service.

.4 CSA

.1 CSA B137.1 – Polyethylene Pipe Tubing and Fittings for Cold Water Pressure Services.

.2 CSA B182.2 – Plastic Drain and Sewer Pipe and Fittings.

.3 CSA B137.3 – Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications

1.3 Related Work

.1 Section 01 32 19: Submittals.

.2 Section 01 78 19: Operation and Maintenance Data.

.3 Section 31 23 01: Excavating, Trenching and Backfilling.

.4 Section 33 20 17: Carbon Steel Pipe Welding.

.5 Section 33 20 18: Stainless Steel Pipe Welding.

.6 Section 33 20 18A: Stainless Steel Piping - Detailed Specification Sheet.

1.4 Shop Drawings

.1 Submit Shop Drawings in accordance with Section 01 32 19 - Submittals.

.2 Submit manufacturer's test data and certification that pipe materials meet requirements of this section at least 4 weeks prior to commencing work.

.3 Provide data to produce record drawings, including direction for opening valves, list of equipment required to operate valves, details of pipe material, location of valves, hydrants, tie-in connections, caps, tees and elbows.

.4 Include maintenance and operating instructions in accordance with Section 01 78 19 – Operation and Maintenance Data.

.5 Provide record drawings, details of pipe material and location of valves.

1.5 Scheduling of Work

.1 Schedule work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions to Engineer and Owner for approval and adhere to interruption schedule as approved by Engineer.

.3 Notify Engineer and Owner minimum of 48 h in advance of any interruption in service.

.4 Notify fire department of any planned or accidental interruption of water supply to hydrants.

.5 Advise Owner and local police department of anticipated interference with movement of traffic.

2. PRODUCTS

2.1 Piping Identification

.1 The drawings designate the size and line service specification of all pipe and fittings to be supplied by the Contractor.

.2 Pipe Material Symbols for Line Identification:

SYMBOL	PIPE MATERIAL
DI	Ductile Iron
HDPE	High Density Polyethylene
GS	Galvanized Steel
PE	Polyethylene
PVC	PVC
RC	Reinforced Concrete

ST	Steel
SS	Stainless Steel

2.2 Piping Material, Joints and Fittings

.1 Stainless Steel Pipe

.1 Size and Location: as shown on Drawings.

.2 Material: To AWWA C220 Schedule 10 – 316L Stainless Steel.

.1 Refer to Section 33 20 18 – Stainless Steel Pipe Welding and

.2 Refer to Section 33 20 18A – Stainless Steel Piping - Detailed Specification Sheet.

.3 Joints:

.1 Welded. Refer to Section 33 20 18 for welding requirements.

.4 Fittings:

.1 Welded. Refer to Section 33 20 18 for welding requirements.

.2 Steel Pipe

.1 Refer to Section 33 20 17 Carbon Steel Pipe Welding.

.2 Size and Location: as shown on Drawings.

.3 Material: To AWWA C200 (minimum wall thickness 9.5 mm) as specified on Drawings and electrically welded. Steel to ASTM A36.

.4 Joints:

.1 Welded. Refer to Section 33 20 17 Carbon Steel Pipe Welding for welding requirements.

.5 Fittings:

.1 Welded. Refer to Section 33 20 17 Carbon Steel Pipe Welding for welding requirements.

.6 Flanges: Steel pipe flanges to AWWA C207. Dimensions for fabricated steel fittings to AWWA C208.

.7 Tie Rods: continuous threaded.

.8 Finishes: inside wetted surfaces to be sandblasted and liquid epoxy coated to AWWA C-210 and NSF-61 specifications. Finish coating to be blue epoxy enamel.

.3 Ductile Iron Pipe

.1 Size and Location: as shown on Drawings.

.2 Material: To AWWA C151, pressure class 350 (minimum thickness 6.4 mm), satisfying AWWA C104 and NSF-61 specifications with cement mortar lining.

.3 Where indicated on Drawings, wrap ductile iron pipes and components with polyethylene wrapping as per AWWA C105.

.4 Joints and Fittings: single rubber gasket push-on bell and spigot type and/or mechanical pipe joints to AWWA C111.

.4 PVC Pipe (storm)

.1 PVC Gravity Pipe

.1 Size and location: as shown on Drawings.

.2 Material: PVC – DR25 to AWWA C900.

.3 Fittings: PVC to AWWA C900.

.4 Joints: Gasketed push-on joints.

.5 PVC Perforated Pipe (tank underdrain)

.1 Size and Location: as shown on Drawings.

.2 Material: PVC Series 160 (SDR26) to CSA B137.3 – Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications. Drilled perforated pipe with two rows of 16mm diameter holes, spaced 150mm along the pipe (centre to centre), with a radial separation of 120 degrees between rows.

.3 Fittings: PVC to 137.3.

.4 Joints: Gasketed bell and spigot push-on joints.

2.3 Pipe Bedding and Surround Material

.1 Type 1 pipe bedding material to Section 31 23 01 - Excavating, Trenching and Backfilling.

.2 Concrete mixes and materials required for bedding cradles, encasement, supports, trench dams, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete.

2.4 Backfill Material

.1 75 mm minus pit run gravel in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling.

2.5 Couplings

.1 General Requirements

.1 Suitable for pressure class specified in Contract Documents.

.2 To AWWA C219.

.3 Anti–corrosion of interior and exterior centre sleeve and end rings to AWWA C213, AWWA C210 or AWWA C550 as specified in the Contract Documents.

.4 Bolts and nuts stainless steel to ASTM F593 or ASTM F738 for bolts and ASTM F594 or ASTM F836M for heavy hex nuts.

.5 Couplings shall be restrained.

.2 Plain end or transition couplings as specified in Contract Documents.

.3 Flanged coupling adapters as specified in the Contract Documents.

.4 Grooved Joint Couplings

.1 Fabricate grooved joint couplings of ductile iron to ASTM A536, and in accordance with AWWA C606.

.2 For steel pipe, provide cut grooves in pipe and fittings in accordance with AWWA C606. Alternatively, rolled grooves and roll-groove type joints may be used on bare steel pipe. Rolled grooves and roll-groove type joints are not acceptable on steel pipe that is internally lined.

.3 Cut grooved joints are not acceptable in stainless steel piping less than schedule 40S and PVC piping less than schedule 80. Provide suitable end pipe piece for grooving as needed if piping wall is thinner.

.4 For all grooved joints, grind or buff edges to a minimum radius of 6 mm. Coordinate with coupling manufacturer to ensure proper fit.

.5 In grooved joint piping systems requiring end-seal type gaskets, provide grooved joint couplings and grooved pipe in accordance with gasket manufacturers recommendations. Acceptable manufacturers:

.1 Gustin-Bacon

.2 Victaulic.

.3 Or approved equal.

.6 Where grooved joint fittings are shown for use in steel piping systems, meet the following requirements:

.1 For flexible style couplings, where grooved joints are used, acceptable products are:

.1 Gustin-Bacon 100

.2 Victaulic Style 77

.3 Or approved equal.

.2 With the Engineer's prior acceptance, flange assemblies may be substituted for above-ground steel piping which is not lined where rigid style couplings are shown or specified. Note any such substitutions in the submittals prior to fabrication.

.7 Where grooved joint fittings are shown for use in stainless steel piping systems, meet the following requirements:

.1 For flexible style couplings where grooved joints are used for noise and vibration control. Acceptable products are:

.1 Victaulic Style 77S

.2 Or approved equal.

2.6 Joint Harnesses

.1 All watermain joints to be restrained.

.2 Provide number of joint harnesses as specified based on pipe diameter, bolt size and working pressure.

.3 Each joint harness to include: two lugs welded to pipe, one deflection ring, steel tie-bolt and two nuts.

2.7 Coatings

.1 Refer to Paragraph 2.2 for interior and exterior coatings for pipe material.

2.8 Valve and Valve Box

.1 Mainline Valve – General Requirements;

.1 Valves to open counter clockwise.

.2 All valves to have manufactures' name, year of manufacture, size and working pressure on the bonnet or body

.3 Valves 400mm and larger to have by-pass sized to AWWA C500

.4 Gate valves 400mm and larger to have gear operators.

.2 Mainline Gate Valves:

.1 Locations of solid wedge or double disc valve and resilient-seated valves show on Contract Drawings.

.2 To AWWA C509: 75mm to 300mm to working pressure 1380 kPa; Gray cast or ductile iron body, resilient seated, non-rising stem, hub or flange ends.

.3 Stem seal to be O-ring type.

.4 Hydrant Valves – to be specified for mainline gate valves

.5 Valves to be complete with 50mm square operating nut for underground service.

.3 Mainline Butterfly valves:

.1 Material: to ANSI/AWWA C504, short body, buried service condition, manual gear box, with combination handwheel, 50 mm square operating nuts, end flanges suitable to mating to ANSI B16.5 Class 300 flange joints.

.4 Air Release, Air/Vacuum and Combination Air Valves:

.1 Gray cast iron or ductile iron body

.2 Threaded or flanged connection

.3 Maximum working pressure 2070 kPa.

.4 To AWWA C512

.5 Mainline Valve Boxes

.1 To be as specified in Contract Documents; telescoping, cast iron, top flange type service box.

.2 Valve box riser to be 150mm diameter PVC DR35 or better.

.6 Check Valves:

.1 Material: to ANSI/AWWA C508: 50 to 300mm to working pressure 1200 kPa; 400 to 500mm to working pressure 1035 kPa; gray cast iron or ductile iron body, clear waterway type, metal to metal seat, mechanical joint ends to AWWA C111 or flanged ends to AWWA C110

2.9 Bolts and Nuts

.1 Bolts and nuts to ASTM A307, Grade B Steel, hex head style zinc plated to ASTM B633. Coat exposed fasteners with petroleum tape, mastic and paste.

2.10 Cathodic Protection

.1 Provide cathodic protection of piping, pipe fittings and appurtenances.

.2 Cables

.1 Single conductors to be stranded copper, type RWU75 XLPE insulated except as noted.

.2 Size cables as follows:

.1 Test Leads: #10 AWG

.2 Reference Electrode: #10 AWG

.3 Anode: #10 AWG

.4 Continuity bond: #8 AWG.

.3 Copper Sleeves

.1 Copper sleeve for thermite welding #10 AWG cable to the pipe to be CAB – 133- 1H.

.2 Copper sleeve for thermite welding #8 AWG cable to the pipe to be CAB – 133- 1L.

.4 Test Station Terminal

.1 Test Station terminal to be Cott Manufacturing Big Fink with eleven terminals colour coded or approved equivalent.

.2 Test station cover to be Terminal City telescopic valve box or approved equivalent.

.5 Zinc Reference Electrodes

.1 Zinc reference electrodes to be 300 mm long, 12 mm in diameter and have a composition as specified by ASTM B418 (latest revision), Type 1, packaged in cardboard tubes with a backfill composed of 75% gypsum, 20% bentonite and 5% sodium sulphate.

.2 Provide #10 AWG RWU (red) insulated stranded cable with each electrode. The cable length to be sized to reach the test station.

.6 Anodes

.1 Use high potential magnesium anodes, packaged in cardboard tubes with a backfill composed of 75% gypsum, 20% bentonite and 5% sodium sulphate.

.2 Provide #10 AWG RWU (blue) insulated stranded copper cable with each anode. The cable length to be sized to reach the test station or the fitting as required.

.7 Trench Marker

.1 Minimum 100mm wide, minimum 3.5 mils thick, heavy duty polyethylene. Yellow with black letters displaying: “CAUTION – ELECTRICAL LINE BURIED BELOW”.

2.11 Water Sample Pipe, Joints and Fittings

.1 Pipe diameter 19 mm to 75 mm to be polyethylene to AWWA C901, pressure class 200 tubing certified to CSA B137.1.

.2 Water sample station:

.1 Provide a water sampling station external to the Highway Tank.

.2 Materials: Eclipse 88 as manufactured by Kupferle Foundry or approved equal.

.3 Shall be non-draining unit that comes standard with a stainless steel and lead free brass waterway and a lockable cast-aluminum enclosure. Shall be manual-draining, non-freezing with use of an attachable manual hand pump.

.4 Shall be fully serviceable from above ground. Certified to NSF-61.

.3 Water sample pipe saddle:

.1 Tapping threads to be tapered to AWWA C800.

.2 Saddles for ductile iron pipe:

.1 Shall have a ductile iron body to ASTM A536.

.2 Anti-corrosion coating to AWWA C210 or AWWA C213 as specified in Contract Documents.

.3 Two type 304 stainless steel U-bolt straps with minimum width per strap of 50 mm.

.4 Corporation stops

.1 Bronze to ASTM B62, AWWA thread inlet, compression type outlet.

.5 Curb stops

.1 25 mm – to be bronze to ASTM B62; inverted key, ball or cylinder type construction utilizing O-ring seals.

.2 Fittings – to be compression type for underground services.

.3 All fittings and valve connections on polyethylene to have solid fluted stiffening liners manufactured from stainless steel to AISI T304 designed for the appropriate type and inside dimension of pipe, warranted by the manufacturer for that use.

2.12 Pipe Disinfection

.1 Sodium hypochlorite or calcium hypochlorite to ANSI/AWWA B300 to disinfect water mains.

3. EXECUTION

3.1 Preparation

.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation. Carefully inspect Materials for defects to approval of Engineer. Remove defective Materials from Work Site as directed by Engineer.

3.2 Trenching

.1 Do trenching work in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling.

.2 Trench depth to provide cover over pipe of not less than 0.9 m from finished grade or as indicated.

.3 Trench alignment and depth require Engineer's approval prior to placing bedding material and pipe.

3.3 Concrete Bedding and Encasement

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete. Place concrete to details as indicated or as directed by Engineer.

.2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 h after placing.

3.4 Granular Bedding

.1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to minimum 95% Standard Proctor density in compliance with ASTM D698.

.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling.

3.5 Pipe Surround

.1 Upon completion of pipe laying and after Engineer has inspected Work in place, surround and cover pipes as indicated.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 2 m of pipe.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to minimum 95% Standard Proctor Density in compliance with ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to minimum 95% Standard Proctor Density in compliance with ASTM D698.

3.6 Pipe Installation

.1 Handle pipe in accordance with manufacturer's recommendations. Do not use chains or cables passed through pipe bore so that weight of pipe bears upon pipe ends.

.2 Lay and join pipes to manufacturer's instructions and specifications except as noted otherwise herein.

.3 Horizontal tolerances: plus or minus 50 mm from specified alignment. Vertical tolerances: plus or minus 10 mm from specified grade. Reverse grade is not acceptable.

.4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.6 Pipes on curved alignments: Do not exceed permissible joint deflection recommended by pipe manufacturer.

.7 Keep jointing material installed pipe free of dirt, water and other foreign materials. Whenever work is stopped, install removable watertight bulkhead at open end of last pipe laid to prevent entry of water and foreign materials.

.8 Cut pipes as required, as recommended by pipe manufacturer, without damaging pipe and leave smooth end at right angles to axis of pipe.

.9 Joints:

.1 Install gaskets as recommended by manufacturer.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes carefully before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.10 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as specified otherwise.

.11 When any stoppage of work occurs, restrain pipes in an approved manner to prevent "creep" during down time.

.12 Plug lifting holes with approved prefabricated plugs, to pipe supplier's recommendations for sealing methods.

.13 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available. Core neat circular holes in walls of existing manholes. Do not hammer or chip except as approved by Engineer.

3.7 Backfill

.1 Place and compact backfill material in accordance with Section 31 23 01 - Excavating, Trenching and Backfilling.

3.8 Field Testing

.1 Upon completion of installation, new water mains will require:

.1 Pressure and Leakage Testing.

.2 Bacteriological Sampling.

.3 Taste and Odour Testing.

.2 Testing of lines to be carried out in presence of Engineer.

.3 Strut and brace caps, bends and tees, to prevent movement when test pressure is applied.

.4 Expel air from lines, by slowly filling water mains. High points to be drilled and tapped and suitable cocks installed to vent air and to be shut when pressure is applied. Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.

.5 No leakage permitted for welded steel lines, and potable water lines.

.6 Apply pressure for 1 h for pressure test and 2 h for leakage test.

.7 Examine exposed pipe, joints and fittings while system is under pressure.

.8 Remove defective joints, pipe and fittings and replace with new sound material.

.9 Define leakage as amount of water supplied from meter in order to maintain test pressure for 2 h.

.10 Do not exceed allowable leakage as defined in ANSI/AWWA C600.

.11 Locate and repair defects if leakage is greater than amount specified in Article 3.9.10.

.12 Repeat test until leakage is within specified allowance.

.13 Complete backfill.

.14 Repeat test after completing backfill. Locate and repair defects and backfill. Repeat tests, repairs and backfills as needed until leakage is less than amount specified in 3.9.10.

3.9 Cleaning and Flushing

.1 Before flushing and testing, ensure sewer system is completely finished and make arrangements with Engineer for scheduling of testing.

.2 Remove foreign material from pipe and related appurtenances by flushing with water. Main to be flushed at water velocities as high as can be obtained from available water source. Continue flushing at least until flow from most distant point has reached discharge point and until water discharges is clean and clear.

END OF SECTION

1. GENERAL

1.1 Scope

.1 This section specifies the requirements for the welding process, such as procedure qualification, welder qualification, lineup, welding, and weld testing, in accordance with the latest edition of shop welding applications, and field-welding applications, except when the terms of these standards are added to or modified by these specifications.

1.2 References

.1 The most recent version of the following standards adopted by the relevant authorities having jurisdiction will be used at the commencement of work.

.2 Conformance to the following reference standards:

.1 ANSI B31.3 – Process Piping

.2 CSA Z662 – Oil and Gas Pipeline Systems

2. PRODUCTS

2.1 Pipe

.1 Steel pipe: to ASTM A106 or A53, Grade B, Sch. 40 seamless or welded pipe to ANSI B36.10. Refer Section 33 11 33 – Waterworks for additional Piping Specifications.

2.2 Filler Material

.1 Shielded metal arch electrodes (manual welding) to conform to CSA W48.3. Grade to be of tensile strength equivalent to or greater than the ultimate tensile strength of the parent metal, and to be suitable for the electric current characteristics, position of welding, and other conditions of intended use.

2.3 End Bevels

.1 Provide pipe ends with mill bevels. Bevels to be 30^{o} with a vertical lip of 1.60 mm unless specified otherwise. Field bevels to be reasonably smooth and uniform, and dimensions shall be in accordance with the qualified welding procedure.

2.4 Bell and Spigot Tolerances

.1 5/64” (2mm) all around max., gap, equally spaced

.2 2/64” (0.8mm) all around min. gap, equally spaced

2.5 Equipment

.1 Welding equipment to be 200 A or larger DC machines, and to be designed and maintained in an acceptable condition to obtain the specified results.

3. EXECUTION

3.1 General

.1 Welding to be performed using procedures qualified to CSA Z662, Clause 7.2. Surfaces to be welded shall be smooth, uniform, free of fins, lamination, tears, slag, grease, paint, and other deleterious conditions which might adversely affect welding. All aspects of the process as outlined in CSA Z662, Clause 7.2.5.2 shall conform to the welding procedure specification.

3.2 Welder Qualification

.1 Welders engaged on the work to possess valid certificates of qualification from the appropriate governing authority for pipeline welding in the flat, vertical, and overhead positions. Certificates to be for the shielded metal arc method of welding. Provide copies of certificates to Engineer when qualification test results are submitted.

.2 Welders to qualify under CSA Z662, Clause 7.2.6, (Field). Welders to qualify under CSA Z245 (Shop).

.3 A record shall be made of the test given to each welder and of the detailed results of each test. Maintain record and a list of qualified welders and procedures in which they are qualified to be provided to the Engineer. Welders may be required to requalify if there is a question about their ability.

3.3 Qualification of the Welding Procedure

.1 Prepare test joints in accordance with the proposed welding specification and as stated in the proposed welding procedure submitted to the Engineer. Give Engineer written notice of when and where the welding of the test joints will take place so that the Engineer can be present. Test joints to be tested at Corporation’s expense, and in accordance with CSA Standard Z662, Clause 7.2.5.4. Upon qualification, no change in the procedure will be permitted without the Engineer's written approval.

3.4 Weather Conditions (Field Welding)

.1 .1 Per CSA Z662, Clause 7.2.7, welding shall not be done when the quality of the completed weld would be impaired by prevailing weather conditions, including but not limited to moisture, blowing sands, high winds, or low temperatures. Windshields may make conditions for welding satisfactory.

.2 If, in the opinion of the Engineer, protection from prevailing weather conditions is necessary, then welding shall cease until this protection has been placed correctly. The Contractor will not be compensated for "downtime" delays of this nature.

.3 Metal surfaces in and adjacent to the welding groove to be dry before welding commences and while welding is in progress.

.4 When ambient temperature is below 0°C, welding operations to cease, unless an appropriate welding procedure has been qualified.

3.5 Geotechnical Conditions

.1 Soft soil conditions or conditions where significant movement can be anticipated

.1 Change joint type from bell and spigot to butt welds or strengthen the pipeline by increasing yield strength.

3.6 Production Welding

.1 Production welding to conform to CSA Z662, Clause 7.2.7 for field welding, and ANSI Code B31.3, Chapter V for shop welding, and the following stipulations.

.2 No pup shorter than 1 m or 3 pipe diameters, whichever dimension is greater to be installed in the line. There shall be at least 1 full joint of pipe installed between pups which are shorter than 5 m. All pups must be moved ahead on a current basis and installed in the line.

.3 No two weld beads shall be started or stopped in the same location. Each weld pass shall be visually examined and any defects (i.e., pin holes, slag inclusions, gas pockets, and undercutting, etc.) shall be repaired prior to welding the next pass.

.4 Striking the arc on the pipe at any point other than the welding groove shall not be allowed. Any section of pipe which has been arc burned may, at the Engineer's discretion, be cut out and replaced at the Contractor's expense.

.5 No weld to be subjected to sudden variations in temperature and no welded sections to be subjected to stresses, due to movement of pipe, loading on pipe, etc., until the welds have cooled below 38°C. Damage caused by the welded pipe being subjected to stresses before complete cooling of welds to be corrected at the Contractor's expense.

.6 All temperatures to be measured by pyrometric crayons or other suitable devices approved by the Engineer.

.7 All passes to have no more than 5 minutes elapse time between the previous pass termination and the commencement of the next pass. When ambient temperature is below 0°C, maximum allowable elapsed time is 4 minutes.

3.7 Lineup Clamps

.1 Use of lineup clamps to conform to CSA Z662, Clause 7.2.7.4. Internal lineup clamps to be used whenever practicable and when used shall not be removed until root bead is complete. External lineup clamps may be used only when use of internal lineup clamps is not practicable. Root bead segments used in connection with external lineup clamps to be uniformly spaced around the circumference of the pipe, and to have an accumulative length of not less than 50% of the pipe circumference before the clamp may be removed. Pipe to remain supported and stationary until root bead is completed.

3.8 Clearance

.1 Clearance to be in accordance with CSA Z662, Clause 7.2.7.8. When the pipe is welded in a trench, bell hole to be of sufficient size to provide the welder or welders ready access to the

joint so that their skill is not impaired. When pipe is welded above ground, the working clearance around the pipe at the weld shall be not less than 400 mm.

3.9 Pipe Handling

.1 Extreme care to be exercised to prevent damage to pipe. Damage to be repaired as directed by the Engineer and at the expense of the Contractor. Bevel ends to be repaired if damaged.

.2 All dents in the pipe deeper than 3.20 mm to be removed by cutting and remaining dented portion of the pipe, rebevelling the cut ends, welding and recoating.

3.10 Inspection

.1 Inspection will be conducted in accordance with ANSI B31.3. After completion of the welding operation, pipe to be left uncoated for a period sufficient to permit Engineer to carry out tests on the welds. Contractor to allow a reasonable time for Engineer to conduct tests on the tie-in welds.

.2 Work performed will be rigidly inspected. Such inspection shall not relieve Contractor of responsibility for performing work in conformance with the specifications. Notify Engineer in advance of performing any work in order that inspection may be arranged. Engineer may reject any work that does not comply with the specified requirements. Furnish to the Engineer reasonable facilities and space for inspection, testing, and obtaining any information Engineer desires respecting the character of material used and progress and condition of the work.

.3 Radiographic inspection to be carried out by operators certified in conformance with CSA W178 and W178.2.

.4 As per ASME B31.1 fluid service category is Normal. Therefore, welding inspection by Radiography/NDE required for 5% of welds.

.5 Engineer may use any method of additional inspection necessary to establish quality control and ensure adherence to welding procedures. Engineer has the right to accept or reject any weld not meeting the approved procedures and/or specified requirements.

3.11 Repair or Removal of Weld Defects

.1 Repair or removal of weld defects to be in accordance with CSA Z662, Clause 7.2.10. Backwelding is not allowed without qualification of the welding procedure used.

.2 All costs for repairing defective welds, including radiographic inspection of the corrected work, to be borne by the Contractor.

3.12 Coasted Pipe Protection and Field Coating

.1 Protect and prepare for field welding all pipe which has been previously coated.

.2 After field welding, pipe coating of welded joints in the field to be done in accordance with AWWA C210. Primer and field coating of bare surfaces to be the same materials as used for shop coating of pipe.

.3 If damage of the coating occurs in the field, repair damaged portions in accordance with AWWA C210.

END OF SECTION

1. GENERAL

1.1 Description

.1 This Section specifies the requirements for stainless steel piping and welded joints.

1.2 Codes

.1 Do all work associated with the welding process, such as procedure qualification, welder qualification, lineup, welding, and weld testing, in accordance with the latest edition of ANSI B31.3 shop welding applications, and CSA Z662.

2. PRODUCTS

2.1 Pipe

.1 See section 35 20 18A for Stainless Steel Piping Detailed Specification.

.2 Stainless steel pipe to be rated Schedule 10.

.3 Pipe Grade to be 316L.

2.2 Filler Material

.1 Shielded metal arc electrodes (manual welding) to conform to CSA W48.3. Grade to be of tensile strength equivalent to or greater than the ultimate tensile strength of the parent metal, and to be suitable for the electric current characteristics, position of welding, and other conditions of intended use.

2.3 End Bevels

.1 Provide pipe ends with mill bevels. Bevels to be 30° with a vertical lip of 1.60 mm unless specified otherwise. Field bevels to be reasonably smooth and uniform, and dimensions are to be in accordance with the qualified welding procedure.

2.4 Equipment

.1 Welding equipment to be 200 A or larger DC machines, and to be designed and maintained in an acceptable condition to obtain the specified results.

3. EXECUTION

3.1 General

.1 Perform welding using procedures qualified to CSA Z662, Clause 7.2. Surfaces to be welded are to be smooth, uniform, free of fins, lamination, tears, slag, grease, paint, and other deleterious conditions which might adversely affect welding. All aspects of the process as outlined in CSA Z662, Clause 7.2.5.2 are to conform to the welding procedure specification.

.2 In accordance with Section 00 13 30, submit five (5) copies of proposed welding procedure to Engineer using the forms provided at the end of this Section. Provide details for procedure to be used to prepare the test joints required for qualification.

3.2 Welder Qualification

.1 Welders engaged on the work to possess valid certificates of qualification from the appropriate governing authority for pipeline welding in the flat, vertical, and overhead positions. Certificates to be for the shielded metal arc method of welding. Provide copies of certificates to Engineer when qualification test results are submitted.

.2 Welders to qualify under CSA Z662, Clause 7.2.6.

.3 Make a record of the test given to each welder and of the detailed results of each test. Record to be maintained by Contractor and a list of qualified welders and procedures in which they are qualified to be provided to the Engineer. Welders may be required to requalify if there is a question about their ability.

3.3 Qualification of the Welding Procedure

.1 Prepare test joints in accordance with the proposed welding specification and as stated in the proposed welding procedure submitted to the Engineer. Give Engineer written notice of when and where the welding of the test joints will take place so that the Engineer can be present. Test joints to be tested at Contractor's expense, and in accordance with CSA Standard Z662, Clause 7.2.5.4. Upon qualification, no change in the procedure will be permitted without the Engineer's written approval.

3.4 Field Welding

.1 No field welding of stainless pipe.

3.5 Production Welding

.1 Production welding to conform to CSA Z662, Clause 7.2.7 for field welding, and ANSI Code B31.3, Chapter V for shop welding, and the following stipulations.

.2 No pup shorter than 1 m or three (3) pipe diameters, whichever dimension is greater to be installed in the line. There is to be at least one (1) full joint of pipe installed between pups which are shorter than 5 m. All pups must be moved ahead on a current basis and installed in the line.

.3 No two (2) weld beads are to be started or stopped in the same location. Visually examine each weld pass and repair any defects (i.e., pin holes, slag inclusions, gas pockets, and undercutting, etc.) prior to welding the next pass.

.4 Do not strike the arc on the pipe at any point other than the welding groove. Any section of pipe which has been arc burned may, at the Engineer's discretion, be cut out and replaced at the Contractor's expense.

.5 No weld to be subjected to sudden variations in temperature and no welded sections to be subjected to stresses, due to movement of pipe, loading on pipe, etc., until the welds have cooled below 38°C. Damage caused by the welded pipe being subjected to stresses before complete cooling of welds to be corrected at the Contractor's expense.

.6 All temperatures to be measured by pyrometric crayons or other suitable devices approved by the Engineer.

.7 All passes to have no more than five (5) minutes elapse between the previous pass termination and the commencement of the next pass. When ambient temperature is below 0°C, maximum lapse time allowable is four (4) minutes.

.8 Use inert gas backing for stainless steel welding. Solar flux prohibited for liquid commodity piping.

.9 For stainless steel pipes carrying solids-containing liquids or slurries pickle all joints and heat affected zones on interior and exterior. Use of pickling paste subject to Engineer’s review. Observe regulatory requirements for disposal of acid.

.10 Passivate exterior of all stainless steel welds after completion. Neutralize and rinse joints.

3.6 Lineup Clamps

.1 Use of lineup clamps to conform to CSA Z662, Clause 7.2.7.4. Internal lineup clamps to be used whenever practicable and when used are not to be removed until root bead is complete. External lineup clamps may be used only when use of internal lineup clamps is not practicable. Root bead segments used in connection with external lineup clamps to be uniformly spaced around the circumference of the pipe, and to have an accumulative length of not less than 50% of the pipe circumference before the clamp may be removed. Pipe to remain supported and stationary until root bead is completed.

3.7 Clearance

.1 Clearance to be in accordance with CSA Z662, Clause 7.2.7.8. When the pipe is welded in a trench, bell hole to be of sufficient size to provide the welder or welders ready access to the joint so that their skill is not impaired. When pipe is welded above ground, the working clearance around the pipe at the weld is to be not less than 400 mm.

3.8 Pipe Handling

.1 Extreme care to be exercised to prevent damage to pipe. Damage to be repaired as directed by the Engineer and at the expense of the Contractor. Bevel ends to be repaired if damaged.

.2 All dents in the pipe deeper than 3.20 mm to be removed by cutting dented portion of the pipe out, rebevelling the cut ends, welding and recoating.

3.9 Inspection

.1 Inspection will be conducted in accordance with ANSI B31.3. After completion of the welding operation, pipe to be left uncoated for a period sufficient to permit Engineer to inspect the welds.

.2 Work performed will be rigidly inspected. Such inspection will not relieve Contractor of responsibility for performing work in conformance with the specifications. Notify Engineer in advance of performing any work in order that inspection may be arranged. Engineer may reject any work that does not comply with the specified requirements. Furnish the Engineer reasonable facilities and space for inspection, testing, and obtaining any information Engineer desires respecting the character of material used and progress and condition of the work.

.3 Ten percent of welds are subject to radiographic inspection, the cost of which will be borne by the Contractor. Radiographic inspection to be carried out by operators certified in conformance with CSA W178.1 and W178.2.

.4 Engineer may use any method of additional inspection necessary to establish quality control and ensure adherence to welding procedures. Engineer has the right to accept or reject any weld not meeting the approved procedures and/or specified requirements.

3.10 Repair or Removal of Weld Defects

.1 Repair or removal of weld defects to be in accordance with CSA Z662, Clause 7.2.10. Backwelding is not allowed without qualification of the welding procedure used.

.2 All costs for repairing defective welds, including radiographic inspection of the corrected work, to be borne by the Contractor.

Proposed Welding Procedures:

Date:	
Job Title	
Associated Engineering Project No.	
Classification of Pipe	
Maximum Tensile Strength	
Maximum Yield Strength	
Percentage Elongation in 50 mm	
Mill Test Forwarded to Associated Engineering	Yes or No
Ladle Analysis Forwarded to Associated Engineering	Yes or No
Carbon Content	
Carbon Equivalent	
Process	
Diameter and Wall Thickness	
Joint Design	

Filler Metal

Pass	**Size**	**AWS Classification**	**Voltage**	**Amperage**	**Polarity**	**Brand**
1						
2						
3						
4						
5						

Position	
Direction of Welding	
Number of Welders	
Time Lapse between Passes	
Inter-Pass Heating (if required)	
Method of Heating	
Cleaning between Passes	
Preheat	
Minimum Ambient Temperature	

END OF SECTION

1. GENERAL

1.1 Description

.1 The following pages provide a summary of the pipe materials and reference specifications for use in the work and should be read in conjunction with Section 33 11 13. Furnish all piping and appurtenances in accordance with the requirements of this Section and those requirements of Section 33 11 13. Where there is a conflict, conform to the most stringent requirements.

.2 Table 1 summarizes the commodities and the general pipe material to be provided. See Part 2 for specific applications and the Detailed Pipe Specification Sheets.

1.2 Table 1: Process Fluids and Pipe Materials

Commodity Abbreviation	Commodity	Pipe Material
W	Municipal Water	316L Stainless Steel

2. PRODUCTS

2.1 General

.1 Detailed stainless steel piping specification sheets follow.

W

GENERAL					
PROCESS FLUID	SYMBOL	MAXIMUM CONDITIONS		TEST CONDITIONS	
		PRESSURE (kPa)	TEMP. (°C)	PRESSURE (kPa)	DURATION (Min.)
Water	**W**	1050	20	1600	120

PIPE					
LOCATION	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
Tunnels, Pumphouses, and Buildings	All	316L Stainless Steel	Sch 10S	AWWA C220, ASTM A312, ANSI B36.19	
Underground	All	316L Stainless Steel	Sch 10S	AWWA C220, ASTM A312, ANSI B36.19	
Below Structures	All	316L Stainless Steel	Sch 10S	AWWA C220, ASTM A312, ANSI B36.19	
Submerged	All	316L Stainless Steel	Sch 10S	AWWA C220, ASTM A312, ANSI B36.19	

COATINGS				
LOCATION	SIZE (mm)	MATERIAL	SPECIFICATIONS	REMARKS
Tunnels, Pumphouses, and Buildings	All	N/A		
Underground	All	N/A		
Below Structures	All	N/A		
Submerged	All	N/A		

LININGS				
LOCATION	SIZE (mm)	MATERIAL	SPECIFICATIONS	REMARKS
Tunnels, Pumphouses, and Buildings	All	N/A		
Underground	All	N/A		
Below Structures	All	N/A		
Submerged	All	N/A		

JOINTS					
LOCATION	SIZE (mm)	TYPE	MAXIMUM SPACING	SPECIFICATIONS	REMARKS
Tunnels, Pumphouses, and Buildings	All	Butt Welded Van Stone Angle Ring Flanges, Slip on or Butt Type	N/A 20 m	Material same as pipe Pattern: ANSI B16.5 ANSI B16.9	
Submerged	All	Butt Welded Van Stone Angle Ring Flanges, Slip on or Butt Type	N/A 20 m	Material same as pipe Pattern: ANSI B16.5 ANSI B16.9	
Below Structures	All	Butt Welded Van Stone Angle Ring Flanges, Slip on or Butt Type	20 m	Material same as pipe Pattern: ANSI B16.5 ANSI B16.9	

Stainless Steel Piping – Detailed Specification Sheet

FITTINGS AND APPURTENANCES					
ITEM	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
Van Stone Flanges, Rolled Angle, FF Or RF	>50	304L Stainless Steel	Class 300	Pipe Material: ASTM A240 Flanges: ASTM A285 Fabrication: ASTM A774 Pattern: ANSI B16.1	
Cap. Plug					
Couplings, E11 - Short Radius, E11 - Long Radius, Tees, Reducers, Reducing Outlets, Laterals	>50	Stainless Steel, Single Longitudinal Weld Seam	Same as Pipe	Material: ASTM A774/A240 Dimensions: ANSI B16.5 ANSI B16.9	
Plug	>50	Stainless Steel	Class 300 Blind Flange	Material: ASTM A774 Dimensions: ANSI B16.5	
Cap	>50	Stainless Steel	Same as Pipe	Material: ASTM A774 Dimensions: ANSI B16.1	
Sockolet					
Threadolet					
Flanged Adaptors					
Flanged Gaskets		Compressed Keviar with Neoprene Binder			
Grooved Joint Gaskets					

VALVES			
TYPE	SIZE (mm)	VALVE SPECIFICATION (SECTION 35 20 19)	REMARKS
Butterfly	-	N/A	
Ball	<75 ≥75	BV02	
Check	All	-	
Globe	-	N/A	
Gate	-	N/A	
Mud	-	N/A	
Plug	-	N/A	

NOTES

1. Refer to Section 35 20 18 for welding specifications.

1. GENERAL

1.1 Description

.1 This section specifies requirements for the supply and installation of precast manholes, catch basins, and valve chambers.

1.2 Sumittals for review

.1 Submit documents in accordance with Section 01 32 19.

.2 Submit manufacturer's test data and certification at least four (4) weeks prior to commencing work. Include manufacturer’s drawings, information and shop drawings.

.3 Submit shop drawings of precast concrete manhole, vertical sections and lids. Structural design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of British Columbia, Canada.

2. PRODUCTS

2.1 Materials

.1 Cast-in-place concrete: Refer to Section 03 30 00.

.1 Cement: to CAN/CSA-A5, type 10.

.2 Concrete mix design to produce 20 MPa minimum compressive strength at twenty-eight (28) days.

.2 Concrete reinforcement: Refer to Section 03 20 00.

.3 Precast manhole units: to ASTM C 478M, H2O loading, circular. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

.4 Joints: to be made watertight using cement mortar or rubber gaskets to ASTM C443.

.5 Mortar:

.1 Aggregate: to CSA A82.56.

.2 Cement: to CAN/CSA-A8.

.3 Ladder rungs: to Land Industries Safety Threads or approved equal.

.6 Adjusting rings: to ASTM C 478M.

.7 Concrete brick: to CAN3-A165 Series.

.8 Steel gratings, I-beams and fasteners: as indicated.

.9 Precast catch basin sections: to ASTM C478M.

.10 Precast reinforced concrete valve chambers: to CAN3-A23.4, complete with knock-outs for pipes, precast lid and base, ladder rungs, sump and aluminum hatch opening. The precast reinforced concrete valve chamber must be designed to withstand buoyancy. Valve chamber to be designed for seismic requirements as provided into Golder geotechnical report.

.11 Frames, gratings, covers to dimensions as indicated and following requirements:

.1 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit.

.2 Gray iron castings: to ASTM A48, strength class 30B and to meet AASHTO H20 loading requirements.

.3 Fasteners for bolted pressure type lids shall be 316 stainless steel

.4 Castings: coated with two applications of asphalt varnish.

.5 Access frames and covers must bear manufacturer identification on casting and shall be heavy duty round manhole frames. Lids to have watertight pick points and shall be sealed with a gasket. Frames to be suitable for casting into concrete slabs.

.6 Emboss covers with “STORM SEWER” as applicable

.12 Aggregate and Granular Materials: refer to Section 31 05 15

3. EXECUTION

3.1 Excavation and Backfill

.1 Excavate and backfill in accordance to Section 31 23 01.

3.2 Concrete Work

.1 Place concrete reinforcement in accordance to Section 03 20 00.

.2 Do concrete work in accordance to Section 03 30 00.

3.3 Installation

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses.

.3 Ensure excavation free of water prior to placing concrete. Dewater excavation in and remove soft and foreign material before placing concrete base in accordance with Section MMCD 03 40 01.

.4 Cast bottom slabs directly on undisturbed ground or when permitted by Engineer set precast concrete base on minimum 150mm of Granular Base as per MMCD Section 31 05 17Articke 2.10, compacted to not less than 100% Standard Proctor maximum Dry Density in accordance with ASTM D 698 with oversize corrections calculated in accordance with ASTM D4718.

.5 Construct base to ensure first precast riser section is set plumb. Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight with Engineer approved material.

.6 Set all inlet and outlet pipes to specified alignments and elevations.

.7 Connect concrete pipe into manhole using spigot or bell precast into manhole wall.

.8 Ensure placement of concrete does not disturb connecting joints. Clean surplus mortar and joint compound from interior surface unit as work progresses.

.9 Set remaining precast riser sections plumb with joints consisting of cement mortar or gaskets to ASTM C443.

.10 Bench to direct flow parallel to main flow of sewer. Form top of benching as high as crown of sewer pipe. Finish concrete to smooth surface using steel trowel.

.11 Brace capped inlets or stubs to withstand testing head.

.12 Set frames by firmly embedding in mortar.

.13 Plug lifting holes in pipe.

.14 Apply waterproof membrane for valve chambers in accordance to manufacturer's recommendations.

END OF SECTION