



TOWN OF
PEACE RIVER
ALBERTA

TOWN OF PEACE RIVER

TENDER Contract: 234423-00

for

NEIGHBOURHOOD INFRASTRUCTURE RENEWAL – 2023

95TH AVENUE 94TH STREET TO 98TH STREET

BLOCK 11 LANE; 94TH AVENUE TO 95TH AVENUE

Schedule 'A' – Water

Schedule 'B' – Sanitary Sewer

Schedule 'C' – Water and Sewer Services

Schedule 'D' – Storm Sewer

Schedule 'E' – Roads and Concrete

**Water, Sanitary Sewer, Water and Sewer Services, Storm Sewer,
Concrete Curb, Gutter and Sidewalk, Granular Base Course,
Asphalt Concrete Pavement (EPS) and Other Work**

**Tender Closing Date
and Time:**

July 4, 2023 at 2:00:00 p.m.

Inquiries Contact:

**d.young@mcintoshperry.com
(Include Tender Number in subject line)**

TENDER SPECIFICATIONS

For

**TOWN OF PEACE RIVER
NEIGHBOURHOOD INFRASTRUCTURE RENEWAL – 2023
95TH AVENUE 94TH STREET TO 98TH STREET
BLOCK 11 LANE; 94TH AVENUE TO 95TH AVENUE**

**Schedule 'A' – Water
Schedule 'B' – Sanitary Sewer
Schedule 'C' – Water and Sewer Services
Schedule 'D' – Storm Sewer
Schedule 'E' – Roads and Concrete**

Maurice Wadman, P.Eng.
Project Engineer

Permit to Practice

Town of Peace River
Neighbourhood Infrastructure Renewal – 2023
95th Avenue; 94th Street to 98th Street
Block 11 Lane; 94th Avenue to 95th Avenue

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INVITATION TO TENDER**Town of Peace River**

Tenders will be received by the undersigned until 2:00 pm on July 4, 2023. **Due to the open house scheduled for July 18, 2023. No extension to the closing date of this Tender will be considered at this time.**

At the Office of:

Town of Peace River Office
Tender Deposit (reception) Counter
9911-100th Street
Peace River, AB, T8S 1S4
Phone: 780-624-2574

For the following work:

Contract -234423-00
NEIGHBOURHOOD INFRASTRUCTURE RENEWAL – 2023
95TH AVENUE 94TH STREET TO 98TH STREET
BLOCK 11 LANE; 94TH AVENUE TO 95TH AVENUE

Approximate Quantities

- Water Mains & Appurtenances	210 m
- Sanitary Sewer Mains & Manholes (6 units)	330 m
- Storm Water Lines, Manholes & Catch Basins (10 units)	145 m
- Water & Sewer Services Replacement	23 units
- Concrete Curb & Gutter, Monolithic and Separate Sidewalk	950 m ²
- Earth excavation, Road Base & Paving	3,435 m ²

Note: This contract is divided into five (5) Schedules and has an interim completion date of **October 25, 2023** for **Schedules A, B, and C**. The remainder of the project has a completion date of **June 30, 2024**.

Tenders must be accompanied by a certified cheque, irrevocable letter of credit or bid bond in the amount of ten percent (10%) of the total sum tendered. Lowest or any tender will not necessarily be accepted. The Owner reserves the right to accept or reject any tender submission. If further information is required, please contact tenders@peacriver.ca

For technical or engineering information, please contact Mr. Delon Young, B.Sc., Project Director, McIntosh Perry, at 780-617-4714.

INSTRUCTIONS TO BIDDERS

1. INSTRUCTIONS TO BIDDERS**1.1 CONDITIONS FOR TENDER SUBMISSION**

Bidders may submit tenders at the following location only:

Town of Peace River Office
Tender Deposit (reception) Counter
9911-100th Street
Peace River, AB, T8S 1S4
Phone: 780-624-2574

Bidders may submit Tenders only up to **2:00 p.m.** local time on **July 4, 2023**, at the Town of Peace River Office, at 9911-100th Street, in the Town of Peace River, Alberta.

This will be a CLOSED tender opening – no public may be present but unofficial results will be made available within a reasonable time frame after the tender review process.

Bidders will also be able to receive the unofficial tender results by fax, email, or other means within a reasonable time frame after the tender review or through public notifications such as the Alberta Roadbuilders and Heavy Construction Association, or Alberta Purchasing Connection.

Bidders must submit Tenders on the forms issued with this Tender Document.

It shall be the Bidder's responsibility to confirm with the Owner that its bid has been received prior to Tender closing.

The Bidder is solely responsible for ensuring that its tender submission is received in its entirety before the tender Closing Date and Time at the Tender Submission Address. The Town of Peace River assumes no responsibility for issue or delay that prevents the tender submission from being received by, or opened after, the tender Closing Date and Time.

When submitting a Tender, all pages entitled "Tender Forms" and all Addenda issued by the Town of Peace River and/ or McIntosh Perry must be included as part of the Tender submission.

Hard copy submissions of the tender package shall be addressed to Tender Deposit Counter, Town of Peace River at the above-noted address, marked "Tender for Construction" with the Tender number, time and date of Tender opening clearly marked on the lower right-hand corner of the envelope. A Bidder must indicate its name and address clearly in the upper left-hand corner of the envelope so that the Tender submission can be identified.

1.2 PROJECT INQUIRIES

For information regarding this project, you may contact the TOWN OF PEACE RIVER'S representing Consultant:

Delon Young, B.Sc.
McIntosh Perry

INSTRUCTIONS TO BIDDERS

10032 99 Street
Peace River, AB, T8S 1B3
Phone: 780-617-4714
Email: d.young@mcintoshperry.com

There will be no pre-tender meeting for this contract.

1.3 TENDER DOCUMENTS AND EVALUATION**1.3.1 Tender Format**

Tenders shall be submitted in two (2) envelopes and be arranged in the following format:

Envelope #1

- 1) Tender Form **Excluding the Unit Price Schedule**
- 2) Cover Letter

This letter will briefly summarize the Company's interest in performing the work and the commitment of key personnel identified in the Tender. It should also provide a summary of the key elements of the qualifications of the Company and its Sub-Contractors. It should highlight any unique and special qualifications or approaches that the Company wishes to be considered in the evaluation. The year the Tendering company was established. The Company's ownership, affiliations, and sister companies.

The cover letter shall include the Company name, physical address and mailing address if different, telephone number, fax number, an e-mail address of branch or head office to be used and the contact name with the individual's position, telephone number and e-mail address.

Dated and signed by an official authorized to negotiate, make commitments, and provide any clarifications with respect to the tender on behalf of the Company.

- 3) Safety Certificate of Recognition (COR) is required for this Tender. Contractors must have and maintain a safety Certificate of Recognition from the Alberta Construction Safety Association or an approved equivalent, such as a valid Temporary Letter of Certification (TLC) issued by the Alberta Construction Safety Association (ACSA). Contractors are advised that a small employer's Certificate of Recognition (for employers with less than 10 employees) is not considered acceptable.
- 4) An executive summary touching on pertinent points in the Tender you wish to highlight, including an overview of the project schedule and project Tender costs.
- 5) The Tenderer shall describe why their firm is the best fit to provide the services described in this Tender and outline the key strengths the Company will bring to the project.
- 6) The Tenderer shall demonstrate the Company's understanding of the Owner's requirements for the project, and that they have the ability to satisfy all aspects of the project, as outlined in this Tender including but not limited to, project deliverables and project schedule.

INSTRUCTIONS TO BIDDERS

- 7) The Tenderer shall identify the Project Team members that will be assigned to the project. The project team members such as owner, superintendent, foremen, operators and pipelayers allocated towards the project must be identified as KEY Project Team members. Proponents are to outline the roles and responsibilities of the KEY Project Team members and which office location they will be working from. The proponent shall also identify the location of the Project Office and the person in charge who will be responsible for overseeing the entire project. Any changes in Project Team members will be subject to the Town of Peace River's acceptance
- 8) The Tenderer's shall include a resume for each KEY Project Team member. The resume should include the person's education, training, number of years' experience, number of years working for the present company and experience on projects of similar size and scope. If sub-contractors are being proposed, proponents shall indicate past projects they have completed together.
- 9) Project Schedule for Deliverables
- 10) The Tenderer shall provide the proposed methodology for completing the scope of work for this Tender based on the timelines stated in the Tender Documents. Each phase of the construction shall be identified.

Envelope #2

- 1) Envelope 2 shall include the Tender Form, Unit Price Schedule. Pages 22-29
- 2) The Tender Deposit: certified cheque, irrevocable letter of credit or bid bond
- 3) The letter of consent from the Surety Company
- 4) The Tenderer proponents may present an item that they consider being additional to the scope of this Tender. All such items must be identified as additional or optional and priced separately. The Town of Peace River reserves the right to exclude any additional item identified at their sole discretion. Any work items necessary to fulfill the obligations of the Contract and the overall intent of the Project will be considered part of other unit price bid items.

1.3.2 Tender Evaluation

The tender will be evaluated based on the following criteria:

Item	Weight	Description
Price	30%	Total Tender Standardized to the site occupancy days stipulated in the contract
Project Experience	15%	Provide information for 3 to 5 recent related projects; Tender/ Actual Value, Tender/ Actual Timeline, project scope and sponsor details.
Personnel Experience	10%	Provide personnel experience as related to the referenced projects and this Tender scope of work.
Schedule	15%	Detail project schedule and timeline with consideration of site occupancy and indicated project restrictions and deadlines

INSTRUCTIONS TO BIDDERS

Project Comprehension	10%	Clarify and comment on critical components of the project.
Local Involvement	10%	Provide at least three (3) business references for work conducted in the Peace Region.
Financial Resources	10%	Provide bid security, consent of surety, COR etc.

When evaluating local involvement, the Town will abide by the NW Partnership Trade Agreement and agreements of internal trade.

The Town will evaluate the Tenders based on the above criteria, to determine which Tender provides them with the greatest value of quality, service and price.

1.3.3 Full Size Plans and Drawings

Full size plans and drawings for this Project will be made available to the Contractor upon award of the tender.

1.3.4 General

Electronic (.PDF) copies of all separate plans and drawings listed in the tender document may be viewed and/or downloaded, from the following website:

- a) Alberta Purchasing Connection www.purchasingconnection.ca

Copies of these drawings will be provided to the successful bidder.

1.4 TENDER SUBMISSION REQUIREMENTS**1.4.1 Bidder Information**

The tender must be submitted by a single individual, partnership, corporation, or company. Joint Ventures are not permitted to bid unless expressly authorized in the tender documents. For all Bidders, the legal name, address, and e-mail address to which all notices or letters are to be mailed and e-mailed must be given in addition to the signature of the individual or one of the officers of the partnership, corporation, or company with authority to bind the Bidder.

1.4.2 Completing Unit Price Schedule

There are five (5) Unit Price Schedules contained in this document, as well as a Tender Summary:

- Schedule 'A' – Water
- Schedule 'B' – Sanitary Sewer
- Schedule 'C' – Water and Sewer Services
- Schedule 'D' – Storm Sewer
- Schedule 'E' – Roads

Contractors must complete all five (5) Unit Price Schedules, as well as the Tender Summary.

INSTRUCTIONS TO BIDDERS

The "Unit Price Schedules" must be completed by:

- Filling in all blank spaces under the headings "Unit Price", and "Estimated Quantity" where applicable, and the "Total Bid"; and
- Filling out the schedule as follows:

a) Unit Price

For bid items where the estimated quantity is fixed and the Bidder is required to provide a unit price, insert the unit price in the "Unit Price" column and insert the total for each item in the "Total Bid" column; (in case of discrepancy, the unit price figure will take precedence over the total in the "Total Bid" column);

b) Lump Sum

For bid items where the Bidder is required to provide a lump sum, insert the lump sum amount in the "Total Bid" column. Only the amount in the "Total Bid" column will be used in calculating the Total Tender;

c) Estimated Quantity

For bid items where the unit price is fixed and the Bidder is required to provide an estimated quantity (for example site occupancy), insert the estimated quantity in the "Estimated Quantity" column, and insert the total for each item in the "Total Bid" column; (in case of discrepancy, the estimated quantity figure in the "Estimated Quantity" column will take precedence over the total in the "Total Bid" column). The "Estimated Quantity" must be a whole number. If the number includes decimals, the Town of Peace River will round to the nearest whole number with .5 being rounded upwards; and

d) Total Tender

Insert the sum of all amounts in the "Total Bid" column in the space marked "Total Tender in Canadian dollars excluding GST".

Prices must not exceed two decimal places. If a submitted unit price schedule contains prices exceeding two decimal places, the Town of Peace River will round to the nearest two decimal places with .005 being rounded upwards. Bidders will be bound to such rounded amounts.

1.4.3 Acknowledging Addenda

Addenda when issued, form part of the Tender Document. Each Bidder shall ascertain before tender submission that it has obtained all addenda issued by the Town of Peace River and by signing the Tender Form or submitting a Tender Amendment Form, each Bidder acknowledges that all issued addenda have been examined, read, and considered in their tender.

During the Tendering period, all Addenda issued by the Owner will be sent by fax, email, or courier to the address for all Parties recorded by the Owner or Consultant as having received

INSTRUCTIONS TO BIDDERS

hard copy Bid Documents, at the time the Addenda is issued. Bidders who have obtained Bid Documents from any source other than the Owner may not automatically receive Addenda via fax, email, or courier. Notwithstanding any other provisions of this Tender, each Bidder shall ascertain, prior to the time fixed for receiving tenders, that it has received all Addenda issued by the Owner.

When an Addendum is issued by the Owner, the covering letter containing instruction regarding the Addendum shall be attached to the inside front cover of the "Contract and Specifications" book. The individual items included in the Addendum shall be inserted in accordance with the covering letter.

1.4.4 Tender Security

Each tender must be accompanied by a bid bond (along with a Consent of Surety), irrevocable letter of credit, or a certified cheque made out to Town of Peace River of the Province of Alberta equal to 10% of the tender amount. Tenders not accompanied by tender security will be rejected as non-compliant.

Bid bonds shall be issued by a duly incorporated surety company authorized to transact business of suretyship in the Province of Alberta in a form acceptable to the Town of Peace River.

Verification of the bid bond may be conducted by the Town of Peace River at any time immediately after Closing Date and Time, or at any time during the life of the bid bond and at the discretion of the Town of Peace River.

The undersigned hereby agrees that if, within twenty-one (21) days after the Contract is presented to him for signature, hand delivered or sent by registered mail or courier addressed to him at the address stated in the Tender, the undersigned refused or fails:

- a) To sign and return to the Town of Peace River the contract for the performance of the Work and the supplying of Materials covered by this Tender; or
- b) To provide security and insurance as required by the Specifications.

The bid bond or deposit shall be subject to forfeiture to the Town of Peace River, and if a Contract for that Work and material is then entered into with some other person for a greater amount, the Undersigned is liable to the Town of Peace River in the amount equal to the difference between the amount of his Tender and the amount of the contract actually entered into; the maximum not exceeding the amount of the security required under this section.

The bid bond shall be enforceable for the earlier of the tender acceptance period as specified in the Instruction to Bidders or until the bond's principal enters into the formal contract.

A bid bond that is a copy or improperly completely or executed may cause the tender to be rejected as non-compliant it, in the Town of Peace River judgement, this would potentially render the bid bond unenforceable.

All costs associated with acquiring bonding must be covered within the Bidders Contract price.

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1.4.5 Safety Prequalification

As a precondition to contract award, the Bidder must have a valid Certificate of Recognition (COR) or a valid Temporary Letter of Certification (TLC), or a Certificate of Recognition Equivalency Letter (COREL) for out of province Bidders, as issued by the Alberta Construction Safety Association (ACSA) or another certifying partner authorized by the Alberta Ministry of Labour to issue CORs, TLCs or CORELs. The COR, TLC or COREL must be relevant to the Work. Possession of a Certificate of Recognition other than a COR, TLC or COREL, such as a Small Employer Certificate of Recognition (SECOR) is not acceptable.

Bidders may be required to submit evidence of safety qualifications by the earlier of:

- i) The date that the Town of Peace River may request in writing, or
- ii) Seven days before expiry of the tender acceptance period.

Prospective Bidders who do not possess a COR, TLC or a COREL and wish to obtain information about obtaining one, are advised to contact:

The Alberta Construction Safety Association	Telephone: (780) 453-3311 or
225 Parsons Rd. S.W.	(Toll Free) 1-800-661-2272
Edmonton, AB, T6X 0W6	Fax: (780) 455-1120 or
Web Site: www.acsa-safety.org	1-877-441-0440
E-mail: Edmonton@acsa-safety.org	

or another certifying partner authorized by Alberta Ministry of Labour.

It is the Bidder's responsibility to ensure its registration in the program is properly documented with the issuing certifying partner. The Owner will assume no liability for errors or omissions in this regard.

The Bidder must maintain a valid registration throughout the course of the Contract.

1.5 REJECTION OF TENDERS

The Owner reserves the right to accept or reject any or all Tenders and to waive irregularities and informalities at its discretion. The Owner reserves the right to accept a Tender other than the lowest Tender without stating reasons. The Owner has the right to award the work to whomever it chooses, in its sole and unfettered discretion, and for whatever reasons the owner deems appropriate. By the act of submitting its bid, the Bidder agrees that any claim the Bidder may have in relation to the award of the work by the Owner is limited to damages for the reasonable costs of preparing the bid and that the Bidder has no right to seek loss of anticipated profit.

Without limiting the generality of the foregoing, the Owner may consider any other factor besides price and capability to perform the work that it deems in its sole discretion to be relevant to its decision but not limited to the following:

- Any past experience with the Bidder, or lack thereof;
- The results of any reference check done by the Owner;

INSTRUCTIONS TO BIDDERS

- Information relating to the financial state of the Bidder, however obtained;
- Show any alteration of form;
- Omit any required information or are illegible;
- Contain qualifications to the bid, or additions not called for;
- Are conditional or alternative bids;
- Are incomplete bids;
- Contain prices, which are unbalanced; or
- Is accompanied by an insufficient certified cheque, irrevocable letter of credit or by a Bid Bond in an unsatisfactory form.

The Town of Peace River reserves the right to waive an irregularity or non-compliance where the Town of Peace River deems the irregularity or non-compliance to be minor or inconsequential. The determination of what is or is not a minor or inconsequential irregularity or non-compliance, and the determination of whether to waive or not waive the irregularity or non-compliance, is at the Town of Peace River's sole discretion.

In addition, failure to satisfactorily complete previous construction contracts with the Town of Peace River, or avoidable delays in completing such contracts, will be considered sufficient cause for rejecting any tender.

1.6 TENDER DATE CHANGES AND CANCELLING OF TENDERS

The Owner may extend the date and time for receiving tenders, or the Owner may amend, suspend, postpone, or cancel this tender at any time.

1.7 DISQUALIFICATION OF BIDDERS

Only one tender per Bidder will be considered. Reasonable grounds for believing that any Bidder is interested in more than one tender for the Work, in the capacity of the Contractor, may cause the rejection of all tenders in which such Bidder is interested.

Any or all tenders will be rejected if there is reason to believe that collusion exists among the Bidders, and none of the participants in such collusion will be considered in future tenders.

1.8 BIDDER'S INVESTIGATION AND REPRESENTATION

The Bidder must examine the contract forms and tender documents, including plans, drawings, Town of Peace River's General Municipal Service Standards, and special provisions, to clearly understand the requirements of the project(s) and to carefully investigate and satisfy themselves of every condition affecting the project(s), including the site conditions and the labour and material to be provided. The Town of Peace River GMSS is available online at <https://peaceriver.ca/engineering-infrastructure/service-standards>. The Bidder agrees that submission of a tender is conclusive evidence that the Bidder has made such investigation; and that, whether or not he has so investigated, he is willing to assume and does assume all risk regarding conditions affecting the project.

The Bidder acknowledges and agrees that, where provided, any information pertaining to subsurface soil, rock and groundwater conditions indicated on the borehole/test pit logs shown on the drawings: 1) has been obtained for design purposes; and 2) is valid only at the specific

INSTRUCTIONS TO BIDDERS

locations of the boreholes/test pits and only on the date(s) that the subsurface investigation(s) took place. Bidders may wish to supplement this information, for their purposes, by performing additional investigations.

The submission of a tender also constitutes a representation by the Bidder that:

- (i) the Bidder has complied with all bidding requirements;
- (ii) the Bidder is qualified and experienced to perform the Work in accordance with the tender documents;
- (iii) the bid is based upon performing the Work in accordance with the tender documents, without exception; and
- (iv) the price or prices stated in the tender cover all the Bidder's obligations under the Contract and all matters and things necessary for the performance of the Work in accordance with the tender documents.

1.9 INTERPRETATION AND REVISION OF TENDER DOCUMENTS

The Bidder must submit all questions about the meaning and intent of the tender documents directly to the contact identified on the cover page of the tender. Interpretations and revisions considered necessary in response to such questions will be issued by the Town of Peace River in writing in the form of addenda.

Addenda may also be issued by the Town of Peace River to revise the tender documents as deemed necessary.

The Bidder must submit questions as early as possible during the tendering period. The Town of Peace River may not respond to questions received too close to the tender Closing Date and Time to permit the issuance of an addendum.

It is the Bidder's responsibility to notify the Town of Peace River, in writing, of any ambiguity, divergence, error, or omission, oversight, contradiction, or item subject to more than one interpretation in these tender documents, as it is discovered, and to request any instruction, decision, or direction required for the Bidder to bid.

If an inquiry requires an interpretation or revision of the tender documents, the response to that inquiry will be issued in the form of a written addendum, to ensure that all bidders base their bids on the same information.

Replies to questions, interpretations and revisions made in a manner other than by written addendum are not binding.

1.10 WITHDRAWAL OR CHANGE OF TENDER

1.10.1 Withdrawal of Tender Submission

A Bidder may withdraw its tender by submitting a request in writing signed by an authorized officer of the Bidder. The request must be received:

INSTRUCTIONS TO BIDDERS

- In accordance with Instructions to Bidders Section 1.1, Conditions for Tender Submission; or
- If the request is submitted by fax, it must be sent to 780-624-4664, marked "ATTENTION: 234423-00 NIR 2023, CONTRACT OPENING" and all pages must be date stamped prior to the tender Closing Date and Time.

1.10.2 No Withdrawal

No Bidder may withdraw a tender at or after the time fixed for receiving tenders until:

- (i) some other Bidder has entered into a Contract with the Town of Peace River for the performance of the project specified in these tender documents and provided the required security and evidence of insurance coverage in accordance with the General Conditions contained within this contract which must be satisfactory to the Town of Peace River and in compliance with Instructions to Bidders Section 2.3.2, Tender Security, or
- (ii) thirty-five (35) calendar days after the time fixed for receiving tenders unless the Town of Peace River has notified the bidder that they are the successful bidder;

whichever occurs first.

The 35-day acceptance period referred to above will commence at 11:59:00 p.m. of the Closing Date and will terminate at 11:59:00 p.m. of the 35th day thereafter. If the 35th day falls on a weekend or statutory holiday, such day(s) will be omitted from the computation.

1.10.3 Changes to Tender Submissions

A Bidder wishing to make changes to its tender before the tender Closing Date and Time may withdraw the tender submission and the modified tender may then be resubmitted in compliance with Instructions to Bidders Section 1.1, Conditions for Tender Submission, up to the tender Closing Date and Time. Bidders are advised that requests for withdrawal of tender submissions must comply with Instructions to Bidders Section 1.10.1, Withdrawal of Tender Submission.

If the changes to its tender are only an amendment to the unit price schedule, the Bidder may send a completed copy of the "TENDER AMMENDMENT FORM" included in the tender document by fax to 780-624-4664, marked "ATTENTION: 234423-00 NIR 2023, CONTRACT OPENING "

To be acceptable, the form must be completed in full including the legal name of the Bidder and the changes to be made and it must be signed by an authorized officer of the Bidder and received before the Tender Closing Date and Time in accordance with the Instructions to Bidders Section 1.1, conditions for Tender Submission.

The Owner and the Consultant accept no responsibility for emailed changes. It is the Bidder's responsibility to confirm receipt of any faxed changes.

The Bidder is responsible for ensuring its modifications are received before the tender Closing Date and Time and are legible, clear as to the intent, unambiguous, and comply with the terms

INSTRUCTIONS TO BIDDERS

of the tender document. Failure of the Bidder to do the foregoing will render these modifications null and void. The Town of Peace River assumes no responsibility or liability for the content of modifications, or for modifications that are, for any reason, delayed, illegible, unclear as to intent, ambiguous, contrary to these instructions, or otherwise improperly received. The Town of Peace River, at its sole discretion, may reject modifications in accordance with the terms of the Tender Amendment Form or may reject the tender in accordance with Instructions to Bidders Section 1.5, Rejection of Tenders, or both.

Prices must not exceed two decimal places. If a submitted unit price schedule change contains prices exceeding two decimal places, the Town of Peace River will round to the nearest two decimal places with .005 being rounded upwards. Bidders will be bound to such rounded amounts.

The "Tender Amendment Form", if applicable, must be completed by identifying only the changes required:

a) Estimated Quantity Changes

For bid items where the unit price is fixed and the Bidder is required to provide an estimated quantity (for example site occupancy), show the amount of the increase, or decrease of the quantity in the "Estimated Quantity Changes + or -" column and the total value of the change in the "Net Change to Total Bid + or -" column. Use the unit price as it appears in the unit price schedule as the unit price in the Tender Amendment Form.

In case of discrepancy, the estimated quantity figure in the "Estimated Quantity Changes + or -" column will take precedence over the amount in "Net Change to Total Bid + or -" column, and the unit price in the unit price schedule will take precedence over the unit price in the Tender Amendment Form;

b) Unit Price Changes

For bid items where the Bidder is required to provide a unit price, show the amount of the change to the unit price in the "Unit Price Changes + or -" column, and the total for each change in the "Net Change to Total Bid + or -" column. Use the estimated quantity as it appears in the unit price schedule as the estimated quantity in the Tender Amendment Form.

In case of discrepancy, the change to the unit price figure in the "Unit Price Changes + or -" column will take precedence over the total change in the "Net Change to Total Bid" column;

c) Lump Sum Changes

For bid items where the Bidder is required to provide a lump sum, leave a blank space in the "Unit Price Changes + or -" column, and enter the amount of the lump sum change in the "Net Change to Total Bid + or -" column; and

d) Net Change to Total Bid

INSTRUCTIONS TO BIDDERS

Show the sum of all items in the "Net Change to Total Bid + or -" column in the space after "Increase (+) or Reduce (-) Total Tender By".

If arithmetical errors are discovered, the changed estimated quantities or unit prices, as applicable, will be considered as representing the Bidder's intentions; and the net change to total bid price extensions and the change to total tender amount entered in the Tender Amendment Form will be corrected accordingly by the Town of Peace River. The Bidder will be bound to such corrected amounts.

1.11 TENDER VALIDATION

The Owner will check the completeness and accuracy of all Bidders' tender submissions to determine if a bid is compliant.

Extensions to unit price items and estimated quantity items entered in the unit price schedule will be verified by the Owner. If arithmetical errors are discovered:

- for unit price items, then the unit prices will be considered as representing the Bidder's intentions;
- for estimated quantity items, then the estimated quantity will be considered as representing the Bidder's intentions.

and the unit price or estimated quantity extensions and the Total Tender amount in the unit price schedule will be corrected accordingly by the Town of Peace River. The Bidder will be bound to such corrected amounts.

If an estimated quantity or unit price is not filled in by the Bidder for an item, but an amount is stated in the Total Bid column, then the Town of Peace River will determine:

- the unit price by dividing the extended amount by the estimated quantity and this unit price value will be considered as representing the Bidder's intentions; or
- the estimated quantity by dividing the extended amount by the unit price and this estimated quantity will be considered as representing the Bidder's intentions.

The Total Tender will be the arithmetically correct sum of the arithmetically correct total bid extensions and lump sums in the unit price schedule.

1.12 CONTRACT AWARD

Bidders may be a single individual, partnership, corporation, or company. However, if the Bidder is a partnership, corporation, or company it must be registered with the Alberta Corporate Registry and obtain a Town of Peace River Business License prior to Contract award.

There are five (5) Unit Price Schedules contained in this document. Where the Contract contains deletable bid items, the Owner reserves the right to make the award based on either the inclusion or deletion of such bid items. Regardless of the option chosen, no separate or additional payment will be made.

INSTRUCTIONS TO BIDDERS

The Owner reserves the right to not award the Contract. The Contractor shall have no claim against the Owner should the Owner exercise its right to not award the Contract.

1.13 SIGNED CONTRACT PACKAGE

The contract forms and any other applicable forms will be completed by the successful Bidder and included in the signed Contract. Prior to commencement of any activities and at any other time requested by the Owner, the successful Bidder must provide its security and proof of insurance, satisfactory to the Owner.

1.14 SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARDS, HIERARCHY OF DOCUMENTS

The following documents apply to this Instructions to Bidders. These documents can be found either in the tender documents or on the Town of Peace River website. In the event of discrepancies, the hierarchy of documents is as follows, in descending order:

- Contract Agreement
- Special Provisions
- General Conditions
- Specifications
- Project Specific Construction Plans
- Standard Construction Plans
- Standard Construction Specifications
- Tender Form
- Instructions to Bidders
- All other documents

In the event of a difference between scaled dimensions on Plans and the figures written thereon, the figures govern. If two or more plans show conflicting information, the information on the most recently dated plan govern.

Any technical and manufacturer's standard, Government Act, Regulation, or Code of Practice referred to in the Contract documents will be a reference to the version current at the time the Contract is awarded.

TENDER FORMS

2. TENDER FORMS**2.1 TENDER FOR CONSTRUCTION**

To Barbara Miller – CAO for the Town of Peace River of the Province of Alberta:

(Legal Name of Bidder)

the undersigned, hereby tenders and agrees to execute and construct all the Work of every description required in the construction and final completion of the following project(s):

NEIGHBOURHOOD INFRASTRUCTURE RENEWAL – 2023**95TH AVENUE 94TH STREET TO 98TH STREET****BLOCK 11 LANE; 94TH AVENUE TO 95TH AVENUE****Schedule 'A' – Water****Schedule 'B' – Sanitary Sewer****Schedule 'C' – Water and Sewer Services****Schedule 'D' – Storm Sewer****Schedule 'E' – Roads and Concrete****Water Mains, Sanitary Sewer Mains, Water and Sewer Services, Storm Sewer,
Concrete Curb, Gutter and Sidewalk, Granular Base Course,
Asphalt Concrete Pavement (EPS) and Other Work****TOWN OF PEACE RIVER**

I, the undersigned, having examined and read the tender documents for the above noted project, including all issued addenda (if any), and having visited the site and examined all conditions affecting the Work, am satisfied I understand the tender documents and site conditions and declare myself competent to undertake and complete the Work and to be the prime contractor as set out in the Occupational Health and Safety Act and do hereby irrevocably bid and agree to carry out the Work in strict accordance with the plans and specifications, for the unit prices in the unit price schedule enclosed.

Each Bidder shall ascertain before bid submission that it has obtained all addenda issued by the Town of Peace River and by signing the Tender Form acknowledges that all issued addenda have been examined, read, and considered in their bid.

TENDER FORMS

The undersigned also understands and agrees as follows:

1. The Engineer's estimate of quantities shown in the Unit Price Schedule is approximate and only for the purpose of comparing bids. No claim by the Contractor will be made because of any increase or decrease in the quantities.
2. The Owner reserves the right to increase, decrease, delete or vary any portion of work: and the Tenderer offers to do the work, whether the quantities are increased or decreased at the unit prices listed.
3. That the description of pay items in the Tender Form is in short form and that completed descriptions are contained within and that payment shall be made on that basis, as measured on site by the Engineer.
4. To do extra work not covered by the attached Schedule of Prices which may be ordered by the Engineer and to accept as full compensation therefor such prices as may be agreed upon in accordance with the General Conditions of the Contract.
5. Within ten (10) days from the date of the "Notice of Acceptance" of this tender, to execute a Contract and upon execution of the Contract to furnish the Owner with a satisfactory Performance Guaranty and Maintenance Bond, in an amount equal to fifty percent (50%) of the Contract Sum, and a Labour and Materials Payment Bond in an amount equal to fifty percent (50%) of the Contract Sum, (or accessible credit agreed by the owner) guaranteeing the faithful performance of all obligations in accordance with the Contract Documents and such policies of insurance as may be required under the Contract.
- 6.* To start work no later than the _____ day of _____, 2023 and complete the Project work in _____ site working days and no later than June 30th , 2024, subject to General Condition 8 and General Condition 23.
7. 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 and to which it relates.
8. That this Tender is made by the Tenderer without any connection, knowledge, comparison of figures or arrangement with any other person or persons making a Tender for the same Contract and in all respects fair and without collusion or fraud.
9. The Tenderer also agrees that the awarding of a Contract based on this Tender shall be affected by the posting in a mail box or Post Office of a Notice to the effect, addressed to the Tenderer at the address given in the Tender. Posting of such notice in the manner provided herein shall constitute an acceptance of this Tender or such portion thereof as may be referred to in the Notice without communication with or any notice to the Tenderer.

TENDER FORMS

Accompanying this Tender is a letter of consent signed by a Surety Company or chartered Bank or Credit Union and a bid bond or a certified cheque in the amount of _____dollars (\$)).

WHICH

is to be forfeited as liquidated damages in the event that the undersigned Tenderer fails to comply with the provision thereof; otherwise such cheque or bond shall be returned to the undersigned.

Dated at _____

this _____ day of _____, A.D. 2023

Signed:

NAME OF COMPANY

Per _____
AUTHORIZED SIGNING OFFICER

(SEAL)

Address

Email Address

TENDER FORMS

LIST OF MATERIALS: It is the intention of the Tenderer that the following material will be purchased from the following suppliers.

<u>ITEM</u>	<u>TYPE OF MATERIAL</u>	<u>SUPPLIER</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

LIST OF EQUIPMENT: It is the intention of the Tenderer that the following equipment will be used on the project. The equipment rates, in the event of extra work items, shall be equivalent to the current ARHCA Equipment Rental Rates Guide at the time the work takes place. The Contractor may provide alternative rates below and shall be considered if less than the ARHCA rates.

<u>EQUIPMENT</u>	<u>SIZE OR CAPACITY</u>	<u>MAKE & MODEL</u>	<u>CONDITION</u>	<u>AGE</u>	<u>HOURLY RATE c/w OPERATOR</u>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

LIST OF SUBCONTRACTORS: It is the intention of the Tenderer that the following work will, on approval of the Owner and Engineer, be subcontracted to the firms indicated below.

<u>TRADE</u>	<u>NAMES AND ADDRESSES</u>
_____	_____
_____	_____
_____	_____
_____	_____

Note: Attach additional pages if necessary.

TENDER FORMS

We are providing the following list of individuals being employees of the Tenderer and Sub-Contractors that will be ensuring the faithful performance of the Contract Work described in the specifications and drawings prescribed herein and to commonly accepted industry standards and practices.

<u>TRADE</u>	<u>FOREMAN AND/OR TRADES PERSON</u>	<u>YEARS OF EXPERIENCE</u>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____

TENDER FORMS

TENDERER'S EXPERIENCE IN SIMILAR WORK COMPLETED

We are providing the following list of our experience in work of a similar nature to that being tendered, which we have successfully completed, in order that the Owner may judge our ability to fulfill the Contract requirements.

<u>YEAR COMPLETED</u>	<u>DESCRIPTION OF CONTRACT</u>	<u>FOR WHOM WORK PERFORMED</u>	<u>VALUE</u>
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____

We are providing the following references with respect to the above noted Project Work.

<u>NAME</u>	<u>POSITION</u>	<u>CONTACT PHONE NO.</u>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

Note: A separate document, if appropriate, may be enclosed.

TENDER FORMS

SUBCONTRACTOR'S EXPERIENCE IN SIMILAR WORK COMPLETED

We are providing the following list of our experience in work of a similar nature to that being tendered, which we have successfully completed, in order that the Owner may judge our ability to fulfill the Contract requirements.

<u>YEAR COMPLETED</u>	<u>DESCRIPTION OF CONTRACT</u>	<u>FOR WHOM WORK PERFORMED</u>	<u>VALUE</u>
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____

We are providing the following references with respect to the above noted Project Work.

<u>NAME</u>	<u>POSITION</u>	<u>CONTACT PHONE NO.</u>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

Note: A separate document, if appropriate, may be enclosed.

TENDER FORMS

ADDITIONAL WORK ITEMS - LABOUR RATES

We have listed below the labour rates we shall be using for all extra work by the Contractor and all Sub-Contractors.

The following rates include Workers Compensation, Unemployment Insurance, Holiday Pay, Statutory Holidays, public liability and public damage insurance, overtime and other payroll costs.

These rates shall apply to all hours in any given day.

	<u>Rate/Hour</u>
Superintendent, including truck	_____
Foreman, including truck	_____
Pipe Layer / Fitter	_____
Labourer	_____
Equipment Operator	_____
Flag Person	_____
Watchman	_____

TENDER FORMS

2.2 UNIT PRICE SCHEDULE

BID ITEM	SECTION NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY		Unit price		Total Bid	
SCHEDULE 'A' - WATER								
1	S.P.	Temporary water servicing including preparation of a servicing plan for approval, labour, equipment and supply of all required materials, connection to the affected customers and hydrants, testin, disinfection and security and maintenance during construction. Coordinate with and notify authorities and residents for temporary water servicing and short duration service interruptions. Includes temporary water servicing to Quality Inns, Co-op and Valley Printers for high pressure hydrant replacement work.	1.0	L.S.	\$ _____	lump sum	\$ _____	
2	02 41 13 31 23 33.01 33 91	Supply and install PVC C-900 watermains and leads including removal and disposal of the existing pipe, appurtenances and excess material, c/w trenching, laying, jointing, bedding, native material backfilling & compaction to 90% S.P.D., testing & clean-up (Min. 3.0 bury).						
		a) 150mm diameter (DR25)	15.0	m	\$ _____	per metre	\$ _____	
		b) 200mm diameter (DR25)	190.0	m	\$ _____	per metre	\$ _____	
		c) 300mm diameter (DR25)	3.0	m	\$ _____	per metre	\$ _____	
		d) 400mm diameter (DR18)	3.0	m	\$ _____	per metre	\$ _____	
3	33 19 33 91	Supply & install gate valves c/w box and rod for 3.0 meter minimum bury and 12 lb. (5.5 kg) zinc anode.						
		a) 150mm diameter	2.0	unit	\$ _____	per unit	\$ _____	
		b) 200mm diameter	1.0	unit	\$ _____	per unit	\$ _____	
4	33 91 Dwgs.	Supply & install molded PVC, C907 fittings.						
		a) 200mm x 150mm diameter tee	1.0	unit	\$ _____	per unit	\$ _____	
		b) 200mm diameter bends	1.0	unit	\$ _____	per unit	\$ _____	
		c) 300mm x 300mm x 200mm diameter tee	1.0	unit	\$ _____	per unit	\$ _____	
5	33 19 33 91 Dwgs.	Supply & install cast iron fittings c/w 12 lb. (5.5kg) anode.						
		a) 400mm x 150mm diameter tee	1.0	unit	\$ _____	per unit	\$ _____	
6	33 19 33 91	Supply & install fire hydrant as per Town of Peace River standards, c/w hose nozzles & one pumper nozzle with 125mm Storz connection (3.0m mim bury) and a 12 lb. (5.5kg) zinc anode.	2.0	unit	\$ _____	per unit	\$ _____	
7	33 02 32 33 02 62	Supply & install 200mm diameter HDPE DR-11 PE 4710 watermain pipe via trenchless methods of construction c/w trenching, transition fitting connection to PVC pipe, backfilling with compaction to 98% SPD, testing & clean up.	61.0	m	\$ _____	per metre	\$ _____	
8	33 41 16.01 33 91 Dwgs	Locate & make connection to existing distribution water mains and new water system commissioning including flushing, disinfection & pressure testing of new mains and services c/w all necessary temporary connections, test points, fittings and adapters. Prepare a water system isolation and commissioning plan for review and approval prior to construction.	1.0	L.S.	\$ _____	lump sum	\$ _____	

TENDER FORMS

BID ITEM	SECTION NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY		Unit price		Total Bid
9	33 41 16.01 33 91 Dwgs.	Locate & make connection to existing High Pressure water lines and water system commissioning including disinfection & flushing of new infrastructure, c/w all necessary fittings and adapters. This includes work related to the hydrant at 98th Street and 95th Avenue. The Town will complete disinfection and flushing of the existing High Pressure water mains and refilling of reservoirs following the Contractor's work.	1.0	L.S.	\$ _____	lump sum	\$ _____
10	33 19 Dwgs.	Supply & install 20 lb. Magnesium anodes on existing steel water mains and appurtenances, if required.	4.0	unit	\$ _____	per unit	\$ _____
11	S.P. 02 41 13 32 91 19.13 32 92 19.13	Repair of all disturbed areas including private and public landscaping is a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule.	subsidiary obligation of the Contractor				
12	S.P. 32 01 90.33 32 93 43.01	Minimizing the damage to trees, branches and roots systems shall be the responsibility of the Contractor. Trimming and/or cutting and disposal of branches and roots shall be considered a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule.	subsidiary obligation of the Contractor				
13	31 23 33.01 32 11 16.01	If required, supply & install 75mm minus imported granular pitrun backfill material with compaction to 98% S.P.D., if deemed necessary by Owner, Engineer and Geotechnical Consultant. Includes disposal of native trench material.	150.0	t.	\$ _____	per tonne	\$ _____
14	31 23 33.01	Base stabilization material in trench (washed crushed rock), if required.	10.0	t.	\$ _____	per tonne	\$ _____
15	S.P. 31 32 41	If required, supply and install 50mm thick insulation (HI-40 or equivalent) c/w additional sand bedding as required.					
		a) 0.61m wide sheet	10.0	m	\$ _____	per metre	\$ _____
		b) 2-0.61m wide sheets bottom and 1-0.61m wide sheet straddling center joint on top.	10.0	m	\$ _____	per metre	\$ _____
16	S.P.	Perform new hydrant flow testing and reporting as per NFPA 291 standard. Coordinate with Owner as required. Owner will color code (re-paint) hydrants if required.	2.0	unit	\$ _____	unit	\$ _____
SUB TOTAL (SCHEDULE 'A')							\$ _____

TENDER FORMS

BID ITEM	SECTION NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY		Unit price		Total Bid
SCHEDULE 'B' - SANITARY SEWER							
1	S.P. 33 01 31	Care of Water & Wastewater Handling; Supply all labour, equipment and materials to block and divert upstream sewage flows and maintain service for existing connections through the duration of construction. Manage precipitation runoff as necessary to prevent saturation of all trenches and subgrade foundations and to prevent deposit of particulate matter in the storm water system. Coordinate with and notify authorities and residents for temporary short duration service interruptions.	1.0	L.S.	\$ _____	lump sum	\$ _____
2	02 41 13 33 25 33 61	Supply & install PVC SDR-35 sewer mains and services, c/w removal and disposal of existing pipe and manhole materials, trenching, laying, jointing, Class 'B' sand bedding, native material backfill with compaction to 98% S.P.D., CCTV inspection, testing & clean-up.					
a) 200mm diameter							
i) 3.0 - 3.5m depth			146.0	m	\$ _____	per metre	\$ _____
ii) 3.5 - 4.0m depth			65.3	m	\$ _____	per metre	\$ _____
iii) 4.0 - 4.5m depth			76.1	m	\$ _____	per metre	\$ _____
b) 150mm diameter							
i) 2.5 - 3.0m depth			47.3	m	\$ _____	per metre	\$ _____
3	33 61	Supply & install 1220mm diameter manholes, including removal and disposal of existing manhole and pipe materials, precast S.R. concrete base, barrels, cone and grade rings and F-39 frame & cover (6 units).	21.5	v.m.	\$ _____	per vertical metre	\$ _____
4	33 61 33 41 16.01	Locate and make connection to existing sanitary sewer and main with new manhole on 94th Street c/w all necessary fittings and adapters. Manhole included in Unit Price Schedule Item 3.	1.0	L.S.	\$ _____	L.S.	\$ _____
5	S.P. 02 41 13 32 91 19.13 32 92 19.13	Repair of all disturbed areas including private and public landscaping is a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule.	subsidiary obligation of the Contractor				
6	S.P. 32 01 90.33 32 93 43.01	Minimizing the damage to trees, branches and root systems shall be the responsibility of the Contractor. Trimming and/or cutting and disposal of branches and roots shall be considered a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule.	subsidiary obligation of the Contractor				
7	32 23 33.01 21 11 16.01	Supply & install 75mm minus imported granular pitrun backfill material with compaction to 98% S.P.D., if deemed necessary by Owner, Engineer and Geotechnical Consultant. Includes disposal of native trench material.	200.0	t.	\$ _____	per tonne	\$ _____
8	31 23 33.01	Base stabilization material (washed crushed rock) in trench and as required at all manholes for pipe support.	14.0	t.	\$ _____	per tonne	\$ _____
9	Dwgs.	Abandon existing Sanitary Sewer manhole, hydrovac flush all abandoned Sanitary Sewer Mains and plug abandoned lines at manholes with concrete.	1.0	L.S.	\$ _____	lump sum	\$ _____
SUB TOTAL (SCHEDULE 'B')							\$ _____

TENDER FORMS

BID ITEM	SECTION NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY		Unit price		Total Bid	
SCHEDULE 'C' - WATER AND SEWER SERVICES								
1	33 67	Supply & install Series 160 PE Municipal water service tubing (Minimum I.D. specified).						
		a) 20mm diameter	234.0	m	\$ _____	per metre	\$ _____	
		b) 38mm diameter	8.0	m	\$ _____	per metre	\$ _____	
		c) 50mm diameter	10.0	m	\$ _____	per metre	\$ _____	
2	33 67	Supply and install service box & fittings, c/w in-line PVC service tees (s.s. saddle on existing main), main stop, curb stop & drain and box & rod for minimum 2.7m bury.						
		a) 20mm diameter	21.0	unit	\$ _____	per unit	\$ _____	
		b) 38mm diameter	1.0	unit	\$ _____	per unit	\$ _____	
		c) 50mm diameter	1.0	unit	\$ _____	per unit	\$ _____	
3	33 67	Supply & install SDR 28 PVC sewer service pipe, c/w connections to mains and services including fittings, plugs, adapters & markers.						
		a) 100mm diameter (± 22 units)	270.0	m	\$ _____	per metre	\$ _____	
		b) 150mm diameter (± 2 units)	40.0	m	\$ _____	per metre	\$ _____	
4	31 23 33.01 33 67	Trench excavation, bedding, backfilling & clean-up for services c/w compaction to 98% S.P.D.	357.0	m	\$ _____	per metre	\$ _____	
5	S.P. 02 41 13 32 91 19.13 32 92 19.13	Repair of all disturbed areas including private and public landscaping is a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule.	subsidiary obligation of the Contractor					
6	S.P. 32 01 90.33 32 93 43.01	Minimizing the damage to trees, branches and root systems shall be the responsibility of the Contractor. Trimming and/or cutting and disposal of branches and roots shall be considered a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule.	subsidiary obligation of the Contractor					
7	32 23 33.01 33 67	If requested complete private property service rehabilitation from property line toward residence. Supply & install SDR 28 PVC sewer service pipe and series 160 PE Municipal water service tubing, c/w trench excavation, bedding, backfilling with compaction to 98% S.P.D. & clean-up and grading to subgrade level. Length to be confirmed by Resident.						
		a) 100mm diameter sewer & 20mm diameter water	20.0	m	\$ _____	per metre	\$ _____	
		b) 150mm diameter sewer & 30/50mm diameter water, if required	5.0	m	\$ _____	per metre	\$ _____	
8	Dwgs.	Supply and install 75mm diameter DB2 electrical conduit for street lighting c/w plug each end and omni marker balls for future locating by Atco (Deletable by Owner).	165.0	m	\$ _____	per metre	\$ _____	
9	S.P. 31 32 41	If required, supply and install 50mm thick insulation (HI-40 or equivalent) c/w additional sand bedding as required.						
		a) 0.61m wide sheet	10.0	m	\$ _____	per metre	\$ _____	
		b) 2-0.61m wide sheets bottom and 1-0.61m wide sheet straddling center joint on top.	10.0	m	\$ _____	per metre	\$ _____	
SUB TOTAL (SCHEDULE 'C')							\$ _____	

TENDER FORMS

BID ITEM	SECTION NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY		Unit price		Total Bid
SCHEDULE 'D' - STORM SEWER							
1	02 41 13 31 23 33.01 33 25 33 41 13 33 41 13.01	Supply & install PCV DR-35 stormwater catch basin leads and mains, c/w removal and disposal of excess material and existing pipe materials, connections to pipes, manholes and catch basins, trenching, laying, jointing, Class 'B' sand bedding, native material backfill with compaction to 98% S.P.D., CCTV inspection, testing & clean-up.					
		a) 250mm diameter	56.0	m	\$ _____	per metre	\$ _____
		b) 675mm diameter	88.0	m	\$ _____	per metre	\$ _____
		c) 900mm diameter	12.0	m	\$ _____	per metre	\$ _____
2	02 41 13 33 41 13.02	Supply & install 900mm diameter catch basin, c/w removal and disposal of existing catch basin, precast S.R. concrete base, barrels, slab top and grade rings and frame & cover as specified.	7.0	unit	\$ _____	per unit	\$ _____
3	33 41 13.02 33 41 16.01 Dwgs.	Supply & install 1524mm diameter manholes, c/w removal and disposal of existing manhole and pipe materials, precast S.R. concrete base, barrels, cone slab top and grade rings, F-39 frame & cover and transition coupler connection to existing lines including any necessary fittings and adapters. Piping included in item 1 above (3 units).	11.0	v.m.	\$ _____	per vertical metre	\$ _____
4	21 23 3.01 32 11 16.01	Supply & install 75mm minus imported granular pitrun backfill material with compaction to 98% S.P.D., if deemed necessary by Owner, Engineer and Geotechnical Consultant. Includes disposal of native trench material.	80.0	t.	\$ _____	per tonne	\$ _____
5	31 23 33.01	Base stabilization material in trench (washed crushed rock) and as required at all manholes for pipe support.	14.0	t.	\$ _____	per tonne	\$ _____
6	Dwgs.	Raise existing manhole; remove and replace grade rings, f/c and add one (1) 150mm concrete grade ring.	1.0	unit	\$ _____	per unit	\$ _____
SUB TOTAL (SCHEDULE 'D')							\$ _____

TENDER FORMS

BID ITEM	SECTION NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY		Unit price		Total Bid	
SCHEDULE 'E' - ROADS AND CONCRETE								
1	32 16 15	Supply & install concrete work as per detailed drawings; including asphalt sawcuts and disposals, earth excavation and disposal, subgrade preparation, compacted base gravel, rebar as specified, backfilling and sealing.						
		a) Standard curb & gutter (to match existing profile)	55.0	m	\$ _____	per metre	\$ _____	
		b) Monolithic standard curb, gutter and 1.5m sidewalk (125mm depth)	10.0	m	\$ _____	per metre	\$ _____	
		c) Rolled curb & gutter	37.0	m	\$ _____	per metre	\$ _____	
		d) Monolithic rolled curb, gutter and 1.5m sidewalk (125mm depth)	306.0	m	\$ _____	per metre	\$ _____	
		e) 125mm depth separate sidewalk; various widths	80.0	m ²	\$ _____	per square metre	\$ _____	
		f) 125mm depth private driveway apron	95.0	m ²	\$ _____	per square metre	\$ _____	
		g) 140mm depth commercial apron	12.0	m ²	\$ _____	per square metre	\$ _____	
		h) 175mm depth public lane apron	68.0	m ²	\$ _____	per square metre	\$ _____	
		i) Additional grading, rebar, finishing and tooling for paraplegic ramps	2.0	unit	\$ _____	per unit	\$ _____	
2	32 16 15	Supply & install concrete infill. Remove and dispose of waste material, level and compact loose gravel and place concrete infill to 40mm below lip of gutter.	1.0	m ³	\$ _____	per cubic metre	\$ _____	
3	03 20 00	Supply & install additional reinforcing steel; 2 - 10 mm bars, as directed by Engineer.	500.0	m	\$ _____	per metre	\$ _____	
4	31 05 16 32 11 16.01	Subcut excavation, disposal & backfill; supply, place, grade and compact 20mm crush granular sub-base material (Des. 4C) to 98% S.P.D., if required.	15.0	m ³	\$ _____	per cubic metre	\$ _____	
5	02 41 13	Removal & disposal of existing concrete c/w mechanical sawcuts, as required.						
		a) Curb and gutter	60.0	m	\$ _____	per metre	\$ _____	
		b) Sidewalk and aprons	450.0	m ²	\$ _____	per square metre	\$ _____	
		c) Monolithic curb, gutter and sidewalk	9.0	m	\$ _____	per metre	\$ _____	
6	31 11 16.02	Supply, place & grade 20mm crush traffic gravel, if required.	60.0	t.	\$ _____	per tonne	\$ _____	
7	S.P. 02 41 13 32 91 19.13 32 92 19.13	Repair of all disturbed areas including private and public landscaping is a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule.	subsidiary obligation of the Contractor					
8	31 24 13	Common earth excavation to waste disposal including asphalt concrete pavement and to landscape embankment west of the Block 11 lane including topsoil stripping and replacement.	1,300.0	m ³	\$ _____	per cubic metre	\$ _____	
9	33 22 16.13	Subgrade preparation to design cross section and compaction to 98% S.P.D.	2,260.0	m ²	\$ _____	per square metre	\$ _____	
10	31 32 19.01	Supply & install Nilex 2006 woven geotextile, if required.	2,260.0	m ²	\$ _____	per square metre	\$ _____	
11	31 32 91.13	Supply & install geogrid granular base reinforcement, if required.	2,260.0	m ²	\$ _____	per square metre	\$ _____	
12	31 05 16 32 11 16.01	Supply, place, grade 300mm compacted depth 20mm crush granular base material (Des. 4C) to 98% S.P.D.	2,260.0	m ²	\$ _____	per square metre	\$ _____	

TENDER FORMS

BID ITEM	SECTION NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY		Unit price		Total Bid	
13	31 23 19.01 32 11 16.02 32 12 3.23 32 12 16.13	Underground works road repairs; sawcut, remove and dispose of existing asphalt, granular and earth materials and replace with Nilex 2008 woven geotextile (or equal), compacted 20mm crush granular base course and 100mm compacted depth asphalt base and surface course (2-lifts) c/w prime and tack coats.						
		a) 300mm compacted depth GBC	450.0	m ²	\$ _____	per square metre	\$ _____	
		b) 400mm compacted depth GBC	850.0	m ²	\$ _____	per square metre	\$ _____	
14	S.P.	Adjustment of valves, manhole frames and existing catch basin frames to final design elevation is a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule. Adjustment via concrete grade rings shall be made where asphalt pavement has been removed.	subsidiary obligation of the Contractor					
15	32 01 11.01 32 12 13.16 32 12 13.23 32 12 16.13 32 12 50	Supply, place and compact hot-mix bituminous asphalt concrete pavement, c/w bituminous prime and tack coat (compaction to 98% S.P.D.)						
		a) 100mm compacted depth base & surface course (2-lifts)	2,260.0	m ²	\$ _____	per square metre	\$ _____	
		b) skin patching, settlements and curb repairs, if required	28.0	t.	\$ _____	per tonne	\$ _____	
16	S.P. 32 01 90.33 32 93 43.01	Minimizing the damage to trees, branches and root systems shall be the responsibility of the Contractor. Trimming and/or cutting and disposal of branches and roots (and notching of root if necessary to accommodate concrete works) shall be considered a subsidiary obligation of the Contractor under the appropriate related work item in the Unit Price Schedule.	subsidiary obligation of the Contractor					
17	S.P. Dwgs. 32 01 90.33 32 93 43.01	Utilize an arborist to remove dead, dying, diseased weak growth and broken tree limbs and properly trim and treat other severed limbs prior to and following construction operations for those trees that are to remain. Work to occur outside of restricted activity periods unless regulatory assessment by Contractor deems otherwise.	1.0	L.S.	\$ _____	lump sum	\$ _____	
18	S.P. Dwgs. 32 93 43.01	Removal and disposal of private and boulevard trees and shrubs as indicated that are obstructing underground and surface works. Work to occur outside of restricted activity periods unless regulatory assessment by Contractor deems otherwise. Includes replacement of private trees and shrubs with semi-mature species as per detailed drawings in consultation with the property owner.	1.0	L.S.	\$ _____	lump sum	\$ _____	
19	S.P. Dwgs. 32 93 43.01	Supply & install Semi-mature Burr Oak tree species in boulevard areas as per detailed drawing (deletable in whole or part).	10.0	unit	\$ _____	per unit	\$ _____	
20	Dwgs.	Construct swale ditches along the west side of Block 11 lane. Earth excavation to waste and embankment included within Item 8 above.	70.0	m	\$ _____	per metre	\$ _____	
21	32 91 19.13 32 92 23	Supply & install grass sod in boulevard areas and replacement of disturbed private grassed landscape areas c/w excavation and disposal, finish grading, 150mm depth topsoil, fertilizing, watering and maintenance.	1,200.0	m ²	\$ _____	per square metre	\$ _____	
SUB TOTAL (SCHEDULE 'E')							\$ _____	

TENDER FORMS

TENDER SUMMARY

	MOBILIZATION	\$ _____
	SUB TOTAL (SCHEDULE 'A')	\$ _____
	SUB TOTAL (SCHEDULE 'B')	\$ _____
	SUB TOTAL (SCHEDULE 'C')	\$ _____
	SUB TOTAL (SCHEDULE 'D')	\$ _____
	SUB TOTAL (SCHEDULE 'E')	\$ _____
	CONTINGENCY ALLOWANCE	\$ <u>100,000.00</u>
	TOTAL TENDER (MOBILIZATION PLUS CONTINGENCY PLUS SCHEDULES 'A+B+C+D+E')	\$ _____

TENDER FORMS

2.3 TENDER AGREEMENT**2.3.1 Rejection/Acceptance**

The Town of Peace River reserves the right to reject any or all tenders, to accept any tender, or to accept any offer which it may consider in the best interests of the Town of Peace River.

2.3.2 Tender Security

The undersigned encloses herewith as tender security a verifiable bid bond, irrevocable letter of credit, or certified cheque made out to the Town of Peace River, for _____ and the undersigned hereby agrees that should he refuse or fail after the Contract is received, and the Contract is received when opened if delivered by mail, or when delivered if using any other means:

- a) within seven (7) calendar days, to sign and return the Contract to the Town of Peace River for the performance of the Work and/or the supplying of material covered by this tender, and
- b) within fourteen (14) calendar days, to provide the required security and evidence of insurance coverage in accordance with General Specifications 1.2.3, Security and 1.2.4, Insurance, satisfactory to the Town of Peace River

the tender security is subject to forfeiture to the Town of Peace River, and if a Contract for the project(s) is then entered into with some other party for a greater amount, the Bidder is liable to the Town of Peace River in the amount equal to the difference between the amount of its tender and the amount of the Contract actually entered into, the maximum liability not exceeding the amount of the tender security required under Instructions to Bidders Section 1.5.6, Security.

2.3.3 Tender Withdrawal

The undersigned hereby acknowledges and agrees that he cannot withdraw this tender at or after the tender Closing Date and Time until:

- (i) some other party has entered into a Contract with the Town of Peace River for the performance of the project specified in the tender documents and provided the required security and evidence of insurance coverage in accordance with General Specifications 1.2.3, Security and 1.2.4, Insurance, which must be satisfactory to the Town of Peace River per Tender Forms Section 2.3.2, Tender Security, or
- (ii) thirty-five (35) calendar days after the time fixed for receiving this tender unless the Town of Peace River has notified them that they are the successful Bidder, whichever first occurs.

The 35-day acceptance period referred to above will commence at 11:59:00 p.m. of the Closing Date and will terminate at 11:59:00 p.m. of the 35th day thereafter. If the 35th day falls on a weekend or statutory holiday, such day(s) will be omitted from the computation.

TENDER FORMS

2.4 CONTRACT

Should this tender be accepted, the undersigned agrees to enter into a written Contract with the Town of Peace River for the faithful performance of the Work covered by this tender, in accordance with the said plans and specifications and complete the said project on or before **June 30, 2024**.

2.5 CONTRACTOR’S SCHEDULE

Contractors are required to submit, along with their Tender, this schedule sheet showing their proposed starting date and completion date of this project.

Project	Starting Date	*Completion Date
Neighbourhood Infrastructure Renewal 2023		

* Completion dates that exceed the Contract Completion Date will be considered a conditional or alternative bid and may be rejected.

2.6 CONTRACTOR’S CHECKLIST

The following items have been included in the tender package submission:

- 1) Bid Bond, Irrevocable Letter of Credit, or Certified Cheque (Bid Security – All Bidders) _____initial
- 2) Consent of Surety _____initial
- 3) All pages headed “Tender Forms” _____initial
- 4) Tender Amendments (if applicable) _____initial
- 5) Bidder’s Schedule _____initial
- 6) Signed and Sealed Tender _____initial
- 7) Addenda (if applicable) _____initial
- 8) COR, TLC, COREL _____initial
- 9) Cover Letter _____initial

TENDER FORMS

2.7 TENDER SIGNING

A representative(s) with the authority to bind the Bidder must sign this tender.

Executed this _____ day of _____, 20_____.

NAME AND ADDRESS
OF BIDDER:
(Print or Type)

TELEPHONE:

E-MAIL ADDRESS:

SIGNATURE OF AUTHORIZED
REPRESENTATIVE(S):

NAME AND TITLE OF AUTHORIZED
REPRESENTATIVE(S):
(Print or Type)

CONTRACT FORMS

3. CONTRACT FORMS**TOWN OF PEACE RIVER****CONTRACT (Page 1)**

THIS Agreement made and concluded in triplicate as of this _____ day of _____, 20____, between the Town of Peace River (hereinafter called "the Town") of the first part and _____ of the _____ in the Province of _____ (hereinafter called "the Contractor") of the second part.

WITNESSETH, that for and in consideration of the covenants and agreements on the part of the Town, hereinafter contained and the prices hereinafter mentioned, the Contractor for himself, his executors, administrators and assigns, covenants and agrees with the Town to do, furnish and perform the works, materials, matters, and things required to be done, furnished and performed, in the manner hereinafter described, in connection with the following work or works, namely:

NEIGHBOURHOOD INFRASTRUCTURE RENEWAL – 2023**95TH AVENUE 94TH STREET TO 98TH STREET****BLOCK 11 LANE; 94TH AVENUE TO 95TH AVENUE****Schedule 'A' – Water****Schedule 'B' – Sanitary Sewer****Schedule 'C' – Water and Sewer Services****Schedule 'D' – Storm Sewer****Schedule 'E' – Roads and Concrete**

**Water Mains, Sanitary Sewer Mains, Water and Sewer Services, Storm Sewer,
Concrete Curb, Gutter, Granular Base Course,
Asphalt Concrete Pavement (EPS) and Other Work**

TOWN OF PEACE RIVER

in strict accordance with the plans and specifications of said work hereto attached, and to deliver the same over, complete and fully finished in every particular to the Town on or before **June 30, 2024**.

CONTRACT FORMS

TOWN OF PEACE RIVER

CONTRACT (Page 2)

It is mutually agreed that the attached Tender and bond of the Contractor, together with the plans, specifications and any special provisions herein designated and referred to are hereby made and shall be considered part of this Agreement the same as if herein fully set forth.

IN CONSIDERATION WHEREOF, and upon the Contractor fully completing and executing in every particular the work herein contracted for within the time hereinbefore set out, and upon the said Contractor satisfying the said Town that all just claims for labour and materials and for damages in connection with the work have been paid, the said Town covenants, promises and agrees to pay unto and to the said Contractor for the actual amount of work done and materials in place at the unit prices stated in the Contractor's attached proposal or Tender.

IN WITNESS WHEREOF, the Contractor has hereunto set his hand and seal as of the day and year herein mentioned, and these presents have been signed and sealed by the representatives of the Town, on behalf of the Town of Peace River.

SIGNED, SEALED AND DELIVERED BY THE CONTRACTOR IN THE PRECENSE OF:	
Witness	

Contractor (Authorized Signature)

Contractor (Printed Name)

SIGNED AND SEALED ON BEHALF OF THE TOWN OF PEACE RIVER	
_____	per
_____	per
Witness	

TENDER AMENDMENT FORM

4. TENDER AMENDMENT FORM

I, _____, the undersigned,
(Legal Name of Bidder)

modify the unit price schedule for our tender as shown in the following table:

UNIT PRICE SCHEDULE CHANGES				
Replaces previous Unit Price Schedule Changes				
ITEM NO.	Description [List bid items that require change to estimated quantity]	Estimated Quantity Changes + or -	Unit Price ^(a)	Net Change to Total Bid + or -
		_____ day		
		_____ day		
ITEM NO.	Description [List bid items that require change to unit price or lump sum]	Estimated Quantity ^(b)	Unit Price Changes ^(c) + or -	Net Change to Total Bid ^(d) + or -
INCREASE (+) OR REDUCE (-) TOTAL TENDER BY:				

- (a) For estimated quantity items state the unit price as it appears in the unit price schedule.
- (b) For unit price or lump sum items state the estimated quantity as it appears in the unit price schedule.
- (c) For lump sum items leave "Unit Price Changes + or -" column blank.
- (d) For lump sum items enter + or - the change amount in the "Net Change to Total Bid + or -".

TENDER AMENDMENT FORM

(e) If required, additional amendment items may be added or attached to this form.

Each Bidder shall ascertain before tender submission that it has obtained all addenda issued by the Town of Peace River and by signing the Tender Amendment Form acknowledges that all issued addenda have been examined, read, and considered in their bid.

We also acknowledge and agree that:

1. This change supersedes all previous changes including those to other bid items. Previously submitted changes are null and void.
2. We accept full responsibility for any lack of confidentiality arising from the use of this process.
3. Failure of these modifications to be received, on time, legibly, clear as to intent, unambiguously, accurately, or completely for any reason will render these modifications null and void.

I am authorized to bind the Bidder:

Authorized Signature

Date

Fax to 780-624-4664

(Marked "ATTENTION: 234423-00 NIR 2023, CONTRACT OPENING")

SPECIAL PROVISIONS

TOWN OF PEACE RIVER NEIGHBOURHOOD INFRASTRUCTURE GENERAL – 2023 95TH AVENUE; 94TH STREET TO 98TH STREET BLOCK 11 LANE; 94TH AVENUE TO 95TH AVENUE

SPECIAL PROVISIONS

ARTICLE 1 GENERAL

The Special Provisions form part of the Contract Documents and shall be read as part thereof. When a conflict occurs between the General or Detailed Specifications and Special Provisions, the Special Provisions shall govern.

ARTICLE 2 OCCUPATIONAL HEALTH & SAFETY ACT AND OTHER REGULATIONS

The Contractor shall comply with the provisions of the Occupational Health & Safety Act, Statutes of Alberta 2017, Chapter 0-2; and amendments thereto and regulations thereunder, and shall at all times ensure that all equipment and manpower at the work site shall comply with the requirements of the said Act and regulations thereunder.

The Contractor shall be the general representative and agent of the Owner for the purposes of ensuring compliance with safety regulations for himself.

The Contractor shall at all times during the continuation of this Contract with the Owner, observe all the provisions of the Labour Regulations Act, Workers' Compensation Act, Employment Standards Act and the Occupational Health & Safety Act, as well as rules and regulations pursuant thereto. In the event the Contractor fails to comply with the said Acts and any regulations thereunder, and the Owner is required to do anything or take any steps or pay any sums to rectify such noncompliance, the Owner may subtract the costs of such rectifications from any monies owing to the Contractor.

ARTICLE 3 INSURANCE & WORKERS' COMPENSATION BOARD COVERAGE

The Contractor shall, at the time the Contract Agreement is signed, submit to the Engineer, copies of the Insurance policies required, as stated in Articles 36, 37, 38 and 39 of the General Conditions, and shall also provide to the Engineer, from time to time, as may be required satisfactory proof that such policies are still in force and effect.

Also, at the time the Contract Agreement is signed, the Contractor shall submit to the Engineer, a letter from the Workers' Compensation Board stating that the Contractor has an account established with the Workers' Compensation Board and that the account is in good standing.

At any time during the term of the Contract, when requested by the Engineer, the Contractor shall provide further evidence of continued compliance with the Workers' Compensation Board.

SPECIAL PROVISIONS

ARTICLE 4 OBLIGATIONS OF PRIME CONTRACTORS AND CONTRACTORS

A "Prime Contractor" shall be designated for the work site where there are two or more employers at the work site at the same time. The "General Contractor" who has signed the Contract Documents shall be designated as the "Prime Contractor". The Prime Contractor will have the overall responsibility to ensure that the Act and regulations are complied with throughout the work site. The responsibilities of a "Contractor" are to ensure that the employers and workers, that the Contractor is directing, comply with the Occupational Health & Safety Act and the regulations under the Act.

ARTICLE 5 CONTACT SPECIFICATIONS

The Contract Documents may reference the City of Grande Prairie Construction Manual and the Aquatera Construction Manual. The Specifications included herein have been modified to suit the local Municipal needs for this Project. Any other referenced specification sections or standard drawings may be viewed online.

The specifications and Standard drawings included within the Contract Documents shall supersede the online specifications and standard drawings.

ARTICLE 6 CONSTRUCTION SCHEDULING AND INTERIM COMPLETION DATE

The Contractor is advised that work under this Contract is subject to an interim completion date. The following contract requirements and work shall be carried out and completed by **October 25, 2023**.

- Schedules A, B, and C, including the decommissioning of temporary servicing and the commissioning of new mains and services, must be finalized.
- All excavations should be backfilled to the original grade to ensure proper drainage and facilitate snow removal.

The purpose of the Interim Completion date is to ensure that all residential and commercial services affected by this project have uninterrupted service during a winter shutdown. If, due to unforeseen circumstances, Schedules A, B, and C cannot be completed before the onset of freezing temperatures, the Contractor is still responsible for decommissioning the temporary services and commissioning the existing services. This includes performing super chlorination of the water lines and conducting bacteriological tests on samples at the Provincial Lab. If temporary servicing is required in the Spring of 2024, the Town will not make any additional payment; this work will be considered a subsidiary obligation of the contractor.

All remaining working, including Schedules D and E, the concrete work, road work, storm sewer, landscaping, trees and sod repairs must be completed by **June 30, 2024**.

Damages for Delay will be assessed for both the interim and final completion dates.

SPECIAL PROVISIONS

ARTICLE 7 LATE COMPLETION

Should the Contractor fail to substantially complete the Project in the number of site working days indicated and / or by the completion date specified, the Owner shall be entitled to make deductions from payments due the Contractor, as compensation for costs incurred by the Owner. Such costs shall include, but are not necessarily limited to, administration bookkeeping and engineering costs. The completion date shall be as noted in Article 6 of the Special Provisions, unless the Owner has agreed, in writing, to an extension of time for completion. The minimum penalty shall be \$250.00 per day by the Town plus engineering expense charged at a rate of \$1,000.00 per day.

ARTICLE 8 CONTRACTOR'S REPRESENTATIVES

The Contractor must have a qualified project representative on call twenty-four (24) hour per day for the duration of the Contract. The Contractor will supply the Engineer with the name, residing address and telephone / mobile number of the representative for use in case of emergencies. The Contractor shall employ a working foreman on-site to ensure the successful progression of orderly and productive work conforming to the drawings and specification herein.

ARTICLE 9 PROJECT MEETINGS

At the discretion of the Owner, Project meetings may be held bi-weekly and as required on site.

ARTICLE 10 CHANGES IN WORK & EXTRA WORK ITEMS

Any construction work for changes in work and extra work items must not commence until written authorization has been received from the Town in the form of a Change Order.

ARTICLE 11 INCIDENTAL WORK

Incidental work shall be work including all labour, equipment and materials necessary to complete the work described in the Contract Documents but not specifically listed as a separate item in the Unit Prices Schedule. Payment for incidental work will not be made directly but the Contractor shall allow for the cost of such work in the most appropriate item of work in the Tender Form Unit Price Schedule.

ARTICLE 12 TEMPORARY FACILITIES – SITE OFFICE

A site office will not be required for this project, but the Contractor must provide all facilities for their work force in accordance with governing regulations and ordinances.

SPECIAL PROVISIONS

ARTICLE 13 MAINTENANCE / WARRANTY PERIOD & SETTLEMENTS

The Maintenance / Warranty period shall be for a period of two (2) years contrary to that specified in the General Conditions and General Requirements of the Contract.

The Contractor shall replace all materials and structures and rectify all failures that occur as a result of settlements of trench backfill or otherwise during the two-year maintenance / warranty period.

ARTICLE 14 EXISTING PAVED ROADS, SURFACES, LANDSCAPING AND OTHER STRUCTURES

The Contractor must confine the area of work to the immediate construction zone so as not to damage the adjacent properties, existing road surfaces and other structures. Any damage caused by the Contractor must be repaired to the standard that existed prior to construction and all costs shall be borne by the Contractor at no additional cost to the Owner.

Repair of all disturbed areas including private and public landscaping is a subsidiary obligation of the Contractor under the appropriate related work item in the Tender Form Schedule. This work shall include but not be limited to topsoil, flower beds, fences and gates, landscape rock or blocks etc. Grass sod and underlying topsoil, concrete and asphalt walks, driveways, and retaining walls shall be replaced under until cost items in the Tender Form Unit Price Schedule.

The above does not apply to private water and sewer service rehabilitation via open cut excavation whereby the Homeowner will be responsible for repair / replacement of all additional landscaping and additional disturbance to concrete and asphalt structures. The Contractor shall be responsible for backfilling with compaction and grading to subgrade level and restoration of the disturbance associated with installation of the underground services to property line.

ARTICLE 15 EXISTING WATER SYSTEM

The operation of the existing water system shall at all times be under the direct supervision of the Municipality or facility Owner. The Contractor shall under no circumstances operate any existing valves or other equipment without consent. The Contractor shall provide notice to the Owner and coordinate the work as required.

ARTICLE 16 WATER USED BY THE CONTRACTOR

Water used for construction purposes can be obtained at no cost to the Contractor by contacting the Municipality's Public Works Superintendent. The Contractor will be required to provide a record of the water used for construction purposes.

SPECIAL PROVISIONS

ARTICLE 17 ENVIRONMENTAL MANAGEMENT

The Contractor shall abide by all conditions of environmental approvals and permits, statutes and/or laws. The Contractor shall conduct work activities in accordance with such legislation and regulations concerning environmental protection and management.

In the event of the release of silt or other deleterious substance into a body of water or watercourse, the Contractor shall take all reasonable measures to contain the release and repair any damage at the Contractor's expense.

Spills or releases of hazardous materials shall be immediately reported to the Engineer and the Contractor shall take all reasonable measures to contain and clean-up the spill. All work shall be performed in accordance with the applicable legislation and regulations at the Contractor's expense.

The Contractor shall prepare and submit to the Owner and Engineer an Environmental Construction Operations (ECO) Plan for review and approval prior to commencement of the work. The preparation of this plan and any requirements necessary not identified in the Plan shall be the responsibility of the Contractor at no additional cost to the Owner.

ARTICLE 18 TRAFFIC ACCOMMODATION

The Contractor shall be responsible for the preparation of a Traffic Accommodation Strategy (TAS). The TAS shall identify all proposed road and lane closures, detours, signage, safety procedures and policies. Consideration of emergency access, vehicular and pedestrian travel / access shall be identified.

The plan shall be submitted to the Owner and Engineer for review and approval prior to the start of construction.

The Contractor is responsible for the supply, placement and maintenance of signs and barricades and for the utilization of flag persons as necessary for the duration of the Project. The Contractor shall complete all work operations so as to minimize public access disruption and to maintain / accommodate access to businesses and residences.

ARTICLE 19 SERVICE DISRUPTIONS, TEMPORARY WATER SUPPLY & COMMISSIONING

It is the Contractor's responsibility to coordinate the work in order to minimize disruption of services including water, sanitary sewer, power, gas, cable television, internet, and telephone. Costs incurred for the installation of temporary services shall be borne by the Contractor.

The Contractor shall arrange for and provide temporary water service to all properties affected by the water system installations, which may interrupt water service. All properties must have a continuous supply of water. The only exception, to the above, will be a maximum of six (6) hours' disruption for initial valve installations/replacement and isolation of the work zone at the Project

SPECIAL PROVISIONS

phase extent(s) where properties outside of the Project work zone may be affected.

The Contractor shall coordinate with the Owner/Municipality for the disinfection and flushing of the affected properties outside of the Project work zone. The isolation work must be planned and coordinated appropriately to provide sufficient time for the Owner / Municipality to complete their work while accommodating delivery of water sample for bacteriological testing at the Provincial Lab.

Temporary water systems and Project work zone isolation must give consideration to fire protection whenever possible in consultation with the Engineer, Town and Fire Chief. Domestic service is intended but hydrants that can be put back into service earlier or areas that are not in the immediate zone that can be fed by overland hydrant linkage must be considered. There shall be a notification period of twenty-four (24) hours before any interruption of water service occurs. This notification shall be, but is not limited to, a verbal and written notice to each property that will be affected by the water supply interruption. The Town, the local radio station, and the Fire Department must also be notified twenty-four (24) hours prior to the water supply interruption.

Water system facilities, temporary or new, shall not be placed into service until they have been appropriately pressure tested, flushed, and disinfected under the direct supervision of the Owner's representative(s). All bacteriological sampling must be performed by the Owner and tested at the Provincial Lab.

The Contractor shall supply a plan to the Engineer and Owner for temporary water and commissioning of the new water system for review and approval prior to construction commencement. Regardless of any review, the Contractor shall

assume full responsibility for the adequacy of the plan and carrying out any works associated at no additional cost to the Owner. The Water Facilities Manager shall be notified and approve any operation with respect to the above noted plans.

Payment for the temporary water supply and maintenance of such systems will be made under Tender Form Unit Price Schedule 'A' Item No. 1. Payment for commissioning of new water systems will be made under Tender Form Unit Price Schedule 'A', Item No. 8 and Item No. 9. These works shall include all supervision, labour, equipment, and materials necessary to complete the work.

ARTICLE 20 CARE OF WATER & WASTEWATER HANDLING

The Contractor will be required to control and accommodate the flow of storm water and wastewater at various stages in the Construction. The Contractor will be compensated by the lump sum price bid Item No. 1 in the Tender Form Unit Price Schedule 'B' and shall include all supervision, equipment, materials, and labour to complete the work.

The Contractor shall construct and maintain all necessary cofferdams, channels flumes, drains, sumps and/or other temporary diversion and protective works;

SPECIAL PROVISIONS

shall furnish all materials required; therefore, shall furnish, install, maintain and operate all necessary pumping and other equipment for dewatering the various parts of the work; and shall maintain the foundation and other parts of the work free of water, as required, for completing the work in the Contract.

After having served their purpose, temporary works shall be removed or levelled so as not to interfere in any way with the operations of the project works and to give a sightly appearance, to the satisfaction of the Engineer. The Contractor shall be responsible for, and shall repair at his own expense, damage to any part of the work caused by floods, water or failure of protective work constructed by the Contractor. Additional excavation and subsequent backfill made necessary by wastewater, water, snow or ice shall be the responsibility of the Contractor.

The Contractor shall ensure that any required undertakings for the Care of Water & Wastewater Handling shall not cause pollution in the area and that discharges from any pumps shall be located and controlled in such a manner as not to cause damage to property, nuisance on roads or injury to the public or wildlife and will minimize deposition of sediment in a water body.

The Contractor's plan for Care of Water & Wastewater Handling shall be submitted to the Engineer and Owner for review and approval prior to construction commencement. Regardless of any review, the Contractor shall assume full responsibility for the adequacy of the diversion and protective work.

ARTICLE 21 PUBLIC COORDINATION AND NOTIFICATION

The Owner will provide the Contractor with contact information that the residents provided for the Project. The Contractor shall attend an Open House presentation to the Public prior to construction on **July 18, 2023.**

The Contractor shall coordinate with the Town and Engineer for placement of an advertisement in the local newspaper one week prior to the start of construction. The Contractor must also provide notification to the local radio station and to emergency services via the Town's Bylaw Officer.

The affected residents must also be notified 48 hours in advance of the start of construction and 24 hours' notice in advance of utility disruption.

ARTICLE 22 ACCESS TO PLACE OF BUSINESS & RESIDENCE

The Contract works shall be carried out in a manner to minimize inconvenience to residents and pedestrians. Access to places of business and residence shall be provided by the Contractor at all times by means of suitable detours, ramps, or walkways. Provisions for such ramps, detours or walkways shall be at the Contractor's expense with no additional cost to the Owner.

ARTICLE 23 COORDINATION OF PROJECT WORKS

The Contractor shall coordinate with the residents, the Engineer and the Town of facilitate timely removal and installation of new infrastructure in order to minimize disruption to the public, residents and businesses.

SPECIAL PROVISIONS

ARTICLE 24 GRADE CONTROL

The Contractor shall employ a grade foreman to complete the necessary construction survey and checks to ensure all works have been constructed to the design lines and levels prior to the Engineer completing a final verification check.

Should the Engineer be required to re-check grades due to deficiencies the Owner shall have the right to deduct the costs for such work from payments due to the Contractor at a rate of \$120.00/hr.

The Contractor is encouraged to employ the use of a pipe laser, two-plane laser level and / or GPS machine control for all possible aspects of the construction.

The use of this technology typically shortens the duration of the work and provides for a more accurate final product.

ARTICLE 25 SURVEY ASSISTANCE

The Contractor shall provide the Engineer with all stakes, paint and other materials, with the exception of technical instruments and apparatus required by the Engineer to set out lines and levels and to take measurements of / for the work. The Contractor shall also supply the Engineer one (1) rodman or surveyor's assistant for every instrument man and / or inspector on the Project to assist in setting of lines, levels and taking measurements for the work. This work shall include but not be limited to:

- 1) Pre-construction cross sectioning for earth quantity.
- 2) Pre-construction cross sectioning and elevations for marking removals and level course if required.
- 3) Baseline layout and leveling.
- 4) Checking grades for pipes and appurtenances, concrete forms and string.
- 5) Final checks for subgrade, granular base and ACP level course/base course.
- 6) Measurements for quantities.

Should the Contractor default in providing the necessary supplies or providing the necessary assistance, the Owner shall have the right to deduct such costs from payments due to the Contractor. These costs shall be at cost plus 10% for supplies and assistance at \$50.00/hr.

ARTICLE 26 CONSTRUCTION SURVEY MARKERS OR STAKES

The Engineer's survey crews and / or site inspector will establish survey stakes or markers for line and grade where required for construction. The Contractor shall maintain these stakes and markers for the duration of the work unless otherwise approved by the Engineer.

The Contractor shall be liable for all expenses incurred by the Engineer's survey crews for replacement of these stakes or markers for which he may require (refer to General Requirements, section 1410 and 1415). The Owner shall have the right to deduct such costs from payments due to the Contractor.

SPECIAL PROVISIONS

ARTICLE 27 QUALITY ASSURANCE TESTING

The Contractor must coordinate directly with the Geotechnical Consultant and provide notice to the Engineer to satisfy the materials testing requirements specified in the Contract Documents and as requested by the Engineer or Owner. Provide minimum 48-hour notice to the Geotechnical Consultant to ensure availability testing.

These tests performed shall not relieve the Contractor of their responsibility for Quality Control Testing.

ARTICLE 28 EXISTING UTILITIES & STRUCTURES

The location and protection of existing utilities & structures shall be the responsibility of the Contractor. This shall include all legal property pins and monuments.

Water and sewer service locations shown on the drawings are approximate and have been produced from CCTV, field surveys and Town of Peace River record drawings. It is the Contractor's responsibility to confirm the location of all utilities and structures.

The general location of the existing deep utilities & structures is shown on the enclosed Contract Drawings. Shallow and overhead utilities may not all be shown. Utility franchise drawings showing the general vicinity of the utilities have been provided for reference in Appendix 'B'. It is the responsibility of the Contractor to locate, protect and repair, if necessary, these facilities at no additional cost to the Owner.

ARTICLE 29 SHALLOW AND OVERHEAD UTILITIES

The Contractor shall coordinate with the utility franchises for the location, protection, inspection, repair or if necessary and upgrade to the utility systems for the duration of the Project.

Repair and/or upgrade of the street lighting system is anticipated. The Contractor shall accommodate the installation of street lighting conduits, cables and light pole bases prior to final landscaping works.

ARTICLE 30 TESTING, INSPECTION AND ADJUSTING WATER VALVE BOXES & MANHOLE/CATCH BASIS FRAMES

All water valves and curb stops in the construction areas shall be lowered to a level prior to the excavation, so as to allow for the passage of equipment over the valve box without damage to the valve box or valve. Upon completion of the base course, or other work the valve boxes shall be raised to finished asphalt, concrete or grading level.

All manholes and catch basins in the construction area shall be adjusted to the finished grade and each until shall be inspected by the Contractor and the Utility

SPECIAL PROVISIONS

Officer to ensure each unit and pipe inverts are in proper operational condition prior to and following construction operations.

The operation of the Municipal infrastructure shall be checked with the Utility Officer to ensure proper operating condition prior to and following construction operations.

Adjustment of water valve boxes and manhole frames will not be measured and the associated work shall be considered a subsidiary obligation of the Contractor under the appropriate unit price bid in the Tender Form Schedule.

ARTICLE 31 EXISTING SIGNS, MAILBOXES, PRIVATE LIGHTING & SPRINKLER SYSTEMS

The Contractor shall supply and maintain temporary signs for those removed during construction and shall replace the signs to the original position and condition following completion of the works at no additional cost to the Owner.

The Contractor shall coordinate with Canada Post to temporarily relocate mailboxes to allow safe access for residents and Canada Post employees.

Mailboxes shall be restored to their original location and condition unless otherwise requested by Canada Post at no additional cost to the Owner.

The Contractor shall be reimbursed for all costs associated with reinstalling private lighting and sprinkler systems to their original condition. The work associated shall be performed on a force account basis.

ARTICLE 32 EXISTING DRIVEWAYS

New curbs may have to be cut to lower the back and sidewalks be adjusted, as necessary, to tie into the existing driveways. This work shall be considered a subsidiary obligation of the Contractor for concrete installation under Tender Form Unit Price Schedule 'E', Item No. 1.

ARTICLE 33 DISPOSAL OF SURPLUS EXCAVATED MATERIAL

- a) All surplus excavated material is to be hauled to the designated disposal area south on 98th Street between Good Sheppard School and the Sewage Treatment Plant or as directed and/or agreed to by the Engineer. No additional payment will be considered. This work is considered a subsidiary obligation of the Contractor under the appropriate Unit Price bid item(s).
- b) All excavated pipe, appurtenances, concrete, asphalt and other waste material shall be disposed of at the Peace Regional Waste Management disposal site or other appropriate or necessary disposal site as determined by the Contractor. Additional payment will not be considered. This work is considered a subsidiary obligation of the Contractor under the appropriate Tender Form Unit Price Schedule item(s).

SPECIAL PROVISIONS

ARTICLE 34 CONCRETE

Cement used shall be HS (High Sulphate Resistant – Type V). Concrete strength shall be 30 MPa in 28 days. It shall contain a minimum cement content of 335 kilograms per cubic meter of concrete and shall contain 6% to 8% air entrainment. The slump shall range from 50mm to 100mm for hand pour and 20 to 40mm for machine pour applications. The maximum water/cement ratio shall be 0.45.

One (1) application of a Silane water repellent sealer (Master Protect H 1000 or equivalent) shall be applied to the exposed concrete surfaces; apply as per manufacturers recommendations following concrete curing. This work shall be considered a subsidiary obligation of the Contractor under Tender Form Unit Price Schedule 'E' Item No. 1.

The Contractor is responsible for quality control testing, including continuous monitoring of slump and air values at no cost to the Owner. Quality assurance testing for slump and air entrainment shall be made by the Town's geotechnical representative when each set of cylinders is cast. Associated costs for these tests will be borne by the Owner.

ARTICLE 35 FLUSH COAT (BITUMINOUS AND SLURRY SEAL COAT)

Flush coat, if required, shall be applied in accordance with the requirements of Section 32 12 of the Specifications, but only in amounts and locations as directed by the Engineer and Owner for asphalt surface irregularities and shall be considered a subsidiary of the Contractor at no additional cost to the Owner.

ARTICLE 36 ASPHALT PLANT REQUIREMENTS

Asphalt plants acceptable on the Project shall meet all requirements of the Specifications.

Asphalt plants acceptable on the project shall be equipped with a screening deck unit or gravels processed for asphalt mix, shall be split on the 6mm or 10mm screen, depending on the gradation of the gravels and recombined by method of a 2-bin cold feed to maintain proper gradation control at no additional cost to the Owner.

ARTICLE 37 REPLACEMENT OF PRIVATE TREES, SHRUBS & OTHER PERENNIALS

The Owner / Homeowner must approve the species of trees, shrubs and / or other perennials to be replaced if other than the original type. The Contractor shall utilize professional services for the preparation and installation of trees and other plants. The planting shall be performed at an appropriate time of year and with equivalent juvenile plant species and semi-mature tree species (as per detail drawings).

No additional payment will be made to the Contractor and this work shall be considered a subsidiary obligation of the Contractor under the appropriate Tender Form Unit Price Schedule item(s).

SPECIAL PROVISIONS

ARTICLE 38 CARE AND MAINTENANCE OF TREES, PLANTS & GRASSED AREAS

Care and maintenance of trees, plants & grassed areas shall be the responsibility of the Contractor until Substantial Performance of the Contract has been achieved (i.e. issuance of the Substantial Performance Certificate (SPC)).

Care and maintenance of trees, plants & grassed areas following issuance of the SPC shall be the responsibility of the Town and Homeowner except for deficiencies noted at the final inspection and repairs necessary due to settlement, failure or defect. The Contractor's liability shall cease upon expiry of the warranty / maintenance period subject to the above.

ARTICLE 39 SEASONAL MAINTENANCE

The Contractor shall be responsible for maintaining any construction signage and barricades etc., site drainage and temporary gravel to minimize disruption to pedestrian and vehicular travel/access for the duration of the project.

ARTICLE 40 OWNER'S RIGHT TO DELETE

The Owner reserves the right to delete in whole or in part thereof, the following Unit Price Schedule Items without any compensation to the Contractor:

- Unit Price Schedule 'C', Item No. 7 & 8
- Unit Price Schedule 'E', Item No. 19

ARTICLE 41 DIVISION 33, SECTION 91, 1.4 TESTING REQUIREMENTS

The following items shall supplement the specification and shall override as applicable.

- 1) The Contractor shall coordinate with the Owner for approval of and witnessing all testing and disinfection efforts for the existing, proposed, and temporary water systems.
- 2) Measurement / monitoring of total chlorine in not required.
- 3) Following the completion of Pressure Testing & Disinfection procedures the water mains and services shall be thoroughly flushed until the replacement water is at an equivalent free chlorine content to the adjacent in-service mains.
- 4) Only one bacteriological sample will be required from each test point, subject to negative test results. Sampling shall occur a minimum of 24 hours after disinfection flushing operations have ceased. Sampling from hydrants is acceptable. The number and location of bacteriological samples required shall be at the discretion of the Owner. The Contractor shall assist the Owner to collect the samples. The samples must be collected **between 12:00pm and 3:00pm on Monday through Thursday** for shipment by the Owner to the Provincial Lab (ProvLab). Thursday shipments risk the lab throwing them out as they may not have time to complete the
- 5) cultures prior to the weekend. No other lab is acceptable for bacteriological testing of potable water samples.

SPECIAL PROVISIONS

- 6) Bacteriological test results are provided to Alberta Public Health and then to the Municipality after which they will be provided to the Contractor and the Engineer. The time required for any review, receipt of results or that required for scheduling of Town staff shall not constitute a delay in the Contractor's work.

ARTICLE 42 ADDITIONAL PROJECT INFORMATION

The following additional Project information is enclosed within the Appendices and shall form part of the Tender / Contract Documents. The Contractor shall adhere to the recommendations and requirements of these documents.

- 1) Geotechnical Investigation, Limited Testhole Investigation, Proposed Neighbourhood Infrastructure Renewal, 94th and 95th Avenue, J.R. Paine & Associated Ltd., May 2020, Report File No. PR 4831-17.

It is the Contractor's sole responsibility to review the Geotechnical Investigation and to conduct any other investigations necessary to understand the sub-surface conditions.

- 2) Atco Pipelines Crossing Agreement T22-0266
Proximity Location; west side of 94th Street.

This agreement is provided for reference and the final executed agreement will be provided prior to construction. All associated costs to meet the requirements of the Atco Pipeline Agreement conditions shall be included in the Tender Form Unit Price Schedule Item for Sanitary sewer main connection at no additional cost to the Owner.

ARTICLE 43 INSULATION FOR UNDERGROUND WORKS

Insulation shall be required for existing exposed and new buried water pipes that have less than 2.7m of earth cover at the discretion of the Engineer. It shall also be required at locations identified on the drawing or as directed by the Engineer.

It is anticipated that insulation may be required at water main connections, existing service connections and storm line crossings.

ARTICLE 44 CURB STOPS

New curb stops shall be placed 0.3m outside of private property. The contractor shall place the top of these structures to 0-50mm below the finished landscape elevation. The finished landscape elevation shall be determined by the Contractor by grading the restored surface to match the adjacent existing landscape elevations unless otherwise directed by the Engineer.

SPECIAL PROVISIONS

ARTICLE 45 HYDRANT FLOW TESTING

The Contractor shall perform flow testing of new hydrants to meet the NFPA 291 Standard, 'Recommended Practice for Water Flow Testing and Marking of Hydrants'. The Town of Peace River will accept one (1) of the following options for qualifications to inspect, test and maintain hydrants:

1. A journeyperson sprinkler systems installer, recognized in Alberta;
2. A person who has acquired an approved certificate of training in the testing and maintenance of water-based fire protection systems in accordance with NFPA 25; or
3. A person who has acquired the Water and Wastewater Operators' Certification, as issued through Alberta Environment and Parks.

ARTICLE 46 WATER SYSTEM WORK NOTIFICATIONS & PROCEDURES

The enclosed document entitled "Town of Peace River, Neighbourhood Infrastructure Renewal, Water System Work Notifications & Procedures" shall form part of the Tender / Contract Documents and shall be included within APPENDIX C. The Contractor shall abide by the requirements of this document for all water system work at no additional cost to the Owner.

ARTICLE 47 MOBILIZATION & DEMOBILIZATION

The Tender Form Unit Price Schedule Summary includes a bid item for Mobilization. Mobilization shall be paid 50% each on Progress Payment Certificate (PPC) No. 1 and No. 2. Demobilization will not be paid as a separate Bid Item and is to be considered a subsidiary obligation of the contract.

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GENERAL CONDITIONS OF THE CONTRACT

GENERAL CONDITION 1 – DEFINITIONS

1.01 Contract Documents

The CONTRACT DOCUMENTS consist of the executed AGREEMENT AND THE SPECIAL PROVISIONS, SPECIFICATIONS, DRAWINGS AND SUCH OTHER DOCUMENTS AS ARE LISTED IN ARTICLE 2 OF THE AGREEMENT, including all amendments thereto incorporated before their execution and subsequent amendments thereto made pursuant to the provisions of the Contract or agreed upon between the parties.

1.02 Owner, Engineer and Contractor

The Owner, Engineer and Contractor are the persons, firms or corporations identified as such in the AGREEMENT and referred to throughout the CONTRACT DOCUMENTS as if singular in number and masculine in gender. The term "Owner, Engineer and Contractor" means the Owner, Engineer and Contractor or their Authorized representative as designated to each party in writing.

"OWNER" is the Owner named in the AGREEMENT.

"CONTRACTOR

1 is the Contractor named in the AGREEMENT.

"Engineer" is the person or firm designated by the Owner being licensed to practice professional engineering in the Province of Alberta, as also named in the AGREEMENT.

1.03 Subcontractor

A Subcontractor is a person, firm or corporation having a direct contract with the Contractor to perform a part or parts of the Work included in the Contract, or to supply products worked to a special design according to the CONTRACT DOCUMENTS. Wherever the singular number and masculine gender occur, plural number and feminine gender apply where the facts or contents so require.

1.04 The Project

The Project is the total construction of which the Work performed under the CONTRACT DOCUMENTS may be the whole or a part.

1.05 The Work

The term "the Work" means the total construction required by the CONTRACT DOCUMENTS and includes all labor, products and services.

1.06 Products

The terms "Products" means all material, machinery, equipment and fixtures forming the completed work as required by the CONTRACT DOCUMENTS, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work and normally referred to as construction machinery and equipment.

GENERAL CONDITIONS OF THE CONTRACT

1.07 Other Contractor

The term "Other Contractor means any person, firm or corporation employed by or having a separate contact directly or indirectly with the Owner for work other than that required by the CONTRACT DOCUMENTS.

1.08 Place of Building

The place of building is the designated site or location of the Project

1.09 Law of the Contract

The law of the place of building shall govern the Contract.

1.10 Time

- a. The Contract Time for Substantial Performance of the Work is the time stated in ARTICLE 3 OF THE AGREEMENT.
- b. The date of Substantial Performance of the Work is the date certified by the Engineer.
- c. The term "Day" as used in the CONTRACT DOCUMENTS shall mean the calendar day.
- d. The term "Working Day" as used in the CONTRACT DOCUMENTS shall mean days other than Saturdays, Sundays and holidays which are observed by the construction industry in the area or place of building.

1.11 Substantial Performance

Substantial Performance of the Work shall have been reached when the Engineer certifies that:

- a. The Work is ready for use or is being used for the purpose intended; and
- b. The Work remaining to be done under the Contract, inclusive of the cost of any deficiencies, is capable of completion or correction at a cost of not more than:
 1. 3% of the first \$500,000 of the Contract price;
 2. 2% of the next \$500,000 of the Contract price;
 3. 1 % of the balance of the Contract price.

1.12 Total Performance

Total Performance shall mean when the entire Work has been performed to the requirements of the CONTRACT DOCUMENTS and the maintenance period has expired and is so certified by the Engineer.

GENERAL CONDITIONS OF THE CONTRACT

GENERAL CONDITION 2 - DOCUMENTS AND DOCUMENT CONFLICT

- 2.01 The CONTRACT DOCUMENTS shall be signed in triplicate by the Owner and the Contractor.
- 2.02 The CONTRACT DOCUMENTS are complementary and what is required by any one shall be as binding as if required by all.
- 2.03 The intention of the CONTRACT DOCUMENTS is to include all labor, products and services reasonably necessary to perform the Work in accordance with these documents. It is not intended, however, that the Contractor shall supply any products or work not covered or properly inferable from any of the CONTRACT DOCUMENTS.
- 2.04 Words which have well known technical or trade meanings are used in the CONTRACT DOCUMENTS in accordance with such recognized meanings.
- 2.05 Should there be any conflict within the CONTRACT DOCUMENTS; the Contractor shall notify the Engineer. The Engineer's decision on such questions arising or the interpretation of the SPECIFICATIONS AND DRAWINGS shall govern.
- 2.06 In the case of discrepancies between drawings, those of later date and details to a larger size shall govern. Figured dimensions shall govern over scaled dimensions.
- 2.07 The apparent generality of the SPECIFICATION AND DRAWINGS as to any detail or the apparent omission from them of a detailed description shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the first quality are to be used
- 2.08 In case of any inconsistency or conflict between the provisions of the CONTRACT DOCUMENTS, the provisions of such documents and ADDENDA thereto shall take precedence and govern in the following order:
- CONTRACT AGREEMENT
 - SPECIAL PROVISIONS
 - GENERAL CONDITIONS
 - SPECIFICATIONS
 - DRAWINGS
 - TENDER FORM
 - INSTRUCTIONS TO TENDERERS
 - All other documents
- 2.09 Figures dimensions on a drawing take precedence over measurements scaled from the drawing, and large-scale drawings take precedence over those of smaller scale. SUPPLEMENTARY DRAWINGS AND SPECIFICATIONS supersede their antecedents. In case of conflict between figured dimensions on a drawing and the dimensions of a specified product, the dimensions of the specified product shall govern. In case of conflict in materials and methods, the SPECIFICATIONS shall govern. The DRAWINGS AND SPECIFICATIONS complement each other and anything called for by one shall be as binding as if called for by both.

GENERAL CONDITIONS OF THE CONTRACT

GENERAL CONDITION 3 - ADDITIONAL INSTRUCTIONS

- 3.01 During the progress of the Work the Engineer shall furnish to the Contractor such additional instructions as may be necessary to supplement the CONTRACT DOCUMENTS. All such instructions shall be consistent with the intent of the CONTRACT DOCUMENTS.
- 3.02 Additional instructions may include minor changes to the Work, which affect neither the Contract Price nor the Contract Time.
- 3.03 Additional instructions may be in the form of drawings, samples, models or written instructions.
- 3.04 Additional instructions will be issued by the Engineer with reasonable promptness and in accordance with any schedule agreed upon.

GENERAL CONDITION 4 - DOCUMENTS PROVIDED

- 4.01 The Contractor will be provided, without charge, with as many copies of the CONTRACT DOCUMENTS or parts thereof as are reasonably necessary for the performance of the Work.

GENERAL CONDITION 5 - DOCUMENTS ON THE SITE

- 5.01 The Contractor shall keep one copy of all current CONTRACT DOCUMENTS and shop drawings on the site, in good order and available to the Engineer and/or his representatives. This requirement shall not be deemed to include the executed CONTRACT DOCUMENTS.

GENERAL CONDITION 6 - OWNERSHIP OF DOCUMENTS AND MODELS

- 6.01 All CONTRACT DOCUMENTS and copies thereof, and all models furnished by the Engineer are and shall remain his property and are not to be used on other work.
- 6.02 Such documents are not to be copied or revised in any manner without the written authorization of the Engineer.
- 6.03 Models furnished by the Contractor or the Owner are the property of the Owner.

GENERAL CONDITION 7 - ENGINEER'S DECISIONS

- 7.01 The Engineer, in the first instance, shall decide on questions arising under the CONTRACT DOCUMENTS and interpret the requirements therein. Such decisions shall be given in writing. The Engineer shall use his powers under the Contract to enforce its faithful performance by both parties hereto.
- 7.02 The Contractor shall notify the Engineer in writing immediately, should he hold that a decision by the Engineer is in error and/or at variance with the CONTRACT DOCUMENTS.

GENERAL CONDITIONS OF THE CONTRACT

- 7.03 If the question of error and/or variance is not resolved immediately and the Engineer decides that the disputed work shall be carried out, the Contractor shall act according to the Engineer's written decision. Any question of change in Contract Price and/or extension of Contract Time due to such error and/or variance shall be decided as provided in GENERAL CONDITION 16 -SETTLEMENT OF DISPUTES.
- 7.04 Should the Engineer's employment be terminated; the Owner shall appoint an Engineer whose status under the Contract shall be that of the former Engineer.
- 7.05 Nothing contained in the CONTRACT DOCUMENTS shall create any contractual relationship between the Engineer and the Contractor.

GENERAL CONDITION 8 – DELAYS

- 8.01 If the Contractor is delayed in the performance of the Work by any act or neglect of the Owner, Engineer or any Other Contractor or any employee of any one of them, then the Contract Time shall be extended for such reasonable time as the Engineer may decide in consultation with the Contractor, and the Contractor shall be reimbursed for any costs incurred by him as a result of such delay, providing he has cooperated and coordinated his activities as required by GENERAL CONDITION 21, ITEM 04.
- 8.02 If the Contractor is delayed in the performance of the Work by a Stop Work Order issued by any court or other public authority and providing that such order was not issued as the result of any act or fault of the Contractor or of any one employed by him directly or indirectly, then the Contract Time shall be extended for such reasonable time as the Engineer and the Contractor may agree that the Work was delayed, and the Contractor shall be reimbursed for any costs incurred by him as the result of such delay.
- 8.03 If the Contractor is delayed in the performance of the Work by labor disputes, strikes, lockouts (including lock-outs decreed or recommendations for its members by a recognized Contractors' Association, of which the Contractor is a member), fire, unusual delay by common carriers or unavoidable casualties, or without limit to any of the foregoing, by any cause of any kind whatsoever beyond the Contractor's control, then the Contract Time shall be extended for such reasonable time as may be mutually decided by the Engineer and Contractor, but in no case shall the extension of time be less than the time lost as the result of the event causing the delay unless such shorter extension of time be agreed to by the Contractor.
- 8.04 In addition and without limit to the foregoing the Contract Time may be extended for any cause within the Contractor's control which the Engineer shall decide as justifying delay for such reasonable time as the Engineer may decide.
- 8.05 No extension shall be made for delay unless written notice of claim is given to the Engineer within fourteen (14) days of its commencement providing that in the case of a continuing case of delay only one claim shall be necessary.
- 8.06 The Engineer shall not, except by written notice to the Contractor, or as provided in GENERAL CONDITION 15 - EMERGENCIES, stop or delay any part of the work pending instructions or proposed changes in the Work.

GENERAL CONDITIONS OF THE CONTRACT

GENERAL CONDITION 9 - OWNER'S RIGHT TO DO WORK

- 9.01 If the Contractor should neglect to perform the Work properly or fail to perform any provisions of the Contract, the Owner may notify the Contractor in writing that he is in default of his contractual obligations and instruct him to correct the default within five (5) working days of receiving the notice.
- 9.02 If the correction of the default cannot be completed within the five (5) working days specified, the Contractor shall be considered to be in compliance with the Owner's instruction if he:
- a. commences the correction of the default within the specified time; and
 - b. provides the owner with an acceptable schedule for such correction; and
 - c. completes the correction in accordance with such schedule.
- 9.03 If the Contractor fails to comply with the PROVISIONS OF 9.01 AND 9.02 the Owner may, without prejudice to any other right or remedy he may have, correct such default and may deduct the cost thereof from the payment then or thereafter due the Contractor provided, however, that the Engineer shall review the action and approve the amount subsequently charged to the Contractor.

GENERAL CONDITION 10 - OWNER'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

- 10.01 If the Contractor should be adjudged bankrupt or makes a general assignment for the benefit of creditors or if a receiver is appointed on account of his insolvency, the Owner may, without prejudice to any other right or remedy he may have, by giving the Contractor written notice, terminate the Contractor.
- 10.02 Subject to the Engineer verifying that sufficient cause exists, the Owner may notify the Contractor in writing that he is in default of his contractual obligations, if the Contractor:
- a. refuses or fails to supply sufficient properly skilled workmen or proper workmanship, products, or construction machinery and equipment for the scheduled performance of the Work within five (5) working days of receiving written notice, except in those cases provided in GENERAL CONDITION 8 - DELAYS; or
 - b. fails to make payments due to his Subcontractors, his suppliers, or his workmen; or
 - c. persistently disregards laws or ordinances, or the Engineer's instructions; or
 - d. otherwise violates the provisions of the Contract.

Such written notice by the Owner shall instruct the Contractor to correct the default within five (5) working days from the receipt of the written notice.

GENERAL CONDITIONS OF THE CONTRACT

- 10.03 If the correction of the default cannot be completed within the five (5) working days specified, the Contractor shall be considered to be in compliance with the Owner's instructions if he:
- a. commences the correction of the default within the specified time; and
 - b. provides the Owner with an acceptable schedule for such correction; and
 - c. completes the correction in accordance with such schedule.
- 10.04 If the Contractor fails to correct the default with the time specified or subsequently agreed upon, the Owner may, without prejudice to any other right or remedy he may have, stop the work or terminate the Contract.
- 10.05 If the Owner terminates the Contract under the conditions set out above, he is entitled to:
- a. take possession of the premises and products and utilize the construction machinery and equipment, the whole subject to the right of third parties, and to finish the Work by whatever method he may deem expedient but without undue delay or expense;
 - b. withhold any further payments to the Contractor until the Work is finished;
 - c. upon total performance of the Work, charge the Contractor the amount by which the full cost of finishing the Work as certified by the Engineer, including compensation to the Engineer to cover the cost of any correction required by GENERAL CONDITION 42 - WARRANTY AND MAINTENANCE PERIOD, exceeds the unpaid balance of the Contract Price; or if such cost of finishing the Work is less than the unpaid balance on the Contract Price, pay the Contractor the difference.
 - d. on expiry of the warranty period, charge the Contractor the amount by which the cost of correction under GENERAL CONDITION 42- WARRANTY AND MAINTENANCE PERIOD, exceeds the allowance provided for such corrections, or if the cost of such corrections is less than the allowance, pay the Contractor the difference.

GENERAL CONDITION 11 - CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

- 11.01 If the owner should be adjudged bankrupt, or makes a general assignment for the benefit of creditors or if a receiver is appointed on account of his insolvency, the Contractor may, without prejudice to any other right or remedy he may have, by giving the Owner written notice, terminate the Contract.
- 11.02 If the Work should be stopped or otherwise delayed for a period of thirty (30) days or more under an order of any court, or other public authority, and providing that such order was not issued as the result of any act or fault of the Contractor or of any one directly or indirectly employed by him the Contractor may, without prejudice to any other right or remedy he may have, by giving the Owner written notice, terminate the Contract.
- 11.03 The Contractor may notify the Owner in writing, with a copy to the Engineer, that the Owner is in default of his contractual obligations if:

GENERAL CONDITIONS OF THE CONTRACT

- a. the Engineer fails to issue a certificate in accordance with GENERAL CONDITION 30 - CERTIFICATE AND PAYMENTS;
 - b. the Owner fails to pay the Contractor when due any amount certified by the Engineer or awarded by arbitrators. Such written notice shall advise the Owner that if such default is not corrected within five (5) working days from the receipt of the written notice the Contractor may, without prejudice to any other right or remedy he may have, stop the work and/or terminate the Contract.
- 11.04 If the Contractor terminates the Contract under the conditions set above, he shall be entitled to be paid for all work performed and for loss sustained upon products and construction machinery and equipment with reasonable profit and damages.

GENERAL CONDITION 12 - OTHER CONTRACTORS

- 12.01 The Owner reserves the right to let separate contracts in connection with the project of which the Work is part.
- 12.02 The Owner shall coordinate the Work and insurance coverages of Other Contractors as it affects the Work of this Contract.
- 12.03 The Contractor shall coordinate his work with that of Other Contractors and connect as required or shown in the CONTRACT DOCUMENTS.
- 12.04 The Contractor shall report to the Engineer any apparent deficiencies in Other Contractor's work which would affect the Work of this Contract immediately as they come to his attention and shall confirm such report in writing. Failure by the Contractor to so report shall invalidate any claims against the Owner by reason of the deficiencies of Other Contractor's Work except as to those of which he was not reasonably aware.

GENERAL CONDITION 13 - ASSIGNMENT

- 13.01 Neither party to the Contract shall assign the Contract or any portion thereof without the written consent of the other.

GENERAL CONDITION 14 - SUBCONTRACTORS

- 14.01 The Contractor agrees to preserve and protect the rights of the Parties under the Contract with respect to any work to be performed under subcontract. He therefore agrees to:
- a. require his Subcontractors to perform their work in accordance with and subject to the terms and conditions of the CONTRACT DOCUMENTS; and
 - b. be as fully responsible to the Owner for acts and omissions of his subcontractors and of persons directly or indirectly employed by them as for acts and omissions of persons directly employed by him. The Contractor therefore agrees that he will incorporate all the terms and conditions of the CONTRACT DOCUMENTS into all Subcontract Agreements he enters into with his Subcontractor.
- 14.02 The Contractor agrees to employ those Subcontractors proposed by him in writing and accepted by the Owner prior to the signing of the Contract for such portions of the Work as may be designated in the bidding requirements.

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- 14.03 The Owner may, for reasonable cause, object to the use of a proposed Subcontractor and require the Contractor to employ one of the other Subcontractor bidders.
- 14.04 In the event that the Owner requires a change from any proposed Subcontractor the Contract Price shall be adjusted by the difference in cost occasioned by such required change.
- 14.05 The Contractor shall not be required to employ as a Subcontractor any person or firm to whom he may reasonably object.
- 14.06 The Engineer may, upon reasonable request and at his discretion, provide to a Subcontractor information as to the percentage of the Subcontractors work which has been certified for payment.
- 14.07 Nothing contained in the CONTRACT DOCUMENTS shall create any contractual relationship between any Subcontractor and the Owner.

GENERAL CONDITION 15 - EMERGENCIES

- 15.01 The Engineer has authority in an emergency to stop the progress of the Work whenever in his opinion such stoppage may be necessary to ensure the safety of life, or the Work, or neighboring property. This includes authority to make changes in the Work, and to order, assess and award the cost of such work, extra to the Contract or otherwise, as may in his opinion be necessary. The Engineer shall within two (2) working days confirm in writing any such instructions. In such a case if work has been performed under direct order of the Engineer, the Contractor shall keep his right to claim the value of such work.

GENERAL CONDITION 16 - SETTLEMENT OF DISPUTES

- 16.01 In the case of any dispute arising between the Owner and the Contractor as to their respective rights and obligations under the Contract, either party hereto shall be entitled to give to the other notice of such dispute. In the event that the parties have agreed to submit such disputes to arbitration pursuant to a SPECIAL PROVISION TO THE CONTRACT, or by subsequent agreement, either party may thereupon request arbitration pursuant to such provisions. In the event that no provision or agreement is made for arbitration, then either party may seek recourse in such judicial tribunal as the circumstances may require.
- 16.02 Arbitration proceedings or legal proceedings shall not take place until after the performance or alleged performance of the disputed work except:
- a. when the dispute concerns a certificate for payment;
 - b. where either party can show that the matter in dispute requires immediate consideration while evidence is available;
 - c. in the case of legal proceedings where the action may become prescribed by reason

GENERAL CONDITION 17 – INDEMNIFICATION

- 17.01 Except as provided in ITEMS 17.02 AND 17.03 below, the Contractor shall indemnify and hold harmless the Owner and the Engineer, their agents and employees from and against all claims, demands, losses, costs, damages, actions, suits or proceedings arising out of or attributable to the Contractor's performance of the Contract, providing that any such claims, damages, loss or expense is:

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- a. attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property; and
 - b. caused by a negligent act or omission of the Contractor or anyone for whose acts he may be liable.
- 17.02 The obligations of the Contractor under this GENERAL CONDITION shall not extend to the liability of the Owner and the Engineer, their agents and employees where the primary cause of the injury or damage arises out of:
- a. the use of maps, drawings, reports, surveys, change orders, designs or specifications provided by the Owner, the Engineer, their agents and employees; or
 - b. the giving of or the failure to give decisions or instructions by the Owner, the Engineer, their agents and employees.
- 17.03 The Owner shall indemnify and hold harmless the Contractor from and against all claims, demands, losses, costs, damages, actions, suits or proceedings arising out of the Contractor's performance of the Contract which are attributable to lack of or a defect in title or an alleged lack of or defect in title to the site of the Work.

GENERAL CONDITION 18 – DRAWINGS

- 18.01 The Drawings are indicated in the INDEX and form part of these SPECIFICATIONS.
- 18.02 The DRAWINGS show the approximate dimensions and general requirements of the principal features of the work. Where necessary, as determined by the Engineer, additional DRAWINGS showing further details or alterations, will be furnished to the Contractor during the process of the work.
- 18.03 Any discrepancies found between the DRAWINGS AND THE SPECIFICATIONS and site conditions or any errors or omissions in the DRAWINGS OR SPECIFICATIONS shall be immediately reported to the Engineer who shall promptly correct such error or omission in writing. Any work done by the Contractor after his discovery of such discrepancies, errors or omissions shall be done at the Contractor's risk.
- 18.04 Where the work of the Contractor is affected by finish dimensions, these shall be determined by the Contractor at the site and he shall assume the responsibility therefor.
- The Contractor shall verify all dimensions, quantities and details shown on the DRAWINGS, SUPPLEMENTARY DRAWINGS, SCHEDULES or other data received from the Engineer and shall notify him of all errors, omissions, conflicts and discrepancies found therein.
- 18.05 Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting therefrom, nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions as full instructions will be furnished to the Contractor by the Engineer.

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GENERAL CONDITION 19 - DESIGN DOCUMENTS

19.01 These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entered into a contract.

GENERAL CONDITION 20 - VARIATION OF INFORMATION

20.01 Information shown on the DRAWINGS or described in the SPECIFICATIONS including topographic lines, locations of existing facilities, ground surveys, and soil conditions is approximate only. The Owner assumes no responsibility for the accuracy of the information described above, nor does the Owner represent that materials or conditions other than those indicated will not be encountered.

20.02 The Contractor shall understand that any borings or other investigations made by the Engineer or Owner and which may be shown on the DRAWINGS or as ADDENDA TO THE SPECIFICATIONS are for the Engineer's and Owner's own information and if any information as to the character of the materials likely to be encountered in performing the Work, or any other information as to the condition of the site is taken from this information, it shall be distinctly understood that the Engineer or Owner shall not be responsible if the information does not correctly set forth the facts or if the boring sheets or other written documents provided by the Engineer or Owner do not correctly set forth the results of borings or other investigations made.

GENERAL CONDITION 21 - COORDINATION OF WORK

21.01 The Contractor shall be responsible for the coordination of all aspects of the completed work.

21.02 The Contractor shall confine his plant and equipment, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the Engineer and shall not unreasonably encumber the work areas with his materials.

21.03 The Contractor shall permit full use, without charge therefore, by the Owner and/or other Contractors of any facilities usable jointly by the Contractor, Owner or other Contractors, as are available for such use without additional cost to the Owner.

21.04 Work at or in the vicinity of the site may be performed by the Owner and/or other Contractors during the period covered by the Contract under THESE SPECIFICATIONS. The Contractor shall cooperate with and coordinate his activities with other Contractors in the work area so that the work of all Contractors concerned will proceed with efficiency and dispatch. No claims for additional payment will be considered on account of delays, changes in construction schedules or any other reason whatsoever due to the fact that other Contractors are operating in the work area.

GENERAL CONDITION 22 - GENERAL INSTRUCTIONS

22.01 Prior to commencing actual construction, check field conditions to obtain actual dimensions required to ensure correct fabrication and execution of the work and notify the Engineer in writing of all matters which could prejudice proper execution of the Work. Commencement of construction shall constitute acceptance of existing conditions and verification of dimensions.

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22.02 Where work of this Contract involves breaking into or connecting to existing services, or utilities, carry out work at times directed by governing authorities, with a minimum of disturbance to the work and/or building occupants.

GENERAL CONDITION 23 - CONSTRUCTION SCHEDULE

23.01 The Contractor's construction operations shall be subject to the review of the Engineer. The sequence of operations and methods of operation shall be such as to ensure the completion of the work by the date specified, or time specified.

23.02 Within seven (7) calendar days after the Contractor has been advised in writing of the acceptance of this tender, he shall furnish the Engineer with his proposed schedule of operation. The Contractor shall immediately advise the Engineer of any proposed changes to his construction schedule.

23.03 Should the Contractor's work fail to progress according to the applicable progress schedules, and if in the opinion of the Engineer the work cannot be completed within the time stated in the Contract or such extension therefor as may have been granted, the Contractor shall work such additional time (including Sundays and Statutory Holidays), as approved by the Client and Engineer, over and above the normal hours worked by the applicable trades, as may be required to meet the scheduled completion, without additional cost to the Owner.

GENERAL CONDITION 24 - TEMPORARY FACILITIES

24.01 Install and maintain temporary water supply and sanitary facilities for work force, in accordance with governing regulations and ordinances.

24.02 Provide fire extinguishing equipment as required by the National Building Code. 24.03 Remove all temporary facilities from site upon work completion.

GENERAL CONDITION 25 - CONTINGENCY ALLOWANCE

25.01 The Contract Price includes the contingency allowance, if any, stated in the CONTRACT DOCUMENTS.

25.02 The contingency allowance is specified to provide for changes in the Work authorized under GENERAL CONDITION 27 - CHANGES IN THE WORK, and evaluated under GENERAL CONDITION 28- VALUATION AND CERTIFICATION OF CHANGES IN THE WORK. Unexpended portions of the contingency allowance shall be retained by the Owner.

GENERAL CONDITION 26 - CASH ALLOWANCES

26.01 The Contract Price includes all cash allowances stated in the CONTRACT DOCUMENTS.

26.02 Cash allowances, unless otherwise specified, cover the net cost to the Contractor of all services, products, construction machinery and equipment, freight, unloading, handling, storage, installation and other authorized expenses incurred in performing the work stipulated under the cash allowance.

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- 26.03 The Contract Price, and the cash allowance, includes the Contractor's overhead and profit in connection with such cash allowances.
- 26.04 Where costs under a cash allowance exceed the amount of the allowance, the Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in the CONTRACT DOCUMENTS.
- 26.05 The Contract Price shall be adjusted by written order to provide for any excess or deficit to each cash allowance.
- 26.06 Progress payments on account of authorized purchases under cash allowances shall be certified on the Engineers monthly certificates for payment.
- 26.07 A schedule shall be prepared jointly by the Engineer and the Contractor to show when items called for under cash allowances must be authorized by the Engineer for ordering purposes so that the progress of the work will not be delayed.

GENERAL CONDITION 27 - CHANGES IN THE WORK

- 27.01 The Owner, through the Engineer, without invalidating the Contract, may make changes by altering, adding to, or deducting from the Work, with the Contract Price and the Contract Time being adjusted accordingly.
- 27.02 Except as provided in GENERAL CONDITION 15 - EMERGENCIES, no change shall be made without a written order from the Engineer and no claim for an addition or deduction to the Contract Price or change in the Contract Time shall be valid unless so ordered and at the same time valued or agreed to be valued as provided in GENERAL CONDITION 28 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK.

GENERAL CONDITION 28 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK

- 28.01 The value of any changes shall be determined in one or more of the following methods:
- a. By estimate and acceptance in a lump sum.
 - b. By unit prices set out in the Contract or subsequently agreed upon.
 - c. By cost plus on a force account basis.
- 28.02 When a change in the Work is proposed or required, the Contractor shall present to the Engineer for approval his claim for any changes in the Contract Price and/or change in Contract Time. The Engineer shall satisfy himself as to the correctness of such claim and, when approved by him, shall issue a written order to the Contractor to proceed with the change. The value of work performed in the change shall be included for payment with the regular certificates for payment.
- 28.03 In the case of changes in the Work to be paid for under method (b.) of ITEM 28.01, in the form of presentation of costs and methods of measurement shall be agreed to by the Engineer and Contractor before proceeding with the change.
- 28.04 In the case of changes in the Work to be paid for under method (c.) of ITEM 28.01, compensation will be made in accordance with the following:
- a. Labor
All labor will be paid for at the unit prices tendered or mutually agreed upon for Foreman and Laborer. The unit prices will include board allowance, fringe benefits, insurance and profit.

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b. Equipment

Unless otherwise specified in the CONTRACT DOCUMENTS, rental rates for the Contractors' Equipment for Force Account Work shall be in accordance with the current rates provided by the Alberta Road Builders Association (or, if applicable, the B.C. Road Builders & Heavy Construction Equipment Rental Rates Blue Book). All rates include overhead, profit, operator's wages, fuel, oil, repairs, servicing, and other incidentals. Rental Rates will be paid only for the actual time equipment is used under the Force Account, and no stand-by time will be allowed for other equipment not required during this period. For all other classes of equipment, or supply items such as Air Compressors, Air Tools, Light Plants, Space Heaters, etc. the actual costs or the Alberta Transportation Rental Rates (or the B.C. equivalent) will apply plus 10% for overhead and profit.

c. Materials

Materials supplied by the Contractor will be paid for at the supplier's invoice price plus ten percent (10%) for handling and indirect overhead cost.

d. On subcontract work, the allowance to the Contractor will be ten percent (10%) of the Subcontractor's invoice.

e. The Contractor shall submit, for the Engineer's approval, the cost of the work done on force account on each succeeding day after force account work is carried out. The Contractor shall keep accurate records of any quantities or costs and present an account of the cost of the change in the Work, together with vouchers and receipts.

28.05 If the method of valuation, measurement and the change in Contract Price and/or change in Contract Time cannot be promptly agreed upon, and the change is required to be proceeded with then the Engineer shall determine the method of valuation, measurement and the change in Contract Price and/or Contract Time subject to final determination in the manner set out in GENERAL CONDITION 16 - SETTLEMENT OF DISPUTES. In this case the Engineer shall issue a written authorization for the change setting out the method of valuation and if by lump sum his valuation for the change in Contract Price and/or Contract Time.

28.06 In the case of a dispute in the valuation of a change authorized in the Work and pending final determination of such value, the Engineer shall certify the value of work performed and include the amount with the regular certificates for payment.

28.07 It is intended in all manners referred to above that both the Engineer and Contractor act promptly.

GENERAL CONDITION 29 - APPLICATION FOR PAYMENT

29.01 Applications for payment on account may be made monthly as the Work progresses. Applications for payment shall be dated the last day of the agreed monthly payment period. The total G.S.T. applicable shall be included on each monthly payment shown as a separate amount.

29.02 Claims for materials delivered to the site may be considered by the Owner, upon receipt of a written request from the Contractor. Claims for products delivered to the site, but not yet incorporated into the Work, shall be supported by such evidence as the Engineer may reasonably require establishing the value and delivery of the products.

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- 29.03 Holdback monies shall be ten percent (10%) of the value of work performed to-date.
- 29.04 Applications for release of holdback monies following the Substantial Performance of the Work and the application for final payment shall be made at the time and in the manner set forth in GENERAL CONDITION 30 - CERTIFICATES AND PAYMENTS.
- 29.05 Commencing with the second application for payment and all subsequent applications for payment, the Contractor shall submit a Statutory Declaration relative to the payment of labour, subcontractors and all material suppliers as well as notification from Worker Compensation Board that all accounts relative to the contract work are paid in full.

GENERAL CONDITION 30 - CERTIFICATES AND PAYMENTS

- 30.01 The Engineer will, no later than ten (10) days after the receipt of an application for payment from the Contractor submitted in accordance with GENERAL CONDITION 29 - APPLICATION FOR PAYMENT, issue a Progress Payment Certificate in the amount applied for or in such other amount as the Engineer determines to be properly due. If the Engineer amends the application, he will promptly notify the Contractor in writing giving his reasons for the amendment.
- 30.02 The Owner shall, within thirty (30) days of issuance of a certificate for payment by the Engineer, make payment to the Contractor on account in accordance with the provisions of ARTICLE 3 OF THE AGREEMENT.
- 30.03 Notwithstanding any other provisions of this Contract, if on account of climatic or other conditions reasonably beyond the control of the Contractor there are items of work that cannot be performed, the payment in full for work which has been performed as certified by the Engineer shall not be withheld or delayed by the Owner on account thereof, but the Owner may withhold from the Contract Price until the remaining work is finished only such monies as the Engineer shall determine are sufficient and reasonable to cover the cost of performing such remaining work and to adequately protect the Owner from claims.
- 30.04 The Engineer shall, within ten (10) days of receipt of an application from the Contractor for a certificate of Substantial Performance, make an inspection and assessment of the Work to verify the validity of the application. The Engineer shall, within seven (7) days of his inspection, notify the Contractor of his approval or disapproval of the application. When the Engineer finds the work to be substantially performed he shall issue such a certificate. The date of this certificate shall be the date of Substantial Performance of the Contract.
- 30.05 Following the issuance of the Certificate of Substantial Performance, and upon receipt from the Contractor of all documentation called for in the CONTRACT DOCUMENTS, the Engineer shall issue a certificate for payment of holdback monies. The release of holdback monies authorized by this certificate shall become due and payable following the expiration of the Statutory Limitation Period stipulated in the Builders' Lien Act applicable to the place of building, or where such legislation does not exist or apply in accordance with such other legislation, regulations governing privileges, industry practice or such other provisions which may be agreed to between the parties, providing that:
- a. no Affidavit of Lien or Liens have been filed or other matter recorded to make effective any Builders' Lien or claim,

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- b. the Contractor has complied with any conditions imposed by the Owner in his acceptance of the recommendation of the Engineer to issue the Certificate of Substantial Performance;
 - c. the Contractor has filed with the Owner a current Certificate of the Workers' Compensation Board evidencing that all assessments due to the Board by the Contractor have been paid;
 - d. the Contractor has submitted to the Owner a sworn Statutory Declaration, that all accounts for labor, contracts, subcontracts, products and materials, construction machinery and 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 holdback monies properly retained.
- 30.06 The Engineer shall, within ten (10) days of receipt of an application from the Contractor for payment upon Total Performance of the Contract, make an inspection and assessment of the work to verify the validity of the application. The Engineer shall, within seven (7) days of his inspection, notify the Contractor of his approval or disapproval of the application. When the Engineer finds the Work to be totally performed to his satisfaction, he shall issue a Certificate of Total Performance and certify for payment the remaining monies due to the Contractor under the Contract less any holdback monies which are required to be retained. The date of this certificate shall be the date of Total Performance of the Contract. The Owner shall, within thirty (30) days of issuance of such certificate, make payment to the Contractor in accordance with the provisions of ARTICLE 5 OF THE AGREEMENT.
- 30.07 The release of any remaining holdback monies shall become due and payable following the expiration of the Statutory Limitation Period stipulated in the Builders' Lien Act applicable to the place of building, or where such other legislation, regulations governing privileges, industry practice or such other provisions which may be agreed to between the parties, provided that:
- a. no Notice of Affidavit of Lien or Liens have been filed or other matters recorded to make effective of any Builders' Lien or claim;
 - b. the Contractor has complied with any conditions imposed by the Owner in his acceptance of the recommendation of the Engineer to issue said Total Performance Certificate;
 - c. the Contractor has filed with the Owner a current Certificate of the Workers' Compensation Board evidencing that all assessments due to the Board by the Contractor have been paid;
 - d. the Contractor has submitted to the Owner a sworn Statutory Declaration indicating that all accounts for labor, contracts, subcontracts, products and materials, construction machinery and equipment and other indebtedness which may have been incurred by the Contractor in the Total Performance of the Work, and for which the Owner might in any way be held responsible, have been paid in full, except holdback monies properly retained.
- 30.08 No certificate for payment, or any payment made thereunder, nor any partial or entire use of occupancy of the Work by the Owner shall constitute an acceptance of any work or products not in accordance with the CONTRACT DOCUMENTS.

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30.09 The acceptance of the Certificate of Total Performance or of the payment due thereunder shall constitute a waiver of all claims by the Contractor against the Owner except those made in writing prior to his application for payment upon Total Performance of the Contract and still unsettled.

GENERAL CONDITION 31 - PAYMENT WITHHELD

31.01 Upon receipt of a Certificate in writing from the Engineer stating that, in his opinion, justification exists, the Owner may withhold or nullify, on written notice to the Contractor specifying the ground or grounds relied on, the whole or any part of any payment to the extent necessary to protect himself from loss on account of one or more of the following:

- a. that the Contractor is not making satisfactory progress in the opinion of the Engineer;
- b. that defective Work is not being remedied in a manner satisfactory to the Engineer;
- c. that there are Affidavits of Lien or Liens filed against the land and premises on which the Work is done or is being done, or reasonable evidence that the probable filing of such Affidavits of Lien or Liens;
- d. that the Contractor is failing to make prompt payments as they become due to Subcontractors or for material or labor;
- e. that there exists unsatisfied claims for damages caused by the Contractor to anyone employed on the site or in connection with the Work.

31.02 Where Subcontractors or suppliers of material are not receiving prompt payment, the Owner may make payment to such Subcontractors or suppliers directly and deduct the amount of such payments from amounts otherwise due to the Contractor if the Contractor fails to do so upon Five (5) days' notice from the Owner.

GENERAL CONDITION 32 - LIENS

32.01 The Contractor shall remove or cause to be removed all Affidavits of Lien or Liens filed or registered against the lands and premises on which the Work is being performed or has been performed which claim of Lien or Liens arise out of anything done or to be done under this Contract. The Contractor forthwith upon demand by the Owner or the Engineer shall affect such removal.

32.02 ITEM 32.01 above does not apply to Liens filed by the Contractor.

32.03 Notwithstanding any other provisions herein, the Contractor shall indemnify and hold harmless the Owner from all demands, damages, costs, losses and actions arising in any way out of a lien or liens which arise out of anything done or to be done under the Contract and if the contractor fails to remove all liens promptly, the Owner shall be at liberty to remove same in any manner he chooses at the expense of the Contractor.

32.04 The Contractor shall, in carrying out this Contract, pay fair wages and comply with and fix working conditions, with respect to each employee or class of employment, not less favorable than the wages and working conditions established in the area of the General Contractor's Association and/or the Association of the Industry.

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GENERAL CONDITION 33 - TAXES AND DUTIES

- 33.01 Unless otherwise stated in SPECIAL PROVISIONS the Contractor shall pay all government sales taxes, customs duties and excise taxes with respect to the Contract.
- 33.02 Any increase or decrease in costs to the Contractor due to changes in such taxes and duties after the date of the AGREEMENT shall increase or decrease the Contract Price accordingly.

GENERAL CONDITION 34 - LAWS, NOTICES, PERMITS AND FEES

- 34.01 The laws of the place of building shall govern the Work.
- 34.02 The Contractor shall obtain all permits, licenses and certificates and pay all fees required for the performance of the Work which are in force at the date of tender submission (but this shall not include the obtaining of permanent easements or rights of servitude).
- 34.03 In carrying out its obligations hereunder, the Contractor shall give all required notice and shall be bound by and observe all applicable federal, provincial and municipal legislation and the Contractor shall cause all of its employees and approved subcontractors to be so bound.
- 34.04 The Contractor hereby represents and warrants with and to the Owner, and acknowledges that the Owner is relying upon such representation and warranty, that the Contractor is in compliance with all laws and regulations of any public authority relating to the conduct of its business and has all required approvals, permits, licenses, certificates and authorizations necessary to carry on its business and to carry out its obligations hereunder and there are not any proceedings whatsoever, actual or pending, and whether concerning cancellation, extension or otherwise, relating to the said approvals, permits, licenses, certificates or authorizations.
- 34.05 The Contractor shall not be responsible for verifying that the CONTRACT DOCUMENTS are in compliance with the applicable laws, ordinances, rules, regulations and codes relating to the Work. If the CONTRACT DOCUMENTS are at variance therewith, or changes which require modification to the CONTRACT DOCUMENTS are made to any of the laws, ordinances, rules, regulations and codes by the authorities having jurisdiction subsequent to the date of tender submission, any resulting change in the cost shall constitute a corresponding change in the Contract Price. The Contractor shall notify the Engineer in writing requesting direction immediately any such variance or change is observed by him.
- 34.06 If the Contractor fails to notify the Engineer in writing and obtain his direction as required in Item 34.04 above, and performs any work contrary to any laws, ordinances, rules, regulations, codes and orders of any authority having jurisdiction, he shall be responsible for and shall correct any violations thereof and shall bear all costs, expense and damages attributable to his failure to comply with the provisions of such laws, ordinances, rules, regulations, codes and orders.
- 34.07 By entering into a Contract for this Work, the Contractor acknowledges that he is being appointed Prime Contractor and will be required to assume all of the responsibilities and duties of, the "Prime Contractor" as defined by the Occupational Health and Safety Act. Any references in THESE SPECIFICATIONS to "Contractor" shall mean "Prime Contractor".

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It shall be the responsibility of the Prime Contractor of this Contract to liaise with all other prime contractors and jointly develop a health and safety system or process for the affected worksite.

GENERAL CONDITION 35 - PATENT FEES

35.01 The Contractor shall pay all royalties and patent license fees required for the performance of the Contract. He shall hold the Owner harmless and against all 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 any patent of invention by the Contractor or anyone for whose acts he may be liable.

35.02 The Owner shall hold the Contractor harmless against all 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 any patent of invention in executing anything for the purpose of the Contract, the model, plan or design or which was supplied to the Contractor by the Owner.

GENERAL CONDITION 36 - WORKERS' COMPENSATION

36.01 Prior to commencing the Work and prior to receiving payment on Substantial and Total Performance of the Work, the Contractor shall provide evidence to compliance with all requirements of the Province or Territory of the place of building with respect to Workers' Compensation including payment due thereunder.

36.02 At any time during the term of the Contract, when requested by the Engineer, the Contractor shall provide such evidence of compliance by himself and any or all of his Subcontractors.

GENERAL CONDITION 37 - LIABILITY INSURANCE

37.01 Comprehensive General Liability Insurance:

- a. Without restricting the generality of GENERAL CONDITION 17 - INDEMNIFICATION, the Contractor shall provide and maintain, either by way of a separate policy or by an endorsement to his existing policy, Comprehensive General Liability Insurance acceptable to the Owner and subject to limits of not less than five million dollars (\$5,000,000) inclusive per occurrence for bodily injury, death and damage to property including loss of use thereof.
- b. The insurance shall be in the joint names of the Contractor, the Owner and the Engineer, and shall also cover as Unnamed Insured all Subcontractors and anyone employed directly or indirectly by the Contractor or his Subcontractors to perform a part or parts of the Work but excluding suppliers whose only function is to supply and/or transport products to the project site.
- c. The insurance shall also include as Unnamed Insureds the architectural and engineering consultants of the Owner and the Engineer.
- d. The insurance shall preclude subrogation claims by the Insurer against anyone insured thereunder.
- e. The Comprehensive General Liability Insurance shall include coverage for:

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- Premises and operations liability
- Products or completed operations liability
- Blanket contractual liability
- Cross liability
- Elevator and hoist liability
- Contingent employer's liability
- Personal injury liability arising out of false arrest, detention or imprisonment or malicious prosecution; libel, slander or defamation of character; invasion of privacy, wrongful eviction or wrongful entry
- Shoring, blasting, excavation, underpinning, demolition, pile driving and caisson work, work below ground surface, tunneling and grading, as applicable. • Liability with respect to non-owned licensed vehicles
- Sudden and accidental pollution coverage

37.02 Automobile Liability Insurance

The Contractor shall provide and maintain liability insurance in respect of owned licensed vehicles subject to limits of not less than five million dollars (\$5,000,000) inclusive.

37.03 Aircraft and/or Watercraft Liability Insurance:

The Contractor shall provide and maintain liability insurance with respect to owned or non-owned aircraft and watercraft, as may be applicable, subject to limits of not less than one million dollars inclusive. Such insurance shall be in the joint names of the Contractor, the Owner, the Engineer and those parties defined in ITEM 37.01 (b.) AND (c.), where they have an interest in the use and operation of such aircraft or watercraft. The insurance shall preclude subrogation claims by the Insurer against anyone insured there under.

37.04 All liability insurance shall be maintained continuously until twelve (12) months after the date the Engineer issues a Certificate of Total Performance.

37.05 The Contractor shall provide the Owner with evidence of all liability insurance prior to the commencement of the Work and shall promptly provide the Owner with a certified copy of each insurance policy.

37.06 All liability insurance policies shall contain an endorsement of all Named Insured's with prior notice of changes and cancellations. Such endorsement shall be in the following form:

"It is understood and agreed that the coverage provided by this policy will not be changed or amended in any way nor cancelled until thirty (30) days after written notice of such change or cancellation shall have been given to all Named Insured's."

GENERAL CONDITION 38 - PROPERTY INSURANCE

38.01 The Contractor shall provide and maintain property insurance, acceptable to the Owner, insuring the full value of the Work in the amount of the Contract Price and the full value as stated of products that are specified to be provided by the Owner for incorporation into the Work. The insurance shall be in the joint names of the Contractor and the Owner and shall include the interests of the Contract, the Owner, the Subcontractors and all others having an insurable interest in the Work. The policies shall include all Subcontractors as Unnamed Insured's or, if they specifically request, as Named

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Insured's. The policies shall preclude subrogation claims by the Insurer against anyone insured there under.

38.02 Such coverage shall be provided for by EITHER an All Risks Builders' Risk Policy OR by a combination of a Standard Builders' Risk Fire Policy including extended Coverage and Malicious Damage Endorsements and a Builders' Risk Difference in Conditions Policy providing equivalent coverage.

38.03 The policies shall insure against all risks of direct loss or damage subject to the exclusion specified in the SPECIAL PROVISIONS. Such coverage shall apply to:

a. All products, labor and supplies of any nature whatsoever, the property of the Insured's or of others for which the Insured's may have assumed responsibility, to be used in or pertaining to the site preparations, demolition of existing structures, erection and/or fabrication and/or reconstruction and/or repair of the insured project, while on the site or in transit, subject to the exclusion of the property specified.

b. The installation, testing and any subsequent use of machinery and equipment including boilers, pressure vessels or vessels under vacuum.

c. Damage to the Work caused by an accident to and/or the explosion of any boiler(s) or pressure vessel(s) forming part of the Work.

Such coverage shall exclude construction machinery, equipment, temporary structural and other temporary facilities, tools and supplies used in the construction of the Work and which are not expendable under the Contract.

38.04 The Contractor shall provide the owner with evidence of all insurance prior to commencement of the Work and shall promptly provide the Owner with a certified true copy of each insurance policy. Policies provided shall contain an endorsement to provide all Named Insured's with prior notice of changes and cancellations. Such endorsement shall be in the following form:

"It is understood and agreed that the coverage provided by this policy will not be changed or amended in any way nor cancelled until thirty (30) days after written notice of such change or cancellation shall have been given to all Named Insured's."

38.05 All such insurance shall be maintained continuously until ten (10) days after the date the Engineer certifies the work as complete. All such insurance shall provide for the Owner to take occupancy of the Work or any part thereof during the term of the insurance. Any increase in the cost of this insurance arising out of such occupancy shall be at the Owner's expense.

38.06 The policies shall provide that, in the event of a loss, payment for damage to the Work shall be made to the Owner and the Contractor as their respective interests may appear. The Contractor shall act on behalf of the Owner and himself for the purpose of adjusting the amount of such loss with the Insurers. On the determination of the extent of the loss, the Contractor shall immediately proceed to restore the Work and shall be entitled to receive from the Owner (in addition to any sum due under the Contract) the amount at which the Owner's interest in the restoration work has been appraised, such amount to be paid as the work of the restoration proceeds and in accordance with the Engineer's Certificates for Payment. Damage shall not affect the rights and obligations of either party under the Contract except that the Contractor shall be entitled to such

GENERAL CONDITIONS OF THE CONTRACT

reasonable extension of time for Substantial and Total performance of the Work as the Engineer may decide.

38.07 The Contractor and/or his Subcontractors, as may be applicable, shall be responsible for any deductible amounts under the policies for providing such additional insurance as may be required to protect the Insured's against loss on items excluded from the policies.

GENERAL CONDITION 39 - PROTECTION OF WORK AND PROPERTY

39.01 The Contractor shall protect the property adjacent to the Project site from damage as the result of his operations under the contract.

39.02 The Contractor shall protect the Work and the Owner's property from damage and shall be responsible for any damage, which may arise as the result of his operations under the Contract.

39.03 Should any damage occur to the Work and/or Owner's property for which the Contractor is responsible he shall make good such damage at his own expense or pay all costs incurred by others in making good such damage.

39.04 Should any damage occur to the Work and/or Owner's property for which the Contractor is not responsible as provided in ITEM 39.02 above, he shall make good such damage to the Work, and, if the Owner so directs to the Owner's property, and the Contract Price and Contract Time shall be adjusted in accordance with GENERAL CONDITION 27 - CHANGES IN THE WORK.

GENERAL CONDITION 40 - DAMAGES AND MUTUAL RESPONSIBILITY

40.01 If either party to this Contract should suffer damage in any manner because of any wrongful act or neglect of the other party or anyone employed by him, then he shall be reimbursed by the other party for such damage. The party reimbursing the other party shall be subrogated to the rights of the other party in respect of such wrongful act or neglect if it be that of a third party.

40.02 Claims under this General Condition shall be in writing to the party liable within reasonable time after the first observances of such damages and not later than the time limits stipulated in GENERAL CONDITION 30 - CERTIFICATES AND PAYMENTS, and may be adjusted by agreement or in the manner set out in GENERAL CONDITION 16 - SETTLEMENT OF DISPUTES.

40.03 If the Contractor has caused damage to any Other Contractor on the Work, the Contractor agrees upon due notice to settle with such Other Contractor by agreement or arbitration if he will so settle. If such Other Contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor and may require the Contractor to defend the action at the Contractor's expense. If any final order or judgment against the Owner arises there from the Contractor shall pay or satisfy it and pay all costs incurred by the Owner.

40.04 If the Contractor becomes liable to pay or satisfy any final order, judgment or award against the Owner then the Contractor, upon undertaking to indemnify the Owner against any and all liability for costs, shall have the right to appeal in the name of the Owner such final order or judgment to any and all courts of competent jurisdiction.

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GENERAL CONDITION 41 – BONDS

41.01 The Owner shall have the right during the period stated in the tender documents for acceptance of the tender to require the Contractor to provide and maintain in good standing until the fulfillment of the Contract, bonds covering the faithful performance of the Contract including the requirements of the Warranty provided for in GENERAL CONDITION 42 -WARRANTY AND MAINTENANCE PERIOD, and the payment of all obligations arising under the Contract.

GENERAL CONDITION 42 - WARRANTY AND MAINTENANCE PERIOD

42.01 The Contractor shall, at his expense, maintain the work and correct any defects in the Work due to faulty products and/or workmanship appearing within a period of two years from the date of Construction Completion Certificate.

42.02 The Contractor shall correct and/or pay for any damage to other work resulting from any corrections required under the Conditions of ITEM 42.01.

42.03 Neither the Contract Manager's final certificate nor payment thereunder shall relieve the Contractor from his responsibility hereunder.

42.04 The Owner and/or the Contract Manager shall give the Contractor written notice of observed defects promptly.

42.05 The Contractor shall be liable for the proper performance of the Work only to the extent that careful workmanship and proper implementation of the CONTRACT DOCUMENTS will permit and any warranty given respecting the Work and performance shall only be valid so far as the design will permit such performance.

42.06 Nothing in this GENERAL CONDITION shall be deemed to restrict any liability of the Contractor arising out of any law of the place of building.

GENERAL CONDITION 43 - PROTECTION OF WORK AND PROPERTY

43.01 The Contractor shall protect the property adjacent to the Project site from damage as the result of his operations under the contract.

43.02 The Contractor shall protect the Work and the Owner's property from damage and shall be responsible for any damage which may arise as the result of his operations under the Contract.

43.03 Should any damage occur to the Work and/or Owner's property for which the Contractor is responsible he shall make good such damage at this own expense or pay all costs incurred by others in making good such damage.

43.04 Should any damage occur to the Work and/or Owner's property for which the Contractor is not responsible as provided in ITEM 43.02 above, he shall make good such damage to the Work and, if the Owner so directs to the Owner's property, and the Contract Price and Contract Time shall be adjusted in accordance with GENERAL CONDITION 27 - CHANGES IN THE WORK.

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GENERAL CONDITION 44 - CONTRACTOR'S RESPONSIBILITIES & CONTROL OF THE WORK

- 44.01 The Contractor shall have complete control of the Work except as provided in GENERAL CONDITION 15 - EMERGENCIES. He shall effectively direct and supervise the Work using his best skills and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures for coordinating all parts of the Work under the Contract.
- 44.02 The Contractor shall have the sole responsibility for the design, erection, operation, maintenance and removal of temporary structural and other temporary facilities and the design and execution of construction methods required in their use. The Contractors shall engage and pay for registered professional engineering personnel skilled in the appropriate discipline to perform these functions where required by law or by the Contract Documents and in all cases where such temporary facilities and their methods of construction are of such a nature that professional engineering skill is required to produce safe and satisfactory results.
- 44.03 Notwithstanding the provisions of ITEMS 44.01 AND 44.02 above, or any provisions to the contrary elsewhere in the Contract Documents where such Contract Documents include designs for temporary structural and other temporary facilities or specify a method of construction in whole or in part, such facilities and methods shall be deemed to comprise part of the overall 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 that he is responsible for the execution of the Work.
- 44.04 The Contractor shall carefully examine the Contract Documents and shall promptly report to the Engineer any error, inconsistency or omission he may discover.

GENERAL CONDITION 45 – SUPERINTENDENCE

- 45.01 The Contractor shall employ a competent superintendent and necessary assistance who shall be in attendance at the Work site at all times while work is being performed.
- 45.02 The superintendent shall be satisfactory to the Engineer and shall not be changed except for good reason and only then after consultation with an agreement by the Engineer.
- 45.03 The superintendent shall represent the Contractor at the Work site and directions given to him by the Engineer shall be held to have been given to the Contractor.

GENERAL CONDITION 46 - LABOUR AND PRODUCTS

- 46.01 Unless otherwise stipulated elsewhere in the Contract Documents, the Contractor shall provide and pay for all labour, products, tools, construction equipment and machinery, water, heat, light, power, transportation and other facilities and services necessary for the proper performance of the Work.
- 46.02 All products provided shall be new unless otherwise specified in the Contract Documents. Any products which are not specified shall be of a quality best suited to the purpose required and their use subject to the approval of the Engineer.

GENERAL CONDITIONS OF THE CONTRACT

46.03 The Contractor shall at all times maintain good order and discipline among his employees engaged on the Work and shall not employ on the Work any unfit person nor anyone not skilled in tasks assigned him.

GENERAL CONDITION 47 - USE OF PREMISES

47.01 The contractor shall confine his apparatus, the storage of products, and the operation of his workmen to limits indicated by laws, ordinances, permits or by directions of the Engineer and shall not unreasonably encumber the premises with his products.

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

47.03 The Contractor's use of the premises for signs, advertisements, fires and smoking shall be at the discretion of the engineer.

GENERAL CONDITION 48 - CLEANUP AND FINAL CLEANING OF WORK

48.01 The Contractor shall maintain the Work in a tidy condition and free from the Accumulation of waste products and debris, other than that caused by the Owner, Other Contractors or their employees.

48.02 When the Work is Substantially Performance the Contractor shall remove all his surplus products, tools, construction machinery and equipment not required for the performance of the remaining work. He shall also remove any waste products and debris and leave the Work clean and suitable for occupancy by the Owner unless otherwise specified.

48.03 When the Work is totally performed, the Contractor shall remove all of his products, tools, construction machinery and equipment. He shall also remove any waste products and debris, other than that caused by the owner, other contractors or their employees.

GENERAL CONDITION 49 - CUTTING AND REMEDIAL WORK

49.01 The Contractor shall do all cutting and remedial work that may be required to make the several parts of the Work come together properly.

49.02 The Contractor shall coordinate the schedule of the Work to ensure that this requirement is kept to a minimum.

49.03 Should the Owner or anyone employed by him be responsible for other work necessitating cutting and/or remedial work to be performed, the cost of such cutting and/or remedial work shall be valued as provided in GENERAL CONDITION 28 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK, and added to the Contract Price.

49.04 Cutting and remedial work shall be performed by a specialist familiar with the materials affected and shall be performed in a manner to neither damage nor endanger any Work.

GENERAL CONDITION 50 - INSPECTION OF WORK

50.01 The Owner and the Engineer and their authorized representatives shall have access to the Work for inspection and wherever it is in preparation or progress. The Contractor shall cooperate to provide reasonable facilities for such access.

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- 50.02 If special tests, inspections or approvals are required by the Contract Documents, the Engineer's instructions or the laws or ordinances of the place of building, the Contractor shall give the Engineer timely notice requesting inspection. Inspection by the Engineer by other authorities and shall notify the Engineer of the date and time.
- 50.03 If the Contractor covers or permits to be covered any Work that is subject to inspection or before any special tests and approvals are completed without the approval of the Engineer, the Contractor shall uncover the Work, have the inspection satisfactorily completed and make good the Work at his own expense.
- 50.04 Examination of any questioned Work may be ordered by the Engineer. If such Work be found in accordance with the Contract, the Owner shall pay the cost of examination and replacement. If such Work be found not in accordance with the Contract, through the fault of the Contractor, the Contractor shall pay such cost.
- 50.05 The Contractor shall furnish promptly to the Engineer two (2) copies of all certificates and inspection reports relating to the Work.

GENERAL CONDITION 51 - REJECTED WORK

- 51.01 Defective Work whether the result of poor workmanship, use of defective products or damage through carelessness or other act or omission of the Contractor, and whether incorporated in the Work or not, which has been rejected by the Engineer as failing to conform to the Contract Documents shall be removed promptly from the premises by the Contractor and replaced and/or re-executed promptly in accordance with the Contract Documents at the Contractor's Expense.
- 51.02 Other Contractor's Work destroyed or damaged by such removals or replacements shall be made good promptly at the Contractor's Expense.
- 51.03 If in the opinion of the Engineer it is not expedient to correct defective work not done in accordance with the Contract Documents, the Owner may deduct from the Contract Price the difference in value between the Work as done and that called for by the Contract, the amount of which shall be determined in the first instance by the Engineer.

GENERAL CONDITION 52 - SHOP DRAWINGS

- 52.01 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.
- 52.02 The Contractor shall arrange for the preparation of clearly identified shop drawings as called for by the Contractor Documents or as the Engineer may reasonably request.
- 52.03 Prior to submission to the Engineer, the Contractor shall review all shop drawings. By this review, the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data or will do so and that he has checked and coordinated each shop drawing with the requirements of the Work and the Contract Documents. The Contractor's review of each shop drawing shall be indicated by stamp, date and signature of a responsible person.
- 52.04 The Contractor shall submit shop drawings to the Engineer for his review with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the Work of Other Contractors. If either the Contractor or the Engineer so requests they shall jointly prepare a schedule fixing the dates for submission and return of shop

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drawings. Shop drawings shall be submitted in the form of a reproducible transparency or prints as the Engineer may direct. At the time of submission, the Contractor shall notify the Engineer in writing of any deviations in the shop drawings from the requirements of the Contract Documents unless a deviation on the shop drawings has been approved in writing by the Engineer.

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

GENERAL CONDITION 53 - SAMPLES

53.01 The Contractor shall submit for the Engineer's approval such standard manufacturer's samples as the Engineer may reasonably require. Samples shall be labeled as to origin and intended use in the Work and shall conform to the requirements of the Contract Documents.

53.02 The Contractor shall provide samples of special products, assemblies or components when so specified. The cost of such samples not specified shall be authorized as an addition to the Contract Price as provided in GENERAL CONDITION 28 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK.

GENERAL CONDITION 54 - TESTS AND MIX DESIGNS

54.01 The Contractor shall furnish to the Engineer test results and mix designs as may be requested.

54.02 The costs of tests and mix designs beyond those called for in the Contract Documents or beyond those required by laws, ordinances, rules and regulations relating to the Work and the preservation of public health, shall be authorized as an addition to the Contract Price as provided in GENERAL CONDITION 28 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK.

GENERAL CONDITION 55 - NOTICE TO PROCEED

55.01 Written Notice to Proceed with the Work shall be given to the Contractor by the Owner. The Contractor shall begin work within seven (7) days of the Notice to Proceed and shall execute the Work regularly and uninterruptedly thereafter, unless otherwise directed in writing by the Engineer or Owner, in such a manner as to secure completion of the Work contracted for within the time stated in the Contract Agreement. Time shall be of the essence in the Contract.

DIVISION 1 GENERAL REQUIREMENTS

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Section 01015	Drawings
Section 01040	Coordination of Work
Section 01100	Alternatives
Section 01200	Project Meetings
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Section 01260	Construction Program
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Section 01700	Project Closeout

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01010 - Scope of Work

The work consists of the supply of all labour, supervision, equipment and materials except as may be otherwise specified herein, for the Construction of the works as shown on the Drawings and as specified herein.

SECTION 01015 - Drawings

The Drawings are indicated in the Index and form part of these Specifications.

The Drawings show the approximate dimensions and general requirements of the principal features of the work. Where necessary, as determined by the Owner, additional Drawings showing further details or alterations, will be furnished to the Contractor during the process of the work.

Any discrepancies found between the Drawings and the Specifications and site conditions or any errors or omissions in the Drawings or Specifications shall be immediately reported to the Engineer, who shall promptly correct such error or omission in writing. Any work done by the Contractor after his discovery of such discrepancies, errors or omissions shall be done at the Contractor's risk.

Where the work of the Contractor is affected by finished dimensions, these shall be determined by the Contractor at the site and he shall assume the responsibility therefor. The Contractor shall verify all dimensions, quantities and details shown on the Drawings, Supplementary Drawings, Schedules or other data received from the Engineer, and shall notify him of any errors, omissions, conflicts and discrepancies found therein.

Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting therefrom, nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished to the Contractor by the Engineer.

SECTION 01040 - Coordination of Work

The Contractor shall be responsible for the coordination of all aspects of the completed work.

The Contractor shall confine his plant and equipment, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the Engineer and shall not unreasonably encumber the work areas with his materials.

The Contractor shall permit full use, without charge therefor, by the Owner and/or other Contractors of any facilities usable jointly by the Contractor, Owner or other Contractors, as are available for such use without additional cost to the Owner.

Work at or in the vicinity of the site may be performed by the Owner and/or other Contractors during the period covered by the Contract under these Specifications. The Contractor shall cooperate with and coordinate his activities with other Contractors in the working area so that the work of all Contractors concerned will proceed with efficiency and dispatch. No claims for additional payment will be considered on account of delays, changes in construction schedules or any other reason whatsoever due to the fact that other Contractors are operating in the work area.

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01100 – Alternatives

Quality - In order to establish standards of quality, the Engineer has, in the Specifications, referred to the products by name. This procedure is not to be construed as eliminating from competition other products of equal or better quality. The Engineer will be the sole judge as to the acceptability of substitute products.

Procedure - Submit requests for the use of alternative products in writing and direct to the Engineer at least five (5) days prior to the time of Tender closing. Each application for approval shall fully describe the proposed alternative and be complete with four (4) copies of full and complete technical data such as catalogue sheets, illustrations, performance curves, etc., and all other information required by the Engineer to evaluate the proposed alternative. Submissions solely referenced to catalogues will not be considered. Where the alternative requires corrections, modifications or installation costs in addition to those required by the specified products, include details thereof.

The Engineer will advise in writing of the acceptability of the proposed alternative prior to Tender closing.

SECTION 01200 - Project Meetings

Immediately following the Award of Contract, all parties to the Contract shall meet to discuss and resolve administrative procedures and responsibilities. Senior representatives of the Owner, the Engineer, the General Contractor, major Sub-Contractors, all Field Inspectors and Supervisors should be in attendance.

After award of Contract, arrange meetings at regular intervals at time and locations approved by the Engineer. Notify all parties concerned to attend, to ensure proper coordination of project work.

SECTION 01220 - General Instructions

Prior to commencing actual construction, check field conditions to obtain actual dimensions required to ensure correct fabrication and execution of the work, and notify the Engineer in writing, of all matters which could prejudice proper execution of the work. Commencement of construction shall constitute acceptance of existing conditions, and verification of dimensions.

Where work of this Contract involves breaking into or connecting to existing services, or utilities, carry out work at times directed by governing authorities, with a minimum of disturbance to the work and/or building occupants.

SECTION 01260 - Construction Program

The Contractor's construction operations shall be subject to the review of the Engineer. The sequence of operations and methods of operation shall be such as to ensure the completion of the work by the date specified, or time specified.

Within seven (7) calendar days after the Contractor has been advised in writing of the acceptance of this tender, he shall furnish the Engineer with his proposed program of operation. The Contractor shall immediately advise the Engineer of any proposed changes to his construction program. Should the Contractor's work fail to progress according to the applicable progress schedules, and if in the opinion of the Engineer the work cannot be completed within the time stated in the Contract or such extension

DIVISION 1 – GENERAL REQUIREMENTS

therefor as may have been granted, the Contractor shall work such additional time (including Sundays and Statutory Holidays), over and above the normal hours worked by the applicable trades, as may be required to meet the scheduled completion, without additional cost to the Owner.

The Contractor's attention is directed to the fact that connections to the existing system shall be scheduled to provide the least possible interruption of service in the system and shall be subject to the following:

- a. The operation of the existing system shall at all times be under the direct supervision of the Engineer and the Contractor shall under no circumstances operate any valves, pumps or other equipment which are a part of the existing system;
- b. The Engineer will arrange to isolate and shut off portions of the existing water supply system at a time convenient for both the Owner and the Contractor. Only then shall the existing system be disconnected to enable the Contractor to make the specified connections;
- c. The Contractor shall prepare all materials, pipework, etc., such that a minimum amount of interruption of service will be required and the dates of such interruption shall be confirmed with the Engineer at least twenty-four (24) hours prior;
- d. The work shall be carried out in a manner so as not to contaminate the water supply;
- e. In the event of emergency, the Engineer shall have the right to suspend the Contractor's work and to return the system to service.

SECTION 01300 – Submittals

Refer to General Condition 52 Shop Drawings.

Prepare clearly identified shop drawings as called for by the Technical requirements and for such other items as the Engineer may reasonably request. Submit all shop drawings in the quantity which is required to be returned (maximum of six) plus four (4) copies which will be retained by the Engineer, or transparency line drawings for review by the Engineer. Submit pre-printed data sheets where such products may be normally described.

Completely identify each submittal by showing name of project and specification section and drawing number to which the submittal applies.

Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items; the Engineer may reject partial submittals as not complying with the provisions of the Contract Documents.

Provide samples of special materials, assembling or components when so specified.

At termination of work, submit three (3) copies of manufacturer's operating and maintenance instructions for each item of major equipment.

Maintain project "as-built" record drawings and record accurately significant deviations from Contract Documents caused by site conditions and changes ordered by the Engineer. At completion of project and prior to final inspection, submit record drawings to the Engineer.

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01400 - Quality Control

If the Contractor covers or permits to be covered any work that is subject to inspection or before any special tests and approvals are completed with-out the approval of the Engineer, the Contractor shall uncover the Work, have the inspections satisfactorily completed and make good the work at his own expense.

The Contractor shall furnish to the Engineer test results and mix designs as may be requested. Testing shall be carried out by an independent inspection firm appointed by the Engineer and paid for by the Owner under a cash allowance. Extra tests required because of noncompliance of the works with the minimum requirements for materials and workmanship shall be paid for by the Contractor.

SECTION 01410 – Surveys

The Contractor shall provide the Engineer with all stakes and other materials, with the exception of technical instruments, required by the Engineer to establish all horizontal and vertical control from the work. The Contractor shall also supply the Engineer with reasonable assistance and with assistants as required for establishing or checking line and grade as well as measuring quantities.

The Contractor shall have the responsibility to carefully preserve bench marks, reference lines, stakes, grade marks, monuments, legal survey pins, and all data pertaining to horizontal and vertical control, and in the case of destruction thereof by the Contractor or resulting from his negligence, the Contractor shall be charged with the expense and damage resulting therefrom and shall be responsible for any mistakes that may be caused by the unnecessary loss or disturbance of any horizontal and vertical control.

All legal survey pins or monuments must be replaced by a Registered Land Surveyor if any have been destroyed by the Contractor. The Contractor shall bear the entire expense of replacement of said survey pins or monuments.

SECTION 01415 - Lines and Levels

The Engineer will set a bench mark and reference point, or base line to be used as a datum for all other elevations and as reference for the location of the works.

The Contractor shall establish all remaining elevations and lines as he may require, using the Engineer's bench mark and datum's lines as reference. The Contractor shall be responsible for the correctness of elevations and dimensions from such references.

The Contractor shall exercise care in the preservation of bench marks and datum's lines set for his use. If bench marks and/or datum are displaced or removed, the Contractor shall pay for resetting same.

SECTION 01420 - Warning Signs and Barricades

The Contractor shall provide adequate signs, barricades, red lights, and watchman and take all necessary precautions for the protection of the work and the safety of the public. All barricades and obstructions shall be protected at night by signal lights or flares which shall be kept burning from sunset to sunrise. Barricades shall be of substantial construction and shall be painted to increase their visibility at night. Suitable warning signs shall be so placed and illuminated at night as to show in advance where construction, barricades or detours exist.

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01430 - Public Safety and Convenience

The Contractor shall at all times so conduct his work as to ensure the least possible obstruction to traffic and inconvenience to the general public and the residents of the vicinity of the work and to ensure the protection of persons and property. No road or street shall be closed to the public except with the permission of the Engineer and proper governmental authority. Fire Hydrants on or adjacent to the work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the Contractor to ensure the use of sidewalks and the proper functioning of all gutters, sewer inlets, drainage ditches and irrigation ditches which shall not be obstructed except as approved by the Engineer.

SECTION 01440 – Holidays

The Contractor shall not work on any Sunday or on any other day normally observed as a holiday without the Engineer's written approval.

SECTION 01450 - Night Work

No night work shall take place unless authorized in writing by the Engineer. When night work is authorized, the Contractor shall supply at his own cost, a sufficient number of electric or other approved and efficient lights, to enable the work to be done in an effective manner which is safe and satisfactory.

SECTION 01500 - Temporary Facilities

Site Office: Provide and maintain appropriate lighted and heated office space furnished with plan table, desk, chairs and filing cabinet. Arrange and pay for a temporary telephone in the site office. Install and maintain temporary water supply for work force.

Install and maintain wiring, poles, panels and cables to provide temporary electrical power at site. The utility charges are to be paid for by the Contractor. Arrange for necessary metering and switching as required.

Provide sanitary facilities for work force in accordance with governing regulations and ordinances. Provide fire extinguishing equipment as required by the National Building Code. Prior to permanent enclosure of new building or portions thereof, provide temporary enclosures and heating equipment and attendants as may be required to heat materials and fully protect the Work. Properly ventilate all heated areas.

Provide all site transportation, scaffolding and temporary scaffolding structures required. Remove all Temporary facilities from site upon work completion.

SECTION 01530 - Protection of Existing Surface and Underground Structures

The Contractor shall take all necessary measures to protect any existing structures from injury and shall substantially and sufficiently support all structures that may be endangered by work or other operations carried out as part of the Contract.

The existence and location of underground utilities shown on the Drawings is not guaranteed, and

DIVISION 1 – GENERAL REQUIREMENTS

notwithstanding any other provision in the Contract and without limiting the generality of the foregoing, sewer, water and gas mains or lines, electric light, power or telephone conduits, or lines or cables or other such structures of utilities must be located by the Contractor, and failure to locate same does not negate the Contractor's responsibility thereto. The Contractor shall pay any charges to the Utility Companies in this regard. The Contractor shall make arrangements with the Owner of any underground structure to be present to supervise the work adjacent to the structure. Should any structures be injured by the aforementioned operations, they shall be restored at the expense of the Contractor.

SECTION 01540 - Land By Owner

The Owner shall provide the lands shown on the Drawings upon which the work under the Contract is to be performed and to be used for rights-of-way for access. Any delay in furnishing these lands by the Owner shall be deemed proper cause for adjustment in the Contract Amount and the time of completion.

SECTION 01550 - Lands By Contractor

Any additional land and access thereto not shown on the Drawings that may be required for temporary construction facilities or for storage of materials shall be provided by the Contractor, with no liability to the Owner. The Contractor shall confine his apparatus and storage of materials and operation of his workmen to those areas described in the Drawings and Specifications and such additional areas which may be provided as approved by the Engineer.

SECTION 01555 - Fair Wages

The Contractor shall, in carrying out this Contract, pay fair wages and comply with and fix working conditions, with respect to each employee or class of employment, not less favorable than the wages and working conditions established in the area of the General Contractor's Association and/ or the Association of the Industry.

SECTION 01565 - First Aid

The Contractor shall provide at the site such equipment and medical facilities as are necessary to supply first aid services to anyone who may be injured in connection with the work.

SECTION 01570 – Explosives

When explosives are used, the Contractor shall be responsible for the handling, storage and transportation in accordance with applicable laws and/or ordinances.

Blasting for excavating will be permitted only after securing the approval of the Engineer and only when proper precautions are taken for the protection of persons and property. The hours of blasting will be fixed by the Engineer. Any damage caused by blasting shall be repaired by the Contractor at his expense. The Contractor's methods of procedure in blasting shall conform to applicable laws and/or ordinances.

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01575 - Salvaged Utilities

All existing utility material such as hydrants, valves, pipes, etc., that is removed from the site during construction shall remain the property of the Owner and shall be stockpiled as directed by the Engineer. All materials not claimed by the Owner, shall be disposed of by the Contractor.

SECTION 01580 - Restoration of Existing Features

No trees whatsoever shall be cut down without the written permission of the Engineer. Trees, shrubbery, fences, poles and all other private property and surface structures shall be protected unless their removal is shown on the Drawings or authorized by the Engineer. No tree branches shall be cut unless authorized by the Engineer.

All existing sidewalks, ditches, culverts, gravel surfaces, and other surface features affected by the Contractor's construction operations shall, as closely as possible, be returned to their original condition upon completion of the work in the area. Restoration work will be the responsibility of the Contractor and no additional compensation will be paid.

SECTION 01585 - Access to Private Property

The Contractor shall provide and maintain reasonable access to all private property and places of business. When actual construction operations prohibit provision of such access the Contractor shall notify, well in advance, any residents to be affected by the closure.

SECTION 01605 - Manufacturer's Instructions

The Contractor shall be responsible for the correct installation and assembly of all items of equipment. Manufacturer's instructions shall be carefully read and rigidly adhered to in the installation of materials and equipment. Any damage resulting from either a failure to observe the manufacturer's instructions or as a result of proceeding with the work without complete knowledge of how a particular job is to be done, will be the Contractor's responsibility and he shall make good any loss or damage resulting from same.

SECTION 01610 - Materials Furnished by the Contractor

All materials used in the work shall meet the requirements of the respective Specifications. All materials not otherwise specifically indicated shall be furnished by the Contractor.

SECTION 01615 - Materials Furnished by the Owner

Materials specifically indicated shall be furnished by the Owner. The fact that the Owner is to furnish material is conclusive evidence of its acceptability for the purpose intended, and the Contractor may continue to use it until otherwise directed. If the Contractor discovers any defect in material furnished by the Owner, he shall notify the Engineer. Unless otherwise noted or specifically stated, materials furnished by the owner, which are not of local occurrence, are considered to be f.o.b. the nearest Transport Depot. The Contractor shall be prepared to unload and properly protect all such material from damage or loss. The Contractor shall be

DIVISION 1 – GENERAL REQUIREMENTS

responsible for material loss or damage after receipt of material at the point of delivery.

SECTION 01620 - Materials Pre-Ordered By Owner

Materials pre-ordered by the Owners shall be as noted on the drawings and specified in the technical specifications.

The Contractor shall be responsible for accepting the materials or equipment from the shipper on behalf of the Owner, and maintaining same in good condition until final acceptance of the Work. Any materials or equipment damaged or found defective after acceptance by the Contractor shall be replaced or repaired to the satisfaction of the Engineer, at the Contractor's expense.

Prime cost sums have been included in the Tender Form Schedule for supply of materials pre-ordered by the Owner. Final payment for these materials will be based on actual invoice prices from the suppliers and the Prime Cost Sum adjusted accordingly.

SECTION 01625 - Storage of Materials and Equipment

Materials shall be so stored as to ensure the preservation of their quality and fitness for the work. Stored materials shall be located so as to facilitate prompt inspection. Private property shall not be used for storage purposes without the written permission of the Owner or the Lessee.

SECTION 01630 - Testing and Start-up

"Testing Period" or testing, is that period in the construction program when the equipment, piping and material is installed and the assembled work is substantially complete to allow thorough examination. During the testing period the Contractor shall test the various pieces of equipment for proper installation, wiring, piping, connections, etc., under the guidance of the Engineer. If required, any phase, stage, unit pipe or assembly can be tested individually to achieve complete testing of the works ready for start-up.

"Start-up Period" or start-up, is defined as that period in the construction program when the equipment, controls, valves, switches, and other equipment can be energized, initiated, filled, primed, flushed or otherwise readied for operation including adjustments and calibration of equipment and controls.

The Contractor shall retain the services of factory trained personnel of the equipment manufacturer or supplier to undertake start-up, the electrical and control. During start-up, the electrical and control instrumentation shall be energized, electric motors shall be "kicked over" to confirm rotation, piping and control lines shall be filled and readied for operation. Each component, unit or system is to be started up one at a time. As each unit or system is started up, the Contractor shall obtain a written statement from each equipment manufacturer's representative stating satisfaction with the installation, wiring and that the equipment is ready for use and remains eligible for full warranty.

The Contractor shall have the factory trained personnel of the equipment manufacturer or supplier spend some time with the operator to familiarize him with the operation and maintenance of each piece of equipment.

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01640 - Maintenance Period

The Contractor shall maintain all works, equipment and structures supplied and installed by him, for a period of two (2) years after the effective date of the Certificate of Substantial Performance for the work. Any faulty workmanship or equipment shall be replaced by the Contractor during this period, at his expense. The Contractor's maintenance shall not include normal scheduled maintenance.

SECTION 01650 - Clean-Up

The Contractor shall at all times keep construction sites free from accumulation of general rubbish and upon completion shall remove all rubbish and surplus material and clean up the site for landscaping or other work or return to its original condition.

The Contractor shall, upon completion of the work, leave the entire works completely clean and ready for use. All surplus excavated material, trees, brush, pieces of concrete and pavement shall be disposed of at the Contractor's expense and at locations approved by the Engineer.

SECTION 01700 - Project Closeout

The Contractor and his Subcontractors shall conduct an inspection of the Work and correct all deficiencies. The Contractor shall notify the Engineer, in writing, of satisfactory completion of the "Contractor's Inspection" and request an Engineer inspection. The Engineer's Inspection shall consist of the Engineering Team and the Contractor. During the "Engineer's Inspection" a list of all deficiencies shall be drawn up and signed by the Engineer. When the Contractor is satisfied that all deficiencies have been corrected, the Contractor shall request, in writing, a "Final Inspection". The Final Inspection Team shall consist of the Owner, Engineer and the Contractor.

When it is mutually agreed by the Final Inspection Team that the Work is completed, the Contractor shall issue a written declaration to the Owner as follows:

All work in respect to the Contract for (Name of Project) and identified as Engineer's Job No. xxx-xxx, has been completed as of (Year), (Month), (Day) and no further work is required except for repairs or replacements as set out in the General Conditions.

The Engineer will state in writing, upon agreement with the above declaration, his approval of the inspected work, and issue a Certificate of Substantial Performance. The Engineer may at any time before issuance of a Certificate of Substantial Performance, describe the portions of the Work not completed to his satisfaction and all things which must be done by the Contractor before a Certificate of Substantial Performance will be issued.

Immediately prior to expiration of the twenty-four (24) month guarantee period, the Contractor shall request in writing, a joint inspection of the work, by the Final Inspection Team. The Engineer will thereafter, on being satisfied that all necessary maintenance has been completed, issue a Certificate of Total Performance.

1. GENERAL

This Section specifies requirements for hauling and haul roads.

1.1 Related Work

.1	Temporary Construction Signing	Section 01 58 99
.2	Site Grading	Section 31 22 13
.3	Excavating, Trenching, and Backfilling	Section 31 23 33.01
.4	Roadway Embankments	Section 31 24 10

1.2 Definitions

- .1 Hauling: The process of transporting material from its point of loading to its designated delivery point.
- .2 Haul Roads: A route over which materials are hauled for the performance of the Work, conforming to the following:
 - .1 An approved route from a designated source or waste disposal site.
 - .2 A contractor selected route from a contractor supply source or waste disposal site.
- .3 Free Haul: Distance excavated soil or granular material is hauled without additional compensation. Free haul distance to be unlimited.
- .4 Over Haul: Distance excavated soil or granular material is hauled beyond the limits of free haul.

1.3 Measurement Procedures

- .1 Unless otherwise stated, hauling is included in the unit price for the material being hauled. No additional compensation will be made for hauling.

1.4 Regulations

- .1 Haul vehicles shall comply with the requirement of the Alberta Safety Act (T-6 RSA 2000) when traveling on or across Public Roadways.

1.5 Municipal Approval & Public Notice

- .1 The Contractor shall prepare Haul Route Drawings and Public Notices as required.

1.6 Maintenance and Restoration of Haul Roads

- .1 The Contractor shall be responsible for all costs associated with the maintenance and restoration of haul roads.

2. PRODUCTS

2.1 Not Used

- .1 Not Used.

3. EXECUTION

3.1 Hauling

- .1 The Contractor shall not haul when hauling operations cause serious hazards or difficulties to the traveling public. These conditions may occur at the following times:
 - .1 when spring thaw is taking place;
 - .2 during or after heavy rainfall; or
 - .3 during period of exceptionally heavy traffic.
- .2 The Contractor shall abide by all load restrictions established by the road or bridge authority having jurisdiction.

3.2 Haul Routes

- .1 Haul roads and hauling equipment to be approved by Engineer.
- .2 Prior to commencement of haul, haul roads shall be inspected by authorized representatives of the local road authorities, the Contractor, and the Engineer to establish and record the general road condition.
- .3 Haul roads shall be maintained in a condition satisfactory to the Engineer throughout the period in which haul is underway. In the event of dispute as to the degree of maintenance required, the Engineer will be the final authority.
- .4 Provide adequate traffic control and warning signs along haul route to ensure public safety.
- .5 Upon completion of haul, the road shall be restored to a condition equivalent to or better than that which was evident at the time haul commenced. Another inspection will then be carried out by authorized representatives of the local road authorities, the Contractor, and the Engineer. The Engineer will be the final authority in assessing the restoration required.

1. GENERAL

This Section specifies requirements for demolishing, salvaging, and removing wholly or in part, various items designated to be removed or partially removed and for backfilling resulting trenches, holes and pits. It also specifies the cutting and removal of existing concrete curbs, sidewalks, driveways, asphalt concrete pavement, and base course materials where new surfacing materials are to be placed abutting the existing structure.

1.1 Related Work

.1	Clearing and Grubbing	Section 31 11 00
.2	Site Grading	Section 31 22 13
.3	Excavating, Trenching and Backfill	Section 31 23 33.01
.4	Roadway Embankment	Section 31 24 13
.5	Reshaping Asphalt Pavement (Milling)	Section 32 01 16.13

1.2 Protection

- .1 Pavement cuts shall not exceed the limits as specified in the construction drawing, Special Provisions or as marked by the Engineer.
- .2 Protect in accordance with Section 31 23 33.01, Excavation, Trenching and Backfill.
- .3 Protect existing items designated to remain and materials designated for salvage. In the event of damage to such items, immediately replace or make repairs to approval of Engineer and at no cost to Owner.

1.3 Solid Waste Disposal

- .1 The Municipality's Solid Waste Disposal Site
Only soil and gravel rubble material will be accepted at the Municipality's Solid Waste Disposal Site. No solid waste disposal fees will be charged.
- .2 All other waste shall be disposed of at the regional landfill authority and shall be subject to disposal fees or otherwise arranged by the Contractor.

1.4 Measurement Procedures

- .1 Removal of asphalt concrete pavement and underlying granular and earth materials will be paid on a cubic metre (m³) and/or square meter (m²) basis as specified in the Tender Form Unit Price Schedule(s). Payment shall be full compensation for saw cutting, loading, hauling and placing at the Town's disposal site with the exception of asphalt concrete pavement to Contractor disposal site. Disposal Site clean-up, including but not limited to, pushing up or "heaping" of piles and/or pushing piles into the waste storage area is considered incidental to the unit price bid for removal and disposal or common excavation to waste disposal.
- .2 Milling of asphalt concrete pavement will be paid in accordance with Section 32 01 16.13 Reshaping Asphalt Pavement (Milling).
- .3 Removal of granular base, sub-base materials and soil cement below concrete structures will not be measured and shall be included with concrete removal and

excavation to disposal site.

- .4 Removal and disposal or salvage as specified, of concrete work will be measured as follows:
- .1 Monolithic curb, gutter, and sidewalk to be measured in lineal metres.
 - .2 Separate sidewalk to be measured in square metres (m²).
 - .3 Curb and gutter to be measured in lineal metres (m).
 - .4 Curb to be measured in lineal metres (m).
 - .5 Paving stone to be measured in square metres (m²)
 - .6 Miscellaneous concrete work removal to be measured as shown in the Schedule of Quantities.
 - .7 Removal and disposal of adjacent and underlying asphalt, granular and earth materials shall be included with the removal and disposal of concrete structures.

Payment for removal and disposal or salvage of concrete work shall be full compensation for saw cutting, loading, hauling and placing at the Contractor's disposal site, salvage yard, regional landfill authority or as specified.

- .5 Removal of culverts, pipe sewers, water mains, service and drains will not be measured.
- .6 Removal of valves, hydrants, manholes and catch basins will not be measured.
- .7 Removal of cable duct banks, regardless of number of ducts in each bank, will be measured in metres (m) from end to end of duct bank for each size.
- .8 Removal of fences and guard rails will not be measured.
- .9 Salvage, stockpiling, sealing, disposal, excavating, backfilling, and restoration will not be measured. Payment for these items will be included in above removal items.
- .10 Removal and salvage of landscape features for future replacement will not be measured.
- .11 Removal and disposal of organics, soil and granular earth materials in boulevard areas will not be measured.

2. PRODUCTS

Not applicable.

3. EXECUTION

3.1 Preparation

- .1 Inspect site and verify with Engineer items designated for removal and items to remain.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.
- .3 Notify utility companies before starting demolition.

3.2 Sawcutting

- .1 The contractor shall cut concrete curbs, sidewalks, driveways, and existing pavement to the full thickness of the structure so that a smooth vertical edge results, against which new materials can be effectively placed and compacted. Rough, jagged edges will not be acceptable.
- .2 Unless otherwise specified in the Special Provisions, the contractor may utilize any alternative cutting methodology to be approved by the Engineer, provided the methods and equipment result in a clean straight vertical cut. All proposed methods and equipment employed by the contractor shall be reviewed and accepted by the Engineer prior to the start of work.
- .3 Sawcuts are to be made with a concrete or asphalt saw capable of providing a true straight joint of consistent depth, as specified. Sawcuts in concrete work are to be made at a construction or surface joint at each end of the designated repair area. Double sawcuts at the removal ends minimizes potential for damage to the existing concrete structures to be maintained. Sawcuts in asphalt adjacent to designated areas of concrete removal shall be parallel to the edge of concrete work at a distance of 300 mm from the lip of gutter.

3.3 Removal

- .1 Remove items as indicated.
- .2 Do not disturb adjacent items designated to remain in place.
- .3 In removal of pavements, curbs and gutters and sidewalk;
 - .1 Square up adjacent surfaces to remain in place by sawcutting or other method approved by Engineer.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying granular materials.
 - .4 When removing curbs and gutters adjacent to pavements, sawcut as per Clause 3.2 of this Section and remove asphalt and granular material in order to complete form work.
 - .5 When trench excavation across an existing structure is required, the contractor shall cut the existing pavement on both sides of the trench to the full depth of the structure. The trench cuts shall result in a trench that is no wider than necessary to permit satisfactory installation of the works, and to thoroughly compact the backfill material. The trench shall be backfilled with similar or better materials than those excavated.

3.4 Salvage

- .1 Carefully dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated by the Owner(s) or as directed by Engineer.

3.5 Sealing

- .1 Seal pipe ends and walls of manholes or catch basins as indicated or as directed by Engineer. Securely plug to form watertight seal.

3.6 Disposal of Material

- .1 Dispose of waste materials not designated for salvage or re-use in work and other excavated solid waste shall be taken to the Contractor's disposal Site or other location as determined by the Contractor.
- .2 No waste disposal fees will be charged by the Municipality.

3.7 Restoration

- .1 Upon completion of work, remove debris, trim surfaces, and leave work site clean.
- .2 Re-instate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work, as outlined in specific sections for each type of work.

1. GENERAL

1.1 Related Work

- | | | |
|----|--------------------------|------------------|
| .1 | Cast in Place Concrete | Section 03 30 00 |
| .2 | Extruder Placed Concrete | Section 03 37 30 |
| .3 | Concrete Work | Section 32 16 15 |
| .4 | Standard Details | Division 50 |

1.2 Reference Standards

- .1 Do reinforcing work in accordance with CSA-A23.1 and welding of reinforcing with CSA -W186, except where indicated otherwise.

1.3 Test Reports

- .1 Upon request, provide Engineer with certified copy of mill test report of steel supplied, showing physical and chemical analysis.

1.4 Shop Drawings

- .1 Submit Shop Drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Clearly indicate bar sizes, spacing, location, and quantities of reinforcement, mesh, chairs, spacers and hangers with identifying code marks to permit correct placement without reference to structural drawings.
- .3 Detail placement of reinforcing where special conditions occur.
- .4 Design and detail lap lengths and bar development lengths to CSA -A23.3, unless otherwise specified on drawings.

1.5 Storage and Hauling

- .1 Ship bar reinforcement in standard bundles easily identifiable and marked in accordance with bar lists.
- .2 Store reinforcement to prevent deterioration or contamination by dirt, detrimental rust, loose scale, paint, oil, or other foreign substances that will destroy or reduce bond.
- .3 Do not straighten or re-bend reinforcement in any manner.
- .4 Do not use bars kinked or bent by improper handling or storage.

1.6 Measurement Procedures

- .1 Measurement for 2-10m reinforcing bars shall be per lineal meter at all new utility crossing locations and replacement concrete sections, as designated by the Engineer.
- .2 No measurement and payment shall be made under this Section for dowels.
- .3 No measurement and payment shall be made under this section for concrete structures specifying reinforcing steel.

2. PRODUCTS

2.1 Materials

- .1 Reinforcing bars: billet steel, grade deformed bars to CSA G30.18 unless indicated otherwise - 400 grade.
- .2 Reinforcing bars: weldable low alloy steel deformed bars to CSA - G30.18.
- .3 Cold-drawn steel wire for concrete reinforcement to CSA -G30.3.
- .4 Welded steel wire fabric to CSA -G30.5.
- .5 Smooth dowels to CSA G30.18

2.2 Fabrication

- .1 Fabricate reinforcing to CSA-A23.1.
- .2 Obtain Engineer's approval for location of reinforcement splices other than shown on steel placing Drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar list.

3. EXECUTION

3.1 Placing Reinforcement

- .1 Place reinforcing steel to CSA-A23.1 and according to the Drawings in Division 50 or as directed by the Engineer.
- .2 Obtain Engineer's approval of reinforcing steel and position before placing concrete.
- .3 Clean reinforcement to ensure it's free from hardened mortar, dirt, rust, scale, paint, oil or other foreign material that may destroy bond before placing concrete.
- .4 The mesh and/or bar reinforcing shall be supported above the compacted gravel base to ensure a minimum 50 mm cover of concrete. The manner of supporting the reinforcing shall be approved by the Engineer.
- .5 Concrete with wire mesh position at the bottom of the concrete element shall be deemed unacceptable.
- .6 All concrete that does not have sufficient concrete cover around reinforcement shall be considered defective and must be removed and replaced at the Contractor's expense.

1. GENERAL

1.1 Related Work

.1	Basic Concrete Materials and Test Methods	Section 03 05 00
.2	Concrete Reinforcement	Section 03 20 00
.3	Concrete Work	Section 32 16 15
.4	Manholes and Catch Basin	Section 33 05 13
.5	Concrete Forming & Accessories	Section 03 10 00
.6	Standard Details	Division 50

1.2 Reference Standards

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1 except where specified otherwise.

1.3 Measurement Procedures

- .1 No measurement to be made under this Section.

2. PRODUCTS

2.1 Materials

- .1 See Section 03 05 00 for ready-mixed concrete material specifications.
- .2 Non-shrink grout: premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 50 MPa at 28 days.
- .3 Dry pack: premixed or non-premixed composition of non-metallic aggregate, cement and sufficient water for mixture to retain its shape when made into a ball by hand and capable of developing compression strength of 50 MPa at 28 days.
- .4 Curing compound to ASTM C309 containing a white pigment.
- .5 Formwork material: to Section 03 10 00.
- .6 Form stripping agent: colourless mineral oil free of kerosene, with viscosity between 15 to 24 mm/s.

2.2 Concrete Mixes

- .1 See Section 03 05 00 for concrete mix design requirements.
- .2 Mix design to be completed by an approved materials testing agency and submitted to the Engineer for approval two weeks prior to concrete being placed.
- .3 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CSA-A23.1, Clause 14, unless specified otherwise.

- .4 Obtain Engineer's approval before using chemical admixtures other than those specified.

3. EXECUTION

3.1 Workmanship

- .1 Obtain Engineer's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .2 Place concrete in accordance with CSA-A23.1.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Obtain Engineer's approval of proposed method for protection of concrete during placing and curing in adverse weather, prior to placing of concrete.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, and air temperature.
- .6 Joints and reinforcement are to be installed in accordance with the Drawings in Division 50, Section 03 20 00 and Section 32 16 15.
- .7 When tying into existing concrete that is more than 28 days old, an expansion joint is to be installed as per the Drawings in Division 50, Standard Detail 50 04 20 and Section 32 16 15.

3.2 Inserts

- .1 Set sleeves, ties, anchor bolts, pipe hangers, and other inserts, openings and sleeves, in concrete floors and walls, as required by other trades. Sleeves, openings, etc., greater than 100 mm x 100 mm not indicated on structural Drawings must be approved by Engineer.

3.3 Extreme Weather Concrete Work

- .1 Hot weather: conform to requirements of CSA-A23.1 for hot weather protection when air temperature is at or above 25°C.
- .2 Cold weather: conform to requirements of CSA-A23.1 and Section 30 05 00 for cold weather protection when air temperature at or below 5°C. Concrete not to be placed on frozen subgrade or subbase. Maintain concrete surface temperatures of 10°C for a period of 7 days by use of insulation or hoarding and heating around concrete.

3.4 Finishing

- .1 *Floated Surface Finish*
 - .1 Strike off the compacted concrete to the cross section and elevation shown on drawings. Keep a slight excess of concrete in front of screed at all times.
 - .2 Obtain a uniform surface by floating as necessary. If floating is not completed before excess water appears at the surface, remove this water before continuing with floating.

- .3 Add or remove concrete during floating as required to obtain a surface with no more than 3 mm deviation from the required surface in any 3 m length.
- .4 Do not overwork concrete surface. Float only enough to obtain a dense uniform surface.

.2 Broomed Finish

- .1 After completion of 3.4.1 above, broom to produce a non-slip surface with regular corrugations not more than 3 mm deep.
- .2 Broom finish shall be applied perpendicular to the pedestrian traffic except at crossings that are brushed perpendicular to the vehicle traffic.

.3 Trowelled Finish

- .1 After completion of 3.4.1 above, trowel at joints to produce a dense smooth finish, with the exception of Paraplegic ramps. Trowelled finishes on paraplegic ramps are to be provided with a broom finish to achieve a non-slip surface.

.4 Surface Hardener

- .1 Apply according to manufacturer's instructions in conjunction with floating operations.

.5 Curing Compound

- .1 For curb, gutter, sidewalk, and other exposed concrete, a curing compound shall be uniformly sprayed, applied immediately on completion of finishing of surface.

3.5 Testing

- .1 See Section 03 05 00 for testing requirements, specifications, and defective work.

1. GENERAL

This Section specifies requirements for use of slip-form machines for concrete curbs, curbs and gutters, and sidewalks.

1.1 Related Work

.1	Concrete Work	Section 32 16 15
.2	Cast in Place Concrete	Section 03 30 00
.3	Concrete Reinforcement	Section 03 20 00
.4	Basic Concrete Materials & Test Methods	Section 03 05 00
.5	Standard Details	Division 50

1.2 Measurement Procedures

- .1 No measurement to be made under this Section.

2. PRODUCTS

2.1 Materials

- .1 See Section 03 05 00 for ready-mixed concrete material specifications.
- .2 Concrete Reinforcement refer to Section 03 20 00.

3. EXECUTION

3.1 Equipment

- .1 Subgrade trimmers: self-powered trimmers capable of producing a clean smooth surface true to line and grade indicated. Remaining loose material on subgrade not to exceed 6 mm in depth.
- .2 Concrete extruders: self-powered extruders with automatic line and grade control capable of placing consolidating, screeding and float finishing in one pass.

3.2 Execution

- .1 Operate concrete extruder continuously until section or scheduled pour completed. Empty hopper of concrete and install a construction joint. When operations delayed more than 30 minutes, install a construction joint. Joint to be installed as per the Drawings in Division 50, Standard Detail 50 04 20 and Section 32 16 15.
- .2 Vibrate concrete to obtain a dense, smooth finished mass.

- .3 Finishing handwork to be minimized. Concrete requiring excessive hand finishing to be rejected.
- .4 Areas of concrete to be formed and placed by hand shall be completed within 7 days of completion of adjacent extruded section.
- .5 When tying into existing concrete that is more than 28 days old, an expansion joint is to be installed as per the Drawings in Division 50, Standard Detail 50 04 20 and Section 32 16 15.

1. GENERAL

This Section specifies general requirements for supplying and processing of aggregates to be stockpiled or incorporated into work. Specific requirements for physical properties of aggregates are given in related work sections.

1.1 Related Work

.1	Excavating, Trenching and Backfilling	Section 31 23 33.01
.2	Roadway Embankments	Section 31 24 13
.3	Granular Sub-base	Section 32 11 16.01
.4	Granular Base	Section 32 11 16.02
.5	Plant-Mix Asphalt Concrete Paving	Section 32 12 16.13
.6	Cast-in-Place Concrete	Section 03 30 00

1.2 Source Approval

- .1 Source of materials to be incorporated into work or stockpiled requires approval.
- .2 The Contractor shall submit one (1) copy of a full sieve analysis per 500 tonnes, including fracture count, liquid limit, and plasticity index per size of aggregate to be used. The sieve analysis may be a typical sample from/during aggregate production, or may be from a sample taken in stockpile.
- .3 The Contractor shall inform the Engineer of proposed source of aggregates and provide access for sampling at least two weeks prior to commencing production.
- .4 If, in the opinion of the Engineer, materials from proposed source do not meet or cannot reasonably be processed to meet specified requirements, procure an alternative source or demonstrate that material from source in question can be processed to meet specified requirements. The Contractor shall suspend aggregate placement until proof of compliance with the specifications is provided to the Engineer.
- .5 Should a change of material source be proposed during work, advise the Engineer two weeks or ten business days, whichever is greater, in advance of the proposed change to allow sampling and testing.
- .6 No placement shall be allowed until written approval is received from the Engineer or the Engineer's representative.
- .7 Acceptance of a material at source does not preclude future rejection if it is subsequently found to lack uniformity or if it fails to conform to requirements specified or if its field performance is found to be unsatisfactory.

1.3 Production Sampling

- .1 Aggregate will be subject to continual sampling during production.
- .2 The Contractor shall provide the Engineer with ready access to source and processed material for purpose of sampling and testing.
- .3 The Contractor shall bear the cost of sampling and testing of aggregates in order to meet design gradations and specifications.

1.4 Measurement Procedures

- .1 No measurement to be made under this Section. Include costs in items of work that require aggregates.

2. PRODUCTS

2.1 General

- .1 Aggregate shall be sound, hard, durable material free from soft, thin, elongated, or laminated particles, organic material, or other deleterious substances.
- .2 Flat and elongated particles are those whose greatest dimension exceeds five times their least dimension.
- .3 Fine aggregates satisfying requirements of applicable section shall be one, or a blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand and/or fines.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section shall be one of following:
 - .1 Crushed rock or slag, composed of sound, hard and durable particles free from elongated particles and injurious materials.
 - .2 Gravel composed of naturally formed particles of stone free of flaky particles, soft shales, organic matter, clay lumps, and other foreign matter.

2.2 Materials

- .1 Gradation: To be within the limits and for the types of materials specified in Table A appended to this Section, when tested to ASTM C117 and ASTM C136, and having a smooth curve without sharp breaks when plotted on a semi-log grading chart to ASTM E11.
- .2 Production of Manufactured Fines: Manufactured fines are defined as that portion of the material passing the 5,000 µm sieve size which is produced by the crushing process.
In the event the manufactured fines in the total combined aggregate do not meet the requirement for the specified Asphaltic Concrete Mix, extra manufactured fines shall be produced by screening the pitrun material so that the screened material contains no more than 5% material passing a 5,000 µm sieve. This screened material shall then be crushed so that 100% passes the 10,000 µm sieve and a minimum of 95% passes the 5,000 µm sieve. All material produced by this crushing process shall be placed in a separate stockpile and designated as manufacturedfines.

- .3 Moisture Content: As specified in specific sections.

2.3 Ice Control

During icy conditions, the following materials shall be applied to the road surface as ice control measures.

.1 Sand

- .1 Sample - A sample of the material shall be provided up on request and shall be approved by the Municipality prior to the commencement of operations. The sample shall be sufficient to allow for inspection testing.
- .2 Moisture Content - The moisture content shall be low enough to ensure that material will not freeze in the stockpile.
- .3 Washing - Normally a washing process is required to reduce the minus 80 µm sieve sand material and crusher dust.
- .4 Sieve Analysis - Results of the material crushed must be provided prior to the material being delivered to the Municipality. The Municipality may, at its discretion, sample the material to ensure it meets the gradation requirements below.

.2 Sodium Chloride (Salt)

- .1 Chemical Composition
 - .1 Sodium chloride - Minimum 95%
 - .2 Soluble chloride - Minimum 98%
- .2 Salt shall be dry and free flowing, and moisture content shall not exceed 1% on delivery.
- .3 Unloading of salt into storage structure shall be performed using conveyor.
- .4 Delivery of salt shall be within 3 working days of order.

.3 Gradation Requirements

- .1 The ice control materials shall meet the following gradation requirements:

SIEVE SIZE PERCENT PASSING METRIC SIEVE (CGSB 8-GP2mm)	ICE CONTROL MATERIAL	
	SAND	SALT
10 000	100	100
5 000	45 - 85	67 - 100
2 500		40 - 85
1 250	20 - 45	
630		15 - 45
315	9 - 22	
160	8 - 14	
80	0 - 8	0 - 3

3. EXECUTION

3.1 Processing

- .1 Process aggregate uniformly using methods that prevent contamination, segregation, and degradation.
- .2 Split and combine aggregates if required to obtain gradation requirements specified. Use approved methods and equipment. Do not blend in stockpiles.
- .3 Blending to increase percentage of crushed particles or decrease percentage of flat and elongated particles is permitted.

Wash aggregates, if required to meet specifications. Use only equipment approved by Engineer.

3.2 Handling

- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.3 Stockpiling

- .1 Stockpile aggregates on site in locations indicated or designated. Do not stockpile on completed pavement surfaces where damage to pavement may result.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules.
- .3 Stockpiling sites shall be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials.
- .4 Except where stockpiled on acceptably stabilized areas, provide a compacted sand base not less than 300 mm in depth to prevent contamination of the aggregate or, if permitted, stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.
- .5 Separate aggregates by substantial dividers or stockpile far enough apart to prevent intermixing.
- .6 Reject intermixed or contaminated materials. Remove and dispose of rejected materials as directed within 48 hours of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Max 1 m for coarse aggregate and base course materials.
 - .2 Max 2 m for fine aggregate and subbase materials.
 - .3 Max 1.5 m for other materials.
- .8 Complete each layer over entire stockpile area before beginning next layer.
- .9 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .10 Coning of piles or spilling of material over edges of pile will not be permitted. Stacking conveyors will not be permitted for stockpiling road base and graded seal coat aggregates.
- .11 During winter operations prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.4 Stockpile Cleanup

- .1 Leave stockpile site in a tidy, well drained condition, free of standing surface water.
- .2 Remove any unused aggregates as directed.

SECTION 31.05 16 – TABLE A

AGGREGATE GRADATION SPECIFICATIONS

AGGREGATE DESIGNATIONS

Designation	Designation 1 Trench Bedding	Designation 2 Sands & Gravels	Designation 3 Sub Base	Designation 4 Base Course	Designation 5 Surfacing Gravel	Designation 6 Asphaltic Concrete Pavement-Aggregate
Designation 1: Trench Bedding Material	e. 10 mm Crushed Gravel					
a. Native Fill Sand	Designation 3: Subbase Aggregate / Gravel Fill 1					
b. Clean Fill Sand	a. 150 mm Subbase Gravel					
c. 20 mm Screened Rock (Granular Bedding B1)	Designation 4: Base Course Aggregate					
Designation 2: Sanding & Gravel Materials	a. 40 mm Crushed ²					
a. 2 mm Masonry Sand	b. 25 mm Crushed ³					
b. 5 mm Playground Sand	c. 20 mm Crushed ³					
c. 5 mm Crushed Gravel	Designation 5: Surfacing Gravel					
d. 7.5 mm Crushed Gravel	a. 25 mm Crushed					

Designation	Designation 1 Trench Bedding			Designation 2 Sands & Gravels			Designation 3 Sub Base			Designation 4 Base Course			Designation 5 Surfacing Gravel			Designation 6 Asphaltic Concrete Pavement-Aggregate		
	a.	b.	c.	a.	b.	c.	d.	e.	a.1	a.2,6	b.3,6	c.3,6	a.4,6	b.5,6	a.6	b.6,7	c.6,7,8	d.6,7,8
150 000	Native Sand	Clean Sand	20mm	2mm	5mm	5mm	7.5mm	10mm	150mm	40mm	25mm	20mm	25mm	20mm	10	12.5	16	20
125 000									100									
80 000									90-100									
50 000									55-100									
40 000										100								
25 000			100						38-90	70-94	100		100					
20 000			95-100								82-97	100		100				100
16 000											55-85	70-94	84-94					97-100
12 500																		97-100
10 000			5-10					100		44-74	52-79	63-86	30-77	35-77	97-100	83-92	70-84	56-84
7 500							100											
5 000	100	100	0-5		100	100	65-85	45-70	20-65	32-62	35-64	40-67	15-55	15-55	60-75	55-70	50-65	35-64
2 500		70-95		100	95-100		5-20											21-49
1 250	66-100			85-100	60-100	45-70		20-45		17-43	18-43	20-43	0-30	0-30	26-50	26-45	26-45	11-34
630	52-100			50-90	35-80	20-45	0-8			12-34	12-34	14-34			18-38	18-38	18-38	8-30
315	35-78	30-65		25-60	15-50	9-22	0-5	9-22	6-30	8-26	8-26	9-26			12-30	12-30	12-30	5-21
160	18-43	10-25		12-30		5-15		5-15		5-18	5-18	5-18			8-20	8-20	8-20	3-13
80	7-13	2-10		10-15	2-15	0-10	0-4	0-10	2-15	2-10	2-10	2-10	0-12	0-12	4-10	4-10	4-10	2-8

1 No fracture faces requirement. The material passing the 315 sieve shall have a plasticity index below 6%.

2 The material passing the 315 sieve shall have a plasticity index below 6% and a liquid limit below 25. A minimum of 50% of the material retained on the 5000 sieve shall have two fractured faces.

L.A. Abrasion loss max percentage to be 50%.

3 The material passing the 315 sieve shall have a plasticity index below 6% and a liquid limit below 25. A minimum of 60% of the material retained on the 5000 sieve shall have two fractured faces.

L.A. Abrasion loss max percentage to be 50%.

4 Fracture Count by % weight shall be a minimum of 25%. The material passing the 315 sieve will have a plasticity index below 8% and a Liquid Limit below 25.

5 Fracture Count by % weight shall be a minimum of 40%. The material passing the 315 sieve will have a plasticity index below 8% and a Liquid Limit below 25.

6 For crushed aggregates, a tolerance of 3% in the amount passing the maximum size sieve will be permitted provided that all oversize material passes the next larger standard sieve size.

7 The minimum allowable percentage of crushed fragments having two or more fractured faces shall be 70% by weight. A minimum of 70% of material passing the 5 000 sieve shall be manufactured fines from crushed rock.

8 The minimum allowable percentage of crushed fragments having two or more fractured faces shall be 80% by weight. A minimum of 80% of material passing the 5 000 sieve shall be manufactured fines from crushed rock.

1. GENERAL

This Section specifies requirements for shaping and compacting the road subgrade to the required grade, cross section, density and typical cross sections indicated or as established by the Engineer.

1.1 Related Work

.1	Special Procedures for Traffic Control	Section 01 35 00.06
.2	Health and Safety Requirements	Section 01 35 29.06
.3	Environmental Procedures	Section 01 35 43
.4	Regulatory Requirements	Section 01 41 00
.5	Quality Control	Section 01 45 00
.6	Hauling and Haul Roads	Section 01 53 40
.7	Basic Concrete Materials and Test Methods	Section 03 05 00
.8	Aggregate Materials	Section 31 05 16
.9	Site Grading	Section 31 22 13
.10	Roadway Embankments	Section 31 24 13
.11	Soil Insulation	Section 31 32 41
.12	Tree and Shrub Preservation	Section 32 01 90.33

1.2 Measurement Procedures

- .1 Reshaping the road subgrade will be measured in square metres of roadway subgrade reshaped.
- .2 Subgrade preparation for concrete works will not be measured.
- .3 Additional subgrade materials will be measured under Section 31 24 13 Roadway Embankments.

1.3 Definitions

- .1 Reshaping road subgrade: re-contouring, pulverizing, blading, moisture conditioning, reshaping, and compacting existing subgrade surface material.

2. PRODUCTS

2.1 Not Used

- .1 Not Used.

3. EXECUTION

3.1 Scarifying and Reshaping

- .1 Ensure the road subgrade is free of all undesirable materials.
 - .1 Remove all organics and deleterious materials
 - .2 Remove all silt pockets
 - .3 Remove all existing structures (i.e. old pavements, culverts, etc.)
- .2 Excavate down to 150 mm below final road subgrade.

- .3 Pulverize and break down scarified material to 20 mm maximum soil clod size, except that stones larger than this size may be left intact as directed by the Engineer.
- .4 Blade and trim pulverized material to elevation and cross section dimensions as indicated or as directed by the Engineer.
- .5 Where deficiency of material exists, add and blend additional road Subgrade material as directed by the Engineer. Ensure all imported materials have been approved by the Engineer.
- .6 Place imported material in lifts not exceeding 150 mm in thickness and compact all fill and subgrade areas to 98% S.P.D, in accordance with ASTM D 698.
- .7 Reuse excess waste material in areas of material deficiency only when approved by the Engineer.
- .8 In areas of weaker road subgrades, ground improvement techniques may be required. Ground improvement plans and processes will need to be submitted and approved by the Engineer. Proven soil improvement techniques may include but are not limited to Lime Stabilization, Cement Stabilization, Geosynthetic reinforcement, sub excavation and replacement with low plastic clay or granular material.

3.2 Compacting

- .1 Road subgrade material may include select native material or granular material. All materials must be approved by the Engineer. Road subgrade material must be placed and compacted to 98% S.P.D, in accordance with ASTM D 698.
- .2 Road subgrade material shall be moisture conditioned to within +/- 2% of optimum.
- .3 Shape and roll material to obtain a smooth, even, and uniformly compacted subgrade surface.
- .4 Apply water as necessary during compaction to obtain specified density and required moisture content.
- .5 If material is excessively moist, aerate with suitable equipment until moisture content is reduced to optimum value for compaction in accordance with ASTM D698.

3.3 Site Tolerances

- .1 Reshaped compacted surface to be within plus or minus 15 mm of elevation as indicated.

3.4 Proof Rolling

- .1 When directly instructed by Engineer the Contractor will proof roll the road subgrade at no cost using a double-axle dual wheeled fully loaded gravel or water truck with the tires inflated to a minimum of 750 kPa (100 psi). The Engineer may authorize use of other acceptable proof rolling equipment. The Contractor will proof roll road subgrade at the level directed by the Engineer

and ensure that all areas of prepared road subgrade are covered. Where proof rolling reveals areas of defective subgrade, the Contractor shall remove and replace as per requirements of this section at no extra cost.

3.5 Protection

- .1 Maintain reshaped road subgrade surface in the condition conforming to this Section until succeeding material is applied or until accepted by the Engineer.
- .2 Restrict traffic in order to protect the final prepared road subgrade and seal the final surface with a smooth drum roller. Ensure all surface water is drained away from the road subgrade and any pooled water is either ditched or pumped into catch basins or storm water drainage ditches.
- .3 Once the road subgrade is approved, protect and cover with the roadway structure, sub-base or base gravels, as soon as possible.

3.6 Traffic Provisions

- .1 Provide and maintain roadways, walkways, and detours, for vehicular and pedestrian traffic as indicated in a traffic plan.
- .2 A traffic plan must be provided to the Engineer for review and acceptance before traffic management changes are enacted. The traffic plan must indicate traffic management details including schedule for implementation and removal.
- .3 Access to private properties shall be maintained at all times unless agreed by the Engineer in conjunction with the owner/occupants of the property. Limitations of access shall be in accordance with the schedule agreed to in the Traffic Plan.

1. GENERAL

This Section specifies requirements for road excavation, road drainage excavation, borrow excavation, embankment construction, and disposal of material in accordance with specification and conforming to lines, grades, dimensions, and typical cross sections shown on plans or established by Engineer.

1.1 Related Work

.1	Special Procedures for Traffic Control	Section 01 35 00.06
.2	Health and Safety Requirements	Section 01 35 29.06
.3	Environmental Procedures	Section 01 35 43
.4	Regulatory Requirements	Section 01 41 00
.5	Quality Control	Section 01 45 00
.6	Hauling and Haul Roads	Section 01 53 40
.7	Site Demolition	Section 02 41 13
.8	Basic Concrete Materials and Test Methods	Section 03 05 00
.9	Aggregate Materials	Section 31 05 16
.10	Clearing and Grubbing	Section 31 11 00
.11	Site Grading	Section 31 22 13
.12	Geotextiles	Section 31 24 13
.13	Soil Insulation	Section 31 32 41
.14	Tree and Shrub Preservation	Section 32 01 90.33
.15	Manholes and Catchbasins	Section 33 05 13
.16	Storm Sewer Mains	Section 33 41 13
.17	Catchbasin Leads	Section 33 41 13.01
.18	Storm Service Connections	Section 33 41 16.02
.19	Pipe Culverts	Section 33 42 13
.20	Sub-Drainage	Section 33 46 16

1.2 Definitions

- .1 **Topsoil Stripping:** Excavation and stockpiling of material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and seeding.
- .2 **Common Excavation:** Excavation, placement, and compaction in embankments of all on-site material whatever nature, which are not included under the definition of topsoil stripping, waste excavation, borrow excavation or rock excavation, including dense tills, hardpan, frozen materials, and partially cemented materials which can be ripped and excavated with a Group 12 Dozer/Ripper or smaller included in the Alberta Roadbuilders & Heavy Construction Association (ARHCA) Equipment Rental Guide.
- .3 **Waste Excavation:** Excavation and removal from site or disposed on-site as designated by the Engineer of any material unsuitable for use in work or surplus to requirements.

- .4 Borrow Excavation: Excavation, delivery to site, placement and compaction of suitable material obtained off-site and used in embankment. Borrow material must be approved by the Engineer. Where required by the Engineer, certificates and testing shall be required to demonstrate that the materials used meet the design specification and are free from physical, chemical or other contamination.
- .5 Rock Excavation: Rock excavation shall be paid for when the material encountered consists of mass or bedrock or a boulder of volume greater than 0.75 cubic meters. Such rock excavation is divided into two categories; (A) and (B), contingent upon its hardness and difficulty experienced in excavation. It shall be the Contractor's responsibility to demonstrate, to the Engineer's satisfaction that the material cannot be removed or that difficulty is being experienced through excavation by conventional means. In doing so, the Contractor may be required by the Engineer to seek and explore planes of weakness or layers that may ease the excavation process. Frozen material is not classified as rock.
- .1 Type 'A' Rock
- Type 'A' Rock refers to materials, such as fractured sandstone, shale or ledge rock, which can be removed by a backhoe for the depth of excavation. For open excavation, it refers to materials, which, in the opinion of the Engineer, result in:
- Substantial delay or decrease in the normal rate of excavation using conventional equipment.
 - Significant damage or wear to the excavating equipment.
- .2 Type 'B' Rock
- Type 'B' Rock requires drilling, blasting, wedging or jackhammering to remove, as determined by the Engineer.
- .6 Transition Material: Refers to the windblown (Aeolian – loose) layer of material encountered between the bottom of topsoil and top of common material. Transition material to be treated as waste excavation.
- .7 Embankment: Material derived from usable excavation and placed above original ground or in stripped or undercut areas up to subgrade level.
- .8 Pavement Structure: Combination of layers of unbound or stabilized granular subbase, base, and asphalt or concrete surfacing.
- .9 Subgrade Elevation: Elevation immediately below pavement structure.
- .10 Subgrade Preparation: Shaping, scarifying, conditioning, blading, and compacting of subgrade.

1.3 Requirements of Regulatory Agencies

- .1 All work performed shall conform to the requirements all applicable Municipal, Provincial and Federal legislation, codes and guidelines including but not limited

to: Occupational Health and Safety Act, Water Act, Migratory Birds Act and Fisheries act.

- .2 No explosives of any kind shall be used without written authorization from the Engineer. If such authorization is obtained, the Contractor shall comply with the Explosives Safety Regulations under the Occupational Health and Safety Act and all other relevant.

1.4 Traffic Provisions

- .1 Provide and maintain roadways, walkways, and detours, for vehicular and pedestrian traffic as indicated in a traffic plan.
- .2 A traffic plan must be provided to the Engineer for review and acceptance before management changes are enacted. The traffic plan must indicate traffic management details including schedule for implementation and removal.
- .3 Access to private properties shall be maintained at all times unless agreed by the Engineer in conjunction with the owner/occupants of the property. Limitations of access shall be in removed in accordance with the schedule in the Traffic Plan.

1.5 Protection

1.5.1 Existing Surface Features

- .1 Protect existing buildings, trees and other plants, lawns, fencing, service poles, wires, or paving located within Right of Way or adjoining properties from damage while work is in progress. Repair to Engineer's satisfaction any damage, which may occur.
- .2 Preserve all survey monuments and property marks along and adjacent the roadway. Use suitable precautions to protect from damage or disturbance until location has been witnessed or otherwise referenced; do not remove until directed.

1.5.2 Trees and Shrubs

- .1 Where excavation necessitates root or branch cutting do so only under direct control of the Engineer.
- .2 Protect existing trees and shrubs in accordance with Section 32 01 90.33.

1.6 Safety Requirements

- .1 Adhere to Municipal and Provincial requirements relating to safety of trenching work, including shoring and bracing as required.
- .2 Adhere to all crossing permit (railway, pipeline, telecommunications duct, etc.) requirements.
- .3 Provide barricades, flares, etc. to adequately denote area of excavation adjacent to roadways in accordance with the Traffic Accommodation Plan.

1.7 Measurement Procedures

- .1 Excavated materials to be measured and paid for in square meters or cubic meters as specified in the Tender Form Unit Price Schedule Items for in-situ material excavation. Asphalt pavement shall be considered as common excavation to waste disposal with no additional payment to the Contractor. The road area excavation extending from lip of gutter to lip of gutter shall be determined by survey cross section of in-situ material at minimum 15-meter intervals as compared to design subgrade elevations using average end area method for volume calculation.
- .2 Topsoil stripping shall be measured and paid for as specified; either in square meters or cubic meters for removal and replacement of topsoil. The excavated volume or area shall be considered for payment.
- .3 Unit price bid shall be full compensation for all work necessary for excavating the specified material and execution as described in Clause 3 - Execution of this Section.
- .4 Volume excavated from solid rock masses to be calculated from cross sections of original rock surface and design grade line for excavation. Excavated boulders and rock fragments to be measured by Engineer and volume to be determined from three maximum mutually perpendicular dimensions.
- .5 Subgrade preparation to be measured in square metres for the area of subgrade prepared beneath pavement.
- .6 Removal of unsuitable subgrade material and replacement with backfill approved by the Engineer to be measured in cubic metres for the volume of material removed and the volume of approved backfill material supplied and placed as described in Clause 3 Execution of this Section.
- .7 No measurement to be made for:
 - .1 Unnecessary excavation beyond lines established.
 - .2 Fillets and overbuild roads and ramps required for site access or other operations required to construct the design.
 - .3 Extra handling of windrowed materials blended on embankment slopes.
 - .4 Moisture adjustment of material.
 - .5 Construction, maintenance, and restoration of haul routes.
 - .6 Subgrade preparation where unsuitable subgrade is removed and replaced with granular material.
 - .7 Subgrade preparation in areas having fills greater than 150 mm.
 - .8 Overhaul.

2. PRODUCTS

2.1 Materials

2.1.1 Embankment Material

Embankment materials to be approved by the Engineer. Unsuitable material shall comprise any material so designated by the Engineer and shall include:

- .1 Cohesive soils having a liquid limit in excess of 90 per cent or

- plasticity index in excess of 65 per cent.
- .2 Any material containing topsoil, wood, peat, muskeg or lignite.
- .3 Any material containing biodegradables.
- .4 Any material containing scrap metal.
- .5 Frozen or waterlogged substances.
- .6 Any material that by virtue of its particle shape or size cannot be properly and effectively compacted.

2.1.2 Subgrade Replacement Material

- .1 Subgrade replacement materials shall consist of the following:
 - .1 150 mm pitrun gravel. Designation 3, Table A, Section 31 05 16.
 - .2 Other material approved by the Engineer - gradation to be in accordance with Section 31 05 16, Aggregate Materials, Table A.

Material to be used as specified by the Engineer, or as shown on the Drawings.

3. EXECUTION

3.1 Compaction Equipment

- .1 Compaction equipment must be capable of obtaining required densities for materials on project. Equipment that does not achieve specified densities must be replaced or lift thicknesses adjusted to accommodate the required compactive effort. In no case will the lifts exceed 150 mm in compacted thickness, unless approved by the Engineer.
- .2 Sheepsfoot packers will be required on cohesive soils and smooth drum packers will be required on non-cohesive soils. Smooth drum packers will be required to seal final subgrades to protect them from moisture penetration.

3.2 Water Distributors

- .1 Apply water with equipment capable of uniform distribution and in a manner acceptable to Engineer.

3.3 Excavating

- .1 Advise Engineer minimum of 5 work days in advance of excavation operations for initial cross sections to be taken.
- .2 Maintain crowns, cross slopes, pumps, or ditches to keep excavations free of running or standing water.

3.4 Topsoil Stripping

- .1 Strip topsoil from areas and to depths indicated or directed prior to beginning of excavation and embankment work. Avoid contamination of topsoil and underlying soil.
- .2 Topsoil excavated to be stockpiled in a location as directed by Engineer.
- .3 Refer to Section 31 22 13 Site Grading and Section 32 91 19 13 Topsoil for further requirements regarding Topsoil including (but not limited to): inspection, screening and acceptability.

3.5 Rock Excavation

- .1 If during excavation, material appearing to conform to classification for rock is encountered, notify Engineer in sufficient time to enable measurements to be made to determine volume of rock.
- .2 Remove rock to 300 mm below subgrade elevation indicated.
- .3 Provide effective drainage to ditches, leaving no undrained pockets in foundation.
- .4 Scale down rock slopes and remove rock fragments, which are liable to slide or roll down slopes.

3.6 Common Excavation

- .1 Material designated as common excavation to be excavated, hauled, and compacted in designated fill areas on site or hauled to waste disposal area as specified. Asphalt materials to be disposed of by Contractor unless otherwise indicated for stockpile.

3.7 Waste Excavation

- .1 Notify the Engineer whenever unsuitable materials are encountered in cut or embankment sections and remove unsuitable materials to depth and extent directed.
2. Dispose of waste excavation at designated waste site. If no waste site is designated dispose of material off-site in an area located by Contractor and approved by Engineer. Costs associated with disposal to be included in unit rate for waste excavation.

3.8 Borrow Excavation

- .1 Use all suitable materials removed from excavations in embankments before taking material from borrow areas.
- .2 Suitable embankment material is to be obtain from borrow areas indicated on the design plans and drawings.
 - .1 Engineer to designate location and extent of borrow areas, and allowable depth of cutting unless indicated otherwise in the Unit Rates and Special Provisions.
 - .2 Recontour of borrow areas on slopes of 4:1 and provide drainage as directed.

- .3 Trim and leave borrow pits in a condition to permit accurate measurement of material removed.

3.9 Unsuitable Subgrade

- .1 Notify the Engineer when unsuitable materials are encountered at design subgrade elevation. Excavate and dispose of unsuitable material and replace with imported compacted approved material.
- .2 Following the excavation of the subgrade, should the subgrade remain unsuitable, geotextile may be installed at direction of the Engineer.

3.10 Side Ditches

- .1 Construct side ditches to depths and widths indicated or directed, to permit ready flow of surface and storm water.
- .2 Maintain and keep ditches open and free from debris until final acceptance of work.

3.11 Embankments

- .1 When directed, scarify, or bench existing slopes in side hill or sloping sections to ensure a proper bond between new materials and existing surfaces. Obtain prior approval of method to be used.
- .2 Ensure the stripping depth of topsoil and transition material has been approved by the Engineer prior to placement of embankment material.
- .3 Do not place material which is frozen, or place material on frozen surfaces.
- .4 Maintain a crowned and sealed surface during construction to ensure ready run-off of surface water.
- .5 After a period of wet weather, remove or scarify, dry, and recompact embankment materials softened by moisture.
- .6 Wetting or drying of fill material shall be carried out such that in-place fill has a moisture content of optimum plus or minus 2%.
- .7 With material containing less than 25% by volume of stone or rock fragments larger than 100 mm:
 - .1 Place and compact to full width in uniform layers not exceeding 150 mm in compacted thickness.
 - .2 Compact each layer to a minimum density of 98%
- .8 Construct and compact embankments to an elevation at least 50 mm above design elevations and cut back to design elevations.
- .9 Fill for landscape areas shall be scarified with a multi-tine wing tipped ripper capable of loosening consolidated common fill material to a minimum depth of 600mm.

3.12 Road Subgrade Preparation

- .1 Once excavated down to/built up to the desired elevations (lines and grade) ensure that the subgrade is approved by the Engineer.

- .2 All road subgrade material must be placed and compacted to 98% S.P.D, in accordance with ASTM D 698.
- .3 Wetting or drying of the subgrade and approved fill material shall be carried out such that a moisture content of optimum plus or minus 2%.
- .4 Windrowed material shall then be replaced and compacted to 98% S.P.D, in accordance with ASTM D 698 and to within 2% of the optimum moisture content.
- .5 Prepared areas should be compacted to a level slightly above the final subgrade elevation then cut back to final grade.
- .6 Finished surface shall conform to lines, grades, and cross sections indicated on Drawings, within a tolerance of +/- 15 mm.

3.13 Proof Rolling

- .1 When directly instructed by Engineer the Contractor will proof roll the subgrade at no cost using a double axle dual wheeled truck (fully loaded with gravel or water) with the tires inflated to a minimum of 750 kPa (100 psi). The Engineer may authorize the use of other acceptable proof rolling equipment. The Contractor will proof roll subgrade at the level directed by the Engineer and ensure that all areas of prepared subgrade are covered. Where proof rolling reveals areas of defective subgrade, the Contractor shall remove and replace as per requirements of this section at no extra cost.
- .2 Proof roll at level in subgrade indicated. If alternative proof rolling equipment is authorized, the Engineer will determine level of proof rolling.
- .3 Make sufficient passes with proof the vehicle to ensure the surface is subjected to a tire load within 1,000mm of any point.
- .4 Where proof rolling reveals areas of defective subgrade, the Engineer shall determine limits of unsuitable subgrade excavation and shall specify replacement material.

3.14 Maintenance

- .1 Maintain finished surfaces in a condition in accordance with this Section until acceptance by the Engineer.
- .2 Do not permit vehicular traffic over the final subgrade.
- .3 Maintain protection of prepared subgrade until subsequent granular sub-base or base course is placed. Repair and retest as required by the Engineer if damaged.

1. GENERAL

This Section specifies requirements for supply and installation of non-woven synthetic geotextile material to be used for separation membranes for rip-rap or hydraulic filters for drainage systems.

1.1 Related Work

.1	Roadway Embankments	Section 31 24 13
.2	Rock Rip-Rap	Section 31 37 00
.3	Gabions	Section 31 36 00
.4	Sub-Drainage	Section 33 46 16

1.2 Mill Certificates

- .1 At least one week prior to start of Work, furnish the Engineer with copies of mill test data and a certificate that geotextile material delivered to the job site meets the requirements of this Section.

1.3 Approval

- .1 Obtain written approval of Engineer for geotextile material before installation of material in the Work.

1.4 Measurement Procedures

- .1 Geotextiles will be measured in square metres of subgrade covered when used as a separation membrane. No extra payment will be made for material overlap.
- .2 No measurement when geotextile material is used as a hydraulic filter. Supply and installation of geotextile material as a hydraulic filter is considered incidental to the work required in Section 33 46 16 Sub- Drainage.

2. PRODUCTS

2.1 Material

- .1 Synthetic fibre: Rot-proof, unaffected by action of oil or salt water and not subject to attack by insects or rodents.
- .2 Fabric: Woven construction supplied in rolls of minimum 3.0 m width, 50 m lengths.
- .3 Seams: Welded or sewn in accordance with manufacturer's recommendations.
- .4 Physical Properties (or equivalent to geotextile as specified by the Engineer):
 - .1 Grab Tensile Strength and elongation to ASTM D4632.
 - .1 Grab Tensile Strength - 1400 N
 - .2 Grab Elongation: 12%
 - .2 Mullen burst strength – 4,100 kPa.
 - .3 Flow Rate – 163 L/min./m²
 - .4 Equivalent opening size (EOS) - ASTM sieve size 0.425mm.

3. EXECUTION

3.1 Installation

- .1 Place material by unrolling on to graded surface, stretch taut and retain in position.
- .2 Protect fabric from displacement or damage until and during placement of overlaid material layers.
- .3 Place fabric on sloping surfaces in one continuous length from toe of slope to upper extent of fabric. For swales straddle the centerline with initial placement.
- .4 Overlap each successive strip of fabric 500mm over previously laid strip or as otherwise requested by Engineer. Overlap transverse joints 1,000mm.
- .5 Join successive strips of geotextile as recommended by manufacturer.
- .6 Protect geotextile material from displacement and damage during placement of granular sub-base and/or granular base material.
- .7 After installation, cover with granular material immediately.
- .8 Remove and replace damaged or deteriorated fabric as directed by Engineer.

3.2 Protection

- .1 Do not permit passage of any vehicle directly on filter fabric at any time.

1. GENERAL

This Section specifies requirements for supplying and installing soil insulation.

1.1 Related Work

- | | | |
|----|---------------------------------------|---------------------|
| .1 | Excavating, Trenching and Backfilling | Section 31 23 33.01 |
| .2 | Roadway Embankments | Section 31 24 13 |

1.2 Delivery and Storage

- .1 During delivery and storage, protect insulation from direct sunlight, physical damage, and incompatible chemicals (solvents, petroleum products, etc.). On the job site, cover temporarily stored insulation with a light coloured tarpaulin. Insulation must not be exposed to flame or another ignition source.

1.3 Measurement Procedures

- .1 Utility Main Insulation
Soil insulation will be measured in lineal metres of material installed for the width and thickness specified, either horizontally or an inverted U. No additional payment will be made for additional sand bedding, trench width and/or depth required to install soil insulation. Where specified payment to be made on a lump sum basis.
Roadway Insulation
Soil insulation will be measured in square metres of material installed for the thickness specified.

2. PRODUCTS

Styrofoam HI-40 as manufactured by Dow Chemical Canada Inc., or approved equal.

3. EXECUTION

3.1 Utility Main Insulation

- .1 Complete trench excavation in accordance with Section 31 23 33.01. Increase trench width to accommodate required insulation width and/or depth.
- .2 Install pipeline and bedding material as specified in Section 31 23 33.01.
- .3 Install soil insulation in accordance with manufacturer's instructions and utilize additional sand bedding.
- .4 Backfill and compact trench in accordance with Section 31 23 33.01.

3.2 Roadway Insulation

- .1 Complete roadway excavation and subgrade preparation in accordance with Section 31 24 13.

- .2 Place soil insulation as shown on the Drawings. To prevent wind blow-off, pin in place with wooden skewers or weigh down with granular material.
- .3 Place and compact first lift of granular material carefully to prevent damage or displacement.
- .4 Place subsequent lifts of granular material and asphalt as specified.

3.3 Protection

- .1 Do not permit passage of any vehicle directly on soil insulation at any time.

1. GENERAL

This Section specifies requirements for preserving and protecting trees and shrubs adjacent to excavations within the Municipal Property.

1.1 Related Work

.1	Clearing and Grubbing	Section 31 11 00
.2	Site Grading	Section 31 22 13
.3	Excavating, Trenching and Backfilling	Section 31 23 33.01
.4	Roadway Embankment	Section 31 24 13
.5	Topsoil Placement and Grading	Section 32 91 19.13

1.2 Scheduling

- .1 Obtain approval from the Engineer of schedule indicating commencement of work.

1.3 Measurement Procedures

- .1 No measurement will be made under this Section.

1.4 Notification

- .1 The Contractor shall advise the Municipalities Parks Operations Department with 48 hours prior to any work proceeding within 6m of the tree or 2m of a shrub. Contractors are prohibited from cutting, pruning or damaging a Municipality owned tree prior to obtaining consent.

2. PRODUCTS

2.1 Materials

- .1 Fill: excavated, pervious soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc.). Excavated material shall be approved by the Engineer before use as fill.
- .2 Coarse washed stones: 35 mm to 75 mm diameter clear round hardstone.
- .3 Do not use materials which will affect pH levels of soil.
- .4 Drain tile: 100 mm diameter corrugated plastic perforated tubing complete with snap couplings to CGSB 41-GP-31M.
- .5 Peat moss:
 - i. Derived from partially decomposed species of Sphagnum Mosses. Only course classed peat moss may be used.
 - ii. Elastic and homogeneous.
 - iii. Free of wood and deleterious material which could prohibit growth.

- iv. Shredded minimum particle size: 5 mm.
 - v. pH between 5.6 and 7.0.
 - vi. Moisture content: maximum 35%.
- .6 Fertilizer:
- i. To Canada Fertilizer Act and Fertilizer Regulations.
 - ii. Complete, commercial, slow release 1:5:1 content in water insoluble form.
- .7 Anti-desiccant: commercial, wax-like emulsion.
- .8 Filter Cloth:
- i. Type 1: 100% non-woven needle punched polyester, 2.75 mm thick, 240 g/m² mass.
 - ii. Type 2: biodegradable burlap.
- .9 Welded wire fabric (WWF): 100 mm x 100 mm x 3.76 mm to CSA C30.5.

3. EXECUTION

3.1 General

All Work shall be done in such a manner as to minimize the effect on trees and shrubs (including root systems). If, in the opinion of the Engineer, the Contractor has failed to minimize the effect on trees and shrubs, the cost of removing, repairing, and replacing them shall be borne by the Contractor.

3.2 Identification and Protection

- .1 Identify plants, limbs and branches and limits of root systems to be preserved to satisfaction of Engineer.
- .2 Protect plant and root systems from damage, compaction, and contamination resulting from construction to satisfaction of Engineer.
- .3 Minimize damage and trimming of branches. Ensure a clean cut with a sharp tool and apply anti-desiccant.
- .4 The Engineer is to determine the best method of tree and root protection, if applicable. i.e. retaining wall, fencing, transplanting.

3.3 Raising Grade Around Existing Trees

- .1 Use Clause 3.3 when raising grade around existing trees. Provide detail Drawings indicating layout and dimensioning.
- .2 Using manual methods, carefully remove turf, plants, leaves, and organic matter in area of root system and slightly loosen topsoil (45 mm) surface. Avoid damage to root system.
- .3 Lay horizontal system of perforated drainpipe on surface of existing grade. Slope drain tile minimum 3% for drainage away from trunk of tree. Connect system with general site drainage system or drain to low point on site.

- .4 Install plastic "vent" pipes vertically over joints in horizontal pipe system or where indicated. Top of vent pipe to be 20 mm above finished grade of fill. Keep top of vent pipe covered during construction.
- .5 Cover joints with Type 1 filter fabric and place coarse washed stone around joints and vertical pipes to secure their position.
- .6 Construct dry well around trunk of tree. Ensure open ends of horizontal pipe system/vertical vent pipes are left exposed for air circulation to root system. Protect openings from blockage during construction. Install protective caps on exposed horizontal openings.
- .7 Place 200 mm depth of coarse washed stone on surface of original ground and horizontal pipe system to limits.
- .8 Place Type 1 filter fabric over surface of granular layer.
- .9 Place Type A fill over filter fabric to required depth without disturbing or damaging drainpipe system. Avoid damage to filter fabric.
- .10 Complete topsoil and sodding/finished paving over area of sub-surface system within one week of placing fill.
- .11 Remove temporary protective covering from vent pipe openings. Install protective caps flush with finished grade.

3.4 Lowering Grade Around Existing Tree

- .1 Use where lowering of grades is anticipated within tree root zone. Schedule work at time appropriate for plant species.
- .2 Commence work in accordance with design and schedule approved by Engineer.
- .3 The Engineer reserves the right to monitor construction or required protection.
- .4 Cut slope not less than 600 mm per 25 mm trunk diameter from tree trunk to new grade level.
- .5 Excavate to depths as indicated. Protect from damage root zone which is to remain.
- .6 When severing roots at excavation level, cut roots with sharp tools.
- .7 Cultivate excavated surface manually to 15 mm depth.
- .8 Prepare homogeneous soil mixture consisting by volume of:
 - i. 50% excavated soil cleaned of roots, plant matter, stones, and debris.
 - ii. 25% coarse, clean, sterile sand.
 - iii. 15% organic matter.
 - iv. Grade 1:5:1 fertilizer at rate of 1.5 kg/m³.
- .9 Place soil mixture over area of excavation to finished grade level. In 150 mm lifts compact each layer to no more than flat foot weight to remove large air voids. Top up with homogeneous soil mixture to fill any voids.
- .10 Water entire root zone to optimum soil moisture level.
- .11 Install surface cover of seeding or sodding as specified in accordance with Sections 32 92 19.13, 32 92 19.16, or 32 92 23 respectively.

3.5 Anti-Desiccant

Apply anti-desiccant to foliage where applicable and as directed by Engineer.

3.6 Maintenance During Warranty Period

- .1 From time of acceptance by Engineer to end of warranty period, the following maintenance operations will be performed by the Municipality and the adjacent Land Owner.
 - i. Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - ii. Apply appropriate agents when required to control insects and disease.
 - iii. Apply fertilizer in early spring at rate of 0.025 kg of nitrogen/m² at manufacturer's suggested rate.
 - iv. Remove dead, broken or hazardous branches from plant material.

1. GENERAL

This Section specifies requirements for supplying, producing, placing, and compacting granular sub-base to lines, grades, and typical cross sections indicated on plans or as directed.

1.1 Definitions

- .1 Sub-base: Design depth of granular material constructed immediately on the prepared subgrade and prior to construction of base material. This layer does not form part of the pavement design. The material may be used as a subgrade replacement or as granular fill.

1.2 Related Work

- .1 Excavating, Trenching and Backfilling Section 31 23 33.01
- .2 Aggregate Materials Section 31 05 16
- .3 Granular Base Section 32 11 16.02

1.3 Measurement Procedures

- .1 Granular sub-base for road and concrete structures to be measured in cubic metres (m³) of compacted material incorporated into work in accordance with design.
- .2 Granular sub-base for trench backfill to be measured in tonnes (t.) as per certified supplier scale tickets.
- .3 Unit price bid shall be full compensation for all work involved in excavating and disposing of unsuitable subgrade materials, supplying granular sub-base and installing as described in Clause 3 - Execution of this Section.

2. PRODUCTS

2.1 Materials

- .1 Granular sub-base aggregate shall consist of the following: 75 mm pitrun gravel consistent with Designation 3, Sub-base but with 100% passing the 80,000 sieve or as specified in the Unit Price Schedule.
Specification to be in accordance with Section 31 05 16, Aggregate Materials.
Material to be used as specified by the Engineer, or as shown on the drawings.

2.2 Materials Testing Frequency

- .1 Granular base material testing shall include 1 sieve analysis per every 5000 m² per 0.3m depth or as material changes.

3. EXECUTION

3.1 Inspection of Existing Subgrade Surface

- .1 Do not place granular sub-base until finished subgrade is inspected.

3.2 Placing

- .1 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow or ice.
- .2 Where specified by Engineer, place geotextile in accordance with Section 31 32 19.01.
- .3 Begin spreading sub-base material on a crown line or high side of a one-way slope.
- .4 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .5 For spreading and shaping material, use spreader boxes having adjustable templates or screens which will place material in uniform layers of required thickness.
- .6 Place material in uniform layers not exceeding 300mm when compacted or to such other depth as instructed by the Engineer.
- .7 Shape each layer to a smooth contour and compact at optimum moisture plus or minus 2% before succeeding layer is placed.
- .8 Remove and replace portion of a layer in which material has become segregated during spreading.

3.3 Compacting

- .1 Compact to a uniform density and check density by proof rolling as detailed below and as approved by the Engineer.
- .2 Shape and roll alternately to obtain a smooth, even and uniformly compacted sub-base.
- .3 Apply water as necessary during compaction to obtain specified density. If sub-base 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 approved mechanical tampers.
- .5 Verify density by proof-rolling.

3.4 Finish Tolerances

- .1 Finish compacted surface to within ± 25 mm of established grade but not uniformly high or low.
- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 Proof Rolling

- .1 For proof rolling use a fully loaded tandem axle water or gravel truck with fully inflated tires.
- .2 Engineer may authorize use of other acceptable proof rolling equipment.
- .3 Proof roll at level in sub-base indicated by Engineer.
- .4 Make sufficient passes with proof roller to subject every point on surface to one pass of a loaded tire.

- .5 Where proof rolling reveals areas of defective subgrade or sub-base remove to depth and extent directed and replace with new materials to requirements of Section 31 24 13 and this Section at no extra cost to Owner.

3.6 Maintenance

- .1 Maintain finished sub-base in condition conforming to this Section until succeeding base is constructed, or until granular sub-base is accepted by Engineer.

1. GENERAL

This Section specifies requirements for supplying, producing, placing, and compacting crushed gravel a granular base to lines, grades, and typical cross sections indicated on plans or as directed.

1.1 Related Work

- | | | |
|----|---------------------------------------|---------------------|
| .1 | Excavating, Trenching and Backfilling | Section 31 23 33.01 |
| .2 | Aggregate Materials | Section 31 05 16 |
| .3 | Granular Sub-base | Section 32 11 16.01 |

1.2 Definitions

- .1 Base: Design depth of granular base constructed immediately on sub-base or subgrade and prior to asphaltic pavement.

1.3 Measurement Procedures

- .1 Granular base to be measured in square meters (m²) on top for the specified width and depth of the compacted material and incorporated into work in accordance with design.

2. PRODUCTS

2.1 Materials

- .1 Granular base aggregate to be 40mm or 25mm or 20mm crushed gravel. Gradation to be in accordance with Section 31 05 16, Aggregate Materials.
- .2 Liquid Limit: ASTM D423 (AASHTO T89), maximum 25.
- .3 Plasticity Index: ASTM D424 (AASHTO T90), maximum 6.
- .4 Los Angeles Abrasion: ASTM C131 (AASHTO T6), maximum 50% loss by weight.
- .5 Crushed fragments: at least 60% of fragments greater than 5000 μm to have at least two freshly fractured faces.

2.2 Materials Testing Frequency

- .1 Granular base material testing shall include sieve analyses and standard proctor density testing as follows:
- .1 Sieve analysis: 1 per every 5000 m² or as material changes.
 - .2 Standard Proctor Density Test: 1 per 1,000 m² or as material changes

3. EXECUTION

3.1 Inspection of Underlying Sub-base or Subgrade

- .1 Do not place granular base until finished sub-base or subgrade surface is inspected and accepted.

3.2 Placing

- .1 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.
- .2 Begin spreading base material on a crown line or on high side of a one-way slope.
- .3 Place using methods which do not lead to segregation or degradation of aggregate.
- .4 For spreading and shaping material, use spreader boxes having adjustable templates or screens which will place material in uniform layers of required thickness.
- .5 Place material in uniform layers not exceeding 200 mm when compacted or to such other depth as approved by Engineer.
- .6 Shape each layer to a smooth contour and compact to specified density at optimum moisture plus or minus 2% before succeeding layer is placed.
- .7 Remove and replace that portion of a layer in which material becomes segregated during spreading.

3.3 Compacting

- .1 Compact to a density not less than 98% of Standard Proctor.
- .2 Shape and roll alternately to obtain a smooth, even and uniformly compacted base.
- .3 Apply water as necessary during compacting 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 approved mechanical tampers.

3.4 Finish Tolerances

- .1 Finished base surface shall be within ± 10 mm of established grade but not uniformly high or low.
- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 Proof Rolling

- .1 If deemed necessary by the Engineer, perform proof rolling in lieu of Nuclear Densometer readings.
- .2 For proof rolling use a fully loaded tandem axle water or gravel truck with the tires fully inflated.

- .3 Engineer may authorize use of other acceptable proof rolling equipment.
- .4 Proof roll top of base upon completion of fine grading and compaction.
- .5 Make sufficient passes with proof roller to subject every point on each to so that all areas of the layer receive at least one separate pass of a loaded tire.
- .6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent directed and replace with new materials to requirements of Sections 31 24 13, 31 23 33.01, and this Section at no extra cost to Owner.

3.6 Maintenance

- .1 Maintain finished base in a condition conforming to this Section until succeeding material is applied or until acceptance by Engineer.

GENERAL

This Section specifies requirements for furnishing and applying asphalt to existing asphaltic concrete and portland concrete surfaces in accordance with these specifications.

1.1 Related Work

- | | | |
|----|---------------------------------------|---------------------|
| .1 | Plant-Mix Asphalt Paving | Section 32 12 16.13 |
| .2 | Asphaltic Concrete Overlay Paving | Section 32 12 50 |
| .3 | Pavement Cleaning and Marking Removal | Section 32 01 11.01 |

1.2 Samples

- .1 If requested, submit to Engineer one 4-litre container of asphalt material proposed for use in work, at least two weeks prior to commencing operations.

1.3 Measurement Procedure

- .1 Asphalt tack coat will not be measured. The unit bid tendered for the supply and installation of asphaltic pavement shall be full compensation for all work involved in supplying the tack coat and installing it as specified in Clause 3 - Execution of this Section.
- .2 Tack coat for asphalt overlays, skin patching, repairs, mating surfaces and levelling course shall be included with the asphalt installation.

2. PRODUCTS

2.1 Materials

- .1 Tack Coat
SS-1 for application through August 31 each season. The Contractor's choice of MC-70 or SS-1 for application after August 31 each season.
- .2 Fog Coat
SS-1 for application through August 31 each season. The Contractor's choice of MC-30 or SS-1 for application after August 31 each season.

3. EXECUTION

3.1 Asphalt Distribution

- .1 Provide distributor so designed, equipped, maintained, and operated that asphalt material at even heat may be applied uniformly on variable widths of surface up to 5 m at readily determined and controlled rates from 0.3 to 1.5 litres per square metre, with uniform pressure, and with an allowable variation from any specified rate not to exceed 0.1 litre per square metre.
- .2 Capable of distributing asphalt material in a uniform spray without atomization at rate specified and temperature required.

- .3 Pump to operate by a separate power unit independent of truck power unit.
- .4 Equipped with an easily read, accurate device which registers temperature of liquid in reservoir.
- .5 Equipped with accurate volume measuring devices or a calibrated tank.

3.2 Preparation

- .1 Clean surface as directed in Section 32 01 11.01.
- .2 Have surface approved by Engineer before applying tack coat.

3.3 Application

- .1 Heat asphalt material to temperature required for pumping and spraying without fogging according to following table:
 - .1 Medium Curing Asphalts
MC 30 30 to 45°C
 - .2 Slow Curing Asphalts
SS-1 or SS-1h 25 to 55°C
- .2 Apply asphalt material only when surface is dry or slightly damp. Do not apply when rain is forecast.
- .3 The Contractor shall apply Tack Coat to only that area that he can foresee covering within the following 72 hours. Tack Coat shall be maintained by the Contractor at his own expense including the cost of the required liquid asphalt.
- .4 Apply tack or fog coat material to existing pavement surface at a rate of 1.1 and 0.5 litres/m², respectively.
- .5 If SS-1 is used for fog coat, the material, as delivered by the supplier, shall be diluted by adding an amount of water to be determined by the Contractor.
- .6 Prevent overlap at junction of spreads.
- .7 Correct areas not sufficiently covered.
- .8 Traffic shall not be permitted to travel on the bituminous coat until it has cured. The Contractor shall use flagmen, if required, to control traffic until the coat has cured.
- .9 Take precautions to prevent curbs, gutters, traffic, or parked vehicles from being sprayed with asphalt.
- .10 The distributor shall be equipped with the following in proper working order:
 - .1 Tachometer.
 - .2 Pressure Gauge.
 - .3 Adjustable Spray Bar.
 - .4 Positive displacement asphalt pump with separate power unit.
 - .5 Heating Coils and Burner.
 - .6 Thermometer and Thermometer Well.

- .11 Prior to applying bituminous material, the Contractor shall ensure that the distributor is adjusted as follows:
 - .1 Rear chassis springs are blocked and chained on all units except semi-trailer types to prevent variations in spray bar height during unloading.
 - .2 All spray bar nozzles are the same type and size.
 - .3 All clogged nozzles have been cleaned.
 - .4 All nozzles are set at the same angle with the longitudinal axis of the spray bar.
 - .5 Spray bar is provided with a positive shut-off to prevent dribbling.
 - .6 The distributor is capable of maintaining a uniform speed.
- .12 The face of concrete surfaces that mate with asphaltic concrete pavement shall be appropriately coated.

1. GENERAL

This Section specifies requirements for furnishing and applying asphalt to an absorbent surface.

1.1 Related Work

- | | | |
|----|-----------------------------------|---------------------|
| .1 | Granular Base | Section 32 11 16.02 |
| .2 | Plant-Mix Asphalt Paving | Section 32 12 16.13 |
| .3 | Asphaltic Concrete Overlay Paving | Section 32 12 50 |

1.2 Samples

- .1 If requested, submit to Engineer one 4 litre container of asphalt material proposed for use in work, at least two weeks prior to commencing operations.

1.2 Measurement Procedure

- .1 Asphalt prime coat will not be measured. Unit bid tendered for the supply and installation of asphaltic pavement shall be full compensation for all work involved in supplying the prime coat and installing it as specified in Clause 3 - Execution of this Section.
- .2 Prime coat for asphalt base and surfacing course and repairs shall be included with the asphalt installation.

2. PRODUCTS

2.1 Materials

- .1 The Contractor's choice of SEP-1, SEP-2, or SS-1 for application through August 31 each season. The Contractor's choice of MC-30, SEP-1, SEP-2, or SS-1 for application after August 31 each season.
- .2 Sand used for the blotting of excess asphalt due to prime shall be supplied by the Contractor.

3. EXECUTION

3.1 Asphalt Distributor

- .1 Provide distributor so designed, equipped, maintained, and operated that asphalt material at even heat may be applied uniformly on variable widths of surface up to 5.6 m at readily determined and controlled rates from 0.3 to 2.0 litres per square meter, with uniform pressure, and with a n allowable variation from any specified rate not to exceed 0.1 litre per square meter.
- .2 Capable of distributing asphalt material in a uniform spray without atomization at rate specified and temperature required.
- .3 Pump to operate by a separate power unit independent of truck power unit.

- .4 Equipped with an easily read, accurate device which registers temperature of liquid in reservoir.
- .5 Equipped with accurate volume measuring devices or a calibrated tank.

3.2 Preparation

- .1 Shape surface to proper cross section.
- .2 Have surface approved by the Engineer before applying prime material.
- .3 The Engineer may authorize a light spraying of water to moisten an excessively dry and dusty surface to aid penetration of asphalt prime.
- .4 The application of Prime Coat to small areas of patching works to be applied at the Engineer's discretion.

3.3 Application

- .1 Heat asphalt material to temperatures required for pumping and spraying without fogging according to following table:
 - .1 Medium Curing Asphalts
MC 30 30 to 45°C
 - .2 Slow Curing Asphalts
SS-1 or SS-1h 25 to 55°C
- .2 Apply asphalt material to a damp gravel surface. Do not apply when rain is forecast.
- .3 Apply prime material to granular base at a rate of 1.1 to 1.5 litres/m².
- .4 Keep traffic off treated areas until liquid has cured, set or been absorbed.
- .5 Prevent overlap at junction of spreads.
- .6 Correct areas not sufficiently covered.
- .7 Take precautions to prevent curbs, gutters, traffic, or parked vehicles from being sprayed with asphalt.
- .8 The Contractor will be permitted to apply a prime coat to all completed granular base course. Any area of prime coat that has become fouled shall be cleaned before Asphalt Concrete Pavement is placed. Prime Coat shall be maintained by the Contractor at his own expense.
- .9 Traffic shall not be permitted to travel on uncured prime coat. After this period of time, excess asphalt material remaining on the surface shall be blotted by sand before traffic is permitted to travel on the surface. The "blotter sand" can be any clean sand meeting the Materials requirements.
- .10 The face of concrete surfaces that mate with asphaltic concrete pavement shall be appropriately coated.

3.4 Use of Sand Blotter

- .1 If prime material fails to penetrate within a reasonable time, spread sand blotter material in amounts required to absorb any excess asphalt material.
- .2 Sweep up and remove excess blotter material.

1. GENERAL

This Section specifies requirements for preparing existing road surface for overlay paving and completing overlay pavingwork.

1.1 Measurement Procedures

- .1 Concrete replacement to Section 32 16 15.
- .2 Adjustment of valve boxes and manholes will not be measured.
- .3 Milling of existing asphalt pavement to Section 32 01 16.13.
- .4 Pavement crack filling to Section 32 01 18.
- .5 Pavement surface cleaning to Section 32 01 11.01.
- .6 Tack coat to Section 32 12 13.16.
- .7 Asphaltic concrete levelling course, fillets and skin patching overlays to be measured in tonnes. All deliveries must be substantiated with "haul tickets" and signed by Engineer. Haul ticket to note project, date, quantity and location. Payment penalties to be in accordance with Section 32 12 16.13.
- .8 Pavement markings to Sections 32 17 23.13 and 32 17 23.23.
- .9 Asphaltic concrete overlay paving to be measured in tonnes or square meters as specified. Payment penalties to be in accordance with Section 32 12 16.13.

2. PRODUCTS

2.1 Materials

- .1 Hot-mix asphalt concrete pavement to Section 32 12 16.13, Table A.
- .2 Tack coat to Section 32 12 13.16.
- .3 Concrete work to Section 32 16 15.01.
- .4 Pavement markings to Sections 32 17 23.13 and 32 17 23.23.
- .5 Manhole and valve adjustments to Section 33 05 13.01.

3. EXECUTION

3.1 Overlay Paving Procedures

- .1 Replace existing concrete at locations shown on Drawing or as designated by Engineer in accordance with Section 32 16 15.
- .2 Concrete work to be constructed to match existing cross section unless shown otherwise on Drawings.
- .3 Complete road repairs adjacent to concrete work as shown on drawings using lean concrete to Section 03 30 20 as replacement for granular base.
- .4 Milling of existing asphalt pavement to Section 32 01 16.13.
- .5 Clean pavement surface following planning to Section 32 01 11.01.

- .6 Repair cracks following planning to Section 32 01 18.
- .7 Coordinate installation of traffic signal detector loops and home run wires with Engineer, which is to take place prior to placement of the top lift of asphalt surfacing.
- .8 Supply and place asphaltic tack coat to Section 32 12 13.16.
- .9 Supply and place asphaltic concrete as directed by Engineer to Section 32 12 16.13.

3.2 Pavement Markings

- .1 Painted pavement markings to Section 32 17 23.13.
- .2 Plastic pavement markings to Section 32 17 23.23.
- .3 The Contractor shall arrange to install temporary pavement markings within two hours following placement of pavement.
- .4 Permanent pavement markings shall be installed within one week following placement of pavement.

3.3 Scheduling of the Work

- .1 The Priority for scheduling various sections of the project shall be at the discretion of the Developer's Engineer and/or the Municipal Engineer. The Contractor shall schedule any necessary asphalt concrete pavement profiling so that there is less than 14 days between profiling and asphalt concrete pavement placement unless otherwise approved by the Municipal Engineer. Spot Road Rental Rates shall be in effect unless otherwise directed by the Municipal Engineer. The Contractor is to make every effort to ensure that delays are minimized once the job has commenced.
- .2 A pre-construction meeting will be held to discuss the scheduling concerns of all parties, following which the Contractor shall submit a construction schedule for the project, if requested to do so.

3.4 Access

- .1 Access is to be provided at all times for vehicular commercial delivery and pickup to business premises.
- .2 Access to residences is to be provided at all times except for the installation and curing of tack coat and asphalt concrete pavement. The Contractor shall notify residents in writing within a minimum of 72 hours prior to commencing work when access will be affected to allow residents to find alternate parking areas. Pedestrian access is to be maintained at all times via bridges, walkways or other temporary facilities, constructed in a sturdy, safe manner so that access is available to all premises within the construction zone.
- .3 Access for garbage collection shall be maintained on scheduled pick up dates unless the Contractor makes alternate arrangements.

3.5 Traffic Control

- .1 During all phases of the Contract the Contractor shall ensure that all traffic control is as per the Traffic Accommodation Strategy and the Alberta Transportation Traffic Accommodation in Urban Work Zones Latest Edition. The Contractor shall provide a traffic accommodation plan prior to the start-up meeting and a minimum of three business days prior to commencing work on any roadway that the general public uses to access homes, businesses, schools, etc. The Engineer and/or the Municipal Engineer may review the signage and request changes necessary to ensure public safety and proper traffic flow.
- .2 The Contractor shall be responsible for maintaining the integrity of all materials used. Unless otherwise directed by the Municipal or Engineer, the Contractor shall not allow traffic onto the following items:
 - .1 Tack Coat - 24 hours or until cured.
 - .2 Overlay Fabric - No traffic allowed.
 - .3 Asphalt Concrete Pavement - immediately after final rolling.
 - .4 Fog Coat - 24 hours or until cured.

1. GENERAL

This Section specifies requirements for Portland cement concrete works, including:

- .1 Monolithic curb, gutter, and sidewalk.
- .2 Separate sidewalk.
- .3 Curb and gutter.
- .4 Curb on asphalt base.
- .5 Sidewalk ramps.
- .6 Concrete cap medians and traffic islands.
- .7 Monolithic slab medians and traffic islands on asphalt base.
- .8 Reinforced lane and driveway crossings.
- .9 Swales.
- .10 Miscellaneous concrete works shown on the drawing and/or listed in the Schedule of Quantities.

1.1 Related Work

.1	Site Demolition	Section 02 41 43
.2	Roadway Embankments	Section 31 24 13
.3	Aggregate Materials	Section 31 05 16
.4	Concrete Reinforcement	Section 03 20 00
.5	Cast in Place Concrete	Section 03 30 00
.6	Extruder Placed Concrete	Section 03 37 30
.7	Basic Concrete Materials & Test Methods	Section 03 05 00
.8	Concrete Forming & Accessories	Section 03 10 00
.9	Precast Concrete Unit Paving	Section 32 14 13
.10	Concrete Inspection Deficiencies	Section 32 16 15.02
.11	Tree and Shrub Preservation	Section 32 01 90.33
.12	Topsoil and Finish Grade	Section 32 91 19.13
.13	Mechanical Seeding	Section 32 92 19.13
.14	Hydraulic Seeding	Section 32 92 19.16
.15	Sodding	Section 32 92 23
.16	Planting of trees, shrubs, and Ground Covers	Section 32 93 10
.17	Tree Pruning	Section 32 93 43.01
.18	Landscaping Maintenance Requirements	Section 32 93 14
.19	Standard Details	Division 50

1.2 Definitions

- .1 Hand formed Concrete Work / Cast in Place Concrete: Conventional method of construction using forms.
- .2 Extruded Concrete: Construction of concrete work using slip-form paving machines.
- .3 Sidewalk Flagging: means the removal and replacement of the sidewalk section of a monolithic curb, gutter, and sidewalk cross section by saw cutting along the

back of curb surface joint and removing the sidewalk panel.

- .4 Curb Flagging: means the removal and replacement of the curb and gutter of a monolithic curb, gutter, and sidewalk cross section by saw cutting along the back of the curb surface joint and removing the curb and gutter and installing dowel pins into the sidewalk.

1.3 Measurement Procedures

- .1 The Contractor shall submit locations and measurements of work completed on a weekly basis to the Engineer as an indicator of work progress. Payment will be made based on measurements taken by the Engineer.
- .2 Disposal of concrete work and other items of work to be at locations specified in Section 02 41 13.
- .3 The quantities, determined as specified in this Section, will be paid for at the contract unit prices, which shall be full compensation for furnishing of all materials, labour, tools, and incidentals necessary to complete the work in accordance with the specifications, plans, and instructions from the Engineer.
- .4 Where there is no bid item in place the following work will be considered incidental to the work specified in this section and no separate payment will be made.
- .1 Initial required saw cutting of concrete or asphalt pavement. Additional cuts required due to drawing changes and/or on-site alterations directed by the engineer will be addressed in the contract documents.
 - .2 Removal and disposal of concrete, asphaltic concrete pavement, granular, earth and other waste materials.
 - .3 Subgrade preparation.
 - .4 Supply and placement of approved crushed gravel for hand-formed and slip-formed concrete work as shown on the drawings or as specified by the engineer.
 - .5 Repair of roadway adjacent to new concrete work, must be completed to a condition equal to or better than existing condition
 - .6 Backfill required behind new concrete work.
 - .7 Tree and shrub preservation (Section 32 01 90.33)
 - .8 Placement of plastic sleeves around standpipes and valve boxes and protection of other permanent surface structures.
 - .9 Supply and placement of reinforcement steel.
 - .10 Removal and replacement of precast concrete sidewalk blocks on private property.
 - .11 Disturbed landscaping adjacent to the concrete work and all other disturbed areas.
- .5 Addition subgrade excavation as per engineer's direction. Removal of unsuitable subgrade shall be replaced with approved crushed gravel and measured by in place cubic metres.
- .6 New install and/or removal of monolithic curb & gutter excluding the sidewalk or separate curb and gutter shall be measured in lineal metres. Concrete is to be measured along the line of the face of curb. New install and/or removal of separate sidewalk or monolithic sidewalk shall be measured in square metres.

- .7 Sidewalk flagging, including installation of reinforcement steel, to be measured in squaremetres.
- .8 Curb flagging, including installation of reinforcement steel, to be measured in lineal metres as measured along the face of curb.
- .9 New install and/or removal of curb on asphalt surface shall be measured in lineal metres as measured along the line of the face of curb.
- .10 Construction of sidewalk ramps including tooling and finishing shall be included with the sidewalk measurement; square meters with separate sidewalk, lineal meters with monolithic curb, gutter & sidewalk and lineal meters with curb & gutter.
- .11 New install and/or removal of concrete cap for medians and islands shall be measured in squaremetres.
Coloured stamped/broom finished concrete shall be measured in square meters.
- .12 New install and/or removal of monolithic slab medians and traffic islands on asphalt base shall be measured in square metres. Unit price bid shall be full compensation for all work involved in supplying and installing slab medians and trafficislands.
- .13 New install and/or removal of driveways and reinforced concrete aprons shall be measured in squaremetres.
- .14 New install and/or removal of reinforced curb and gutter concrete crossings to be measured in lineal metres, along the face of curb.
- .15 New install and/or removal of reinforced separate and mono-sidewalks to be measured in squaremeters.
- .16 New install and/or removal of concrete swales shall be measured in lineal meters, along the center line of the swale, for the width specified.
- .17 New install and/or removal of bus stop pads shall be measured in square meters.
- .18 New install and/or removal of private pedestrian sidewalk shall be measured in square meters.
- .19 Precast tree wells; including tree grate, shall be measured in units installed or removed.
- .20 Parking meter post pads, including supply and installation of parking meter posts, shall be measured in units installed.
- .21 Sign post and waste receptacle pads; including supply and installation of breakaway post bottom sections, shall be measured in units installed.
- .22 Adjustment of manholes and catch basins within concrete work shall not be measured.
- .23 Concrete infill shall be measured in cubic meters based on supplier haul tickets and verification by the Engineer for approximate volume required.

2. PRODUCTS

2.1 Material

- .1 Concrete refer to Section 03 30 00 & Section 03 05 00.
- .2 Concrete paving stone products refer to Section 32 14 13.
- .3 Concrete Reinforcing refer to Section 03 20 00.
- .4 Aggregate refer to Section 31 05 16, Aggregate Materials.
- .5 Form release agent: non-staining mineral type.
- .6 Plastic Sleeves: 250 mm long section of PVC pipe; diameter to suit standpipe and valve box O.D.
- .7 Joint filler refer to ASTM D1751 (AASHTO M213) 16 mm preformed, non-extruding, resilient, bituminous type or approved alternates.
- .8 Joint Sealant: refer to ASTM D1190, Sika 2c or approved equivalent.
- .9 Curing compound refer to ASTM C309 containing a white pigment or plastic film to ASTM C171. Curing compound not to be applied where frost is expected within 14 days. Clear curing compound will be used on all coloured concrete.
- .10 Sealing solution to be applied as per the manufacturer's recommendations. Material data to be supplied to the Engineer prior to use.

3. EXECUTION

3.1 Saw cutting, Removal, and Disposal

- .1 Saw cutting, removal, and disposal of concrete work and/or asphalt refer to Section 02 41 13.
- .2 Saw cutting will take place at a concrete joint or as directed by engineer

3.2 Subgrade / Base Course Preparation

- .1 Subgrade preparation refer to Section 31 24 13.
- .2 Removal and replacement of unsuitable subgrade to be approved by Engineer prior to work proceeding.
- .3 Supply, install, and compact approved base course gravel to 98% Standard Proctor Density, minimum 150mm compacted thickness beneath all concrete work. The gravel base course is to be extended 200mm beyond the back of concrete.
- .4 Protect trees and shrubs refer to Section 32 01 90.33.

3.3 Forming

- .1 Slip forming to Section 03 37 30.
- .2 Hand-forming:
 1. Refer to section 03 10 00 & 03 30 00

3.4 Replace Existing Concrete Work With New Concrete Work

- .1 Saw cut existing concrete work at an existing joint or as directed by the engineer.
- .2 Remove existing concrete work without disturbing concrete work that is to remain. With spot replacement work the undisturbed length of concrete shall not be less than 4.5m in length.
- .3 Reconstruct or adjust base as directed by the Engineer.
- .4 Drill and install reinforcing steel as shown in the Division 50 drawings.
- .5 Place PVC sleeve around valve boxes as shown in Division 50 - Specification Drawings, at locations as directed by the Engineer.

3.5 Separate Sidewalk Dowelled to Existing Curb and Gutter

- .1 Supply and place 10 M dowels at 1000mm O.C.

3.6 Sidewalk Flagging

- .1 Saw cut monolithic sidewalk along the back of curb surface joint.
- .2 Remove sidewalk section without disturbing curb and gutter section.
- .3 Drill and install reinforcing steel as shown in the Division 50 drawings.
- .4 Reconstruct or adjust base as directed by the Engineer.

3.7 Curb Flagging

- .1 Saw cut monolithic curb along the back of curb surface joint.
- .2 Saw cut asphalt.
- .3 Remove curb and gutter section without disturbing sidewalk section.
- .4 Drill and install dowels as shown in the Division 50 drawings.
- .5 Reconstruct or adjust base as directed by the Engineer.

3.8 Lane and Driveway Crossings

- .1 Saw cut the existing concrete work at a longitudinal joint or as directed by the engineer. Partial driveway replacements shall conform to an 8% max slope and shall be saw cut accordingly unless otherwise stated by the engineer.
- .2 Remove existing concrete work without disturbing concrete work that is to remain.
- .3 Reconstruct or adjust base as directed by the Engineer.
- .4 Install reinforcing steel as shown in Division 50 - Specification Drawings, including tying in to adjacent concrete.

3.9 Adjustment to Manholes, Catch Basins, Valve Boxes, Standpipes, and Fire Hydrants

- .1 The Contractor shall be responsible for contacting the Municipality for pre-inspection of all infrastructure prior to and upon completion of adjustments.
- .2 The Contractor shall complete adjustments of manholes and catch basins as per

Division 50 - Specification Drawings and contract documents.

- .3 A cement mortar bond shall be used to repair storm manholes, sanitary manholes, and catch basins which are required to be reset. Each joint shall be made water tight with an approved cement mortar. All surplus mortar shall be cleaned from the interior surface of each unit as work progresses.
- .4 The Contractor will be responsible for all adjustments to water valve boxes, hydrants, and stand pipes.
- .5 The Contractor shall place a plastic sleeve around all valves and standpipes prior to concrete being completed.
- .6 The contractor must take appropriate action to prevent debris from falling into Manholes, catch basins, water valve boxes or any other infrastructure.

3.10 Backfill

- .1 Allow concrete to cure for a minimum of 3 days prior to backfilling.
- .2 Prior to backfilling all debris must be removed.
- .3 Backfill behind concrete work to 100 mm below finished grade with suitable material approved by the Engineer, compact to 95% Standard Proctor Density and shape to required contours within the disturbed area so landscaping repairs can be done.
- .4 Backfill behind the curb shall take place prior to initial paving course against the curb and gutter. The backfill shall be placed a minimum of 300 mm width behind the curb in two 150mm lifts. Tamp each lift with mechanical tampers to 95% S.P.D. to the top of curb elevation, unless topsoil placement or walk/slab construction immediately follows, in which case leave backfill low to accommodate subsequent work. One field density test is required per 250m or "block".

3.11 Road Repairs

- .1 Level and compact existing base course gravel.
- .2 Backfill area between lip of gutter and saw cut edge of asphalt must be filled with lean concrete slurry mix. Place slurry mix to match underside of the existing asphalt or to a maximum depth of 75 mm below lip of gutter. Lean concrete Specification Refer to 03 05 00. Asphalt repairs completed as per contract documents.

3.12 Contractor Reports

The Contractor shall provide records identifying the locations where concrete work has been completed, including the date when the work was completed. Reports shall be provided on a weekly basis and are to be submitted at the beginning of the week for the previous week's work.

3.13 Reinforcing Steel

- .1 Concrete reinforcing steel placement refer to Section 03 20 00 – Concrete Reinforcement, and Division 50.

3.14 Concrete

- .1 Supply concrete to Section 03 05 00 and CAN3-A23.1.
- .2 Use 50 mm pencil vibrators for curb and gutter and for slabs with a thickness equal to or greater than 150 mm. Hand or vibrating screeds are to be used for concrete walks and slabs with a thickness of less than 150 mm.
- .3 Place concrete continuously until the schedule pour is complete. Arrange the rate of concrete delivery to ensure that the discharge interval between successive load does not exceed 30 minutes. If the discharge interval is greater than 30 minutes, the contractor shall install a construction joint.
- .4 Where possible, concrete shall be poured monolithically.
- .5 Finish exposed surfaces to a smooth uniform finish, free of open texturing and exposed aggregate. Do not work more mortar to surface than required. Do not use neat cement as a drier to facilitate finishing.
- .6 Broom finish surface to provide non-skid texture.
- .7 Round edges, including edges of joints, with 10 mm radius edging tool unless otherwise noted.
- .8 Finish surfaces to within the tolerances as specified herein.
- .9 All exposed concrete surfaces, shall have an approved curing compound applied as follows:
 - .1 Apply two coats of curing compound in a uniform pattern and as per manufacturers specifications.
 - .2 Curing compound shall be applied as soon as possible and not more than 30 minutes after surface finishing
 - .3 Ensure concrete surfaces are dry, free of dirt or dust, before applying coating.
 - .4 Dry first coat thoroughly before applying second coat.
 - .5 Protect adjacent surfaces from overspray.
- .10 Transition from straight faced to rolled curb sections to be done gradually over a 3 m length of curb and may require an expansion joint and reinforcement as per Division 50, Standard Detail 50 04 19, or as directed by the Engineer.
- .11 Transitions from existing concrete to new concrete may require an expansion joint and reinforcement as per Division 50, Standard Detail 50 04 20, or as directed by the Engineer.
- .12 Sidewalk ramps are to be provided with tooling marks and joints as per Division 50, Standard Detail 50 04 15. The entire surface is to be broom finished to provide a non-slip surface. The maximum slab width between control joints due to radii shall be no more than 2 m.

3.15 Decorative Coloured Concrete

- .1 Construct a test section, consisting of at least 4 square meters, for approval by the Engineer for colour, texture, and workmanship. Seal the surface of the test section and include one saw-cut joint.
- .2 Keep the approved test section at the worksite as a standard for judging the completed work. Any portion of the completed work that does not match the workmanship of the approved test section must be removed and replaced. All

costs associated with this removal and replacement will be borne by the Contractor.

- .3 Apply pigmented release agent to tools and forms in accordance with the stamping system manufacturer's specifications. Place concrete and screed to the specified grade. Float the surface and evenly apply dry shake colour hardener according to manufacturer's specifications.
- .4 Imprint the surface of the plastic concrete with the forms to obtain the specified pattern. The pigmented release agent will serve as the curing agent. Do not clean the surface until adequate curing has been obtained, as recommended by the stamping system manufacturer.
- .5 Saw cut/ form all joints as per Clause 3.7 below and/or as shown on the drawings or as recommended by the stamping system manufacturer. Seal joints, with color-matched joint sealant, as recommended by the stamping system manufacturer. Apply two coats of low-lustre, matte finish clear, 100% acrylic surface sealer to the finished decorative concrete as recommended by the stamping system manufacturer.
- .6 Take steps to avoid the contamination of adjacent surfaces while placing and finishing coloured, stamped concrete; clean all surfaces that do get contaminated. Areas that were not properly protected and/or cannot be cleaned to the satisfaction of the Engineer must be removed and replaced. All costs associated with this removal and replacement will be borne by the Contractor.

3.16 Marking Concrete Work

- .1 Contractor & Year of Construction
 - .1 The Contractor shall mark the sidewalk and/or curb and gutter with a suitable marking tool approved by the Engineer, showing the name of the Contractor and the year of construction. The letters and numbers of the marking tool shall be 40 mm high.
 - .2 Marks shall be placed at the end of curve of each corner of the block or at 200 metre intervals, whichever is less. If the construction begins or terminates within the middle of the block, the Contractor shall also mark these locations, or as directed by the Engineer.

3.17 Concrete Joints

- .1 Expansion Joints
 1. Expansion joints are constructed to relieve tensile and compressive stresses due to the application of horizontal forces as a result of temperature change.
 2. Expansion joints are to be installed at locations when:
 1. Tying into any existing concrete that has cured for more than 28 days. If doing spot replacements, an expansion joints will be installed on one end of a section greater the 50m in length.
 2. Concrete slabs are longer than 100 metres in length.
 3. Lane or Commercial Crossings are being installed adjacent to

- existing concrete, or;
- 4. As directed by the Engineer
- 3. Expansion joints are to be 16 mm wide with reinforcing steel and approved joint filler. The joint filler material shall be placed all the way through the slab, starting at the gravel base, and should be placed to be below 25 mm the surface. Reinforcing steel is to be installed as per Section 03 20 00 and Division 50 Drawings. The joint is then to be sealed with an approved joint sealer as specified herein.
- .2 Control/ Joints
 - .1 Control joints are constructed to relieve shear stresses due to the application of vertical forces as a result of settlement or settling.
 - .2 Transverse control joints shall be installed at 1.5m spacing unless otherwise noted.
 - .3 Control joints shall be installed to a minimum depth of 30 mm or $\frac{1}{4}$ of the thickness of the slab and the width shall be 12mm.
 - .4 Control joints can be installed using an approved preformed strip or troweled while the concrete is fresh. The surface of any troweled joints must be 65mm wide and provide a smooth dense surface. Alternatively, the control joint can be saw cut within 12 hours of placing the concrete.
 - .5 On any slab wider than 2.0 m a longitudinal control joint shall be required. The longitudinal joint shall be located at the midpoint of the slab or spaced a maximum of 2.0 m.
- .3 Construction Joints
 - .1 Construction joints are constructed to provide a neat joint from where one pour-day ended and another started. Expansion joints can be installed instead of a construction joint, depending upon the length of each pour and the location of the joint. The joint is to be sealed with an approved joint sealer after the concrete has set. Expansion joints to be installed as noted above.
 - .2 Reinforcement is to be installed as per Section 03 20 00 and Division 50 Drawings.
- .4 Isolation Joints
 - .1 Isolation joints are constructed to relieve shear, tensile and compressive stresses due to the application of horizontal and vertical forces as a result of temperature change, settlement or swelling. This joint is intended to completely isolate the slab from something else and allows the separate items to shift/settle independently from each other.
 - .2 Isolation joints are to be constructed around manholes, valve boxes, poles, hydrants, etc. and along length of concrete adjacent to a building or other permanent surface structure, or as directed by engineer.
 - .3 Isolation joints are to be 16 mm wide with approved joint filler. The joint filler material shall be placed all the way through the slab, starting at the gravel base, and should be placed to be below 25 mm the surface. The joint is then to be sealed with an approved joint sealer. No reinforcement is required to be placed for this type of joint.
 - .4 Isolation joints are to be installed as per Division 50 Drawings, or as directed by the Engineer.

- .5 Troweling/Tooling
 - .1 The surface of any joint must be troweled to 65mm wide and provide a smooth dense surface.
 - .2 Troweling/tooling on sidewalk ramps are to be broom finished to provide a non-slip surface.
- .6 Joint Sealing
 - .1 Joints shall be filled no more than 14 days after the concrete has been placed. Immediately before sealing, the joints shall be thoroughly cleaned in such a manner that all loose or foreign material, including membrane curing compound, is removed.
 - .2 Joints shall be inspected and approved by the Engineer prior to sealing.
 - .3 All reinforced joints shall be filled to not less than 3 mm from the surface or the contractor may be required to redo.
 - .4 Any material spilled on adjacent pavement areas shall be removed immediately and the pavement surface cleaned.
 - .5 The use of sand or similar material to cover the seal shall not be permitted.
 - .6 Refer to section 32 16 15.02 for details of concrete deficiencies at time of construction completion/warranty completion
 - .7 Joint sealer to be installed according to the manufacturer's specifications.

3.18 Field Quality Control

- .1 Refer to Section 32 16 15.02
- .2 Protect finished work from damage, repair to the satisfaction of the Engineer if damaged. Cost of the repairs to be borne by the Contractor.

1. GENERAL

This Section specifies requirements for final site grading for topsoil placement, and covers the supply, placement, modification, and preparation of topsoil.

1.1 Related Work

.1	Site Grading	Section 31 22 13
.2	Mechanical Seeding	Section 32 92 19.13
.3	Hydraulic Seeding	Section 32 92 19.16
.4	Sodding	Section 32 92 23
.5	Preservation of Trees and Shrubs	Section 32 01 90.33

1.2 Site Conditions

- .1 Known underground and surface utility lines and buried objects are indicated on the Drawings. Contractor to verify locations prior to starting Work.

1.3 Protection

- .1 Prevent damage to existing trees, roots, fencing, landscaping, natural features, bench marks, existing buildings, existing pavement, surface or underground utility lines which are to remain. Repair any damage.
- .2 Protect existing trees and shrubs in accordance with Section 32 01 90.33.

1.4 Samples and Testing

- .1 The Contractor shall provide details and nominate the sources of the Topsoil for use in the Works.
- .2 Supply to the Engineer, four weeks prior to start of topsoil placement soil test results.
- .3 Soil testing is to be done by an approved Laboratory. Test to be done on stockpile by combining soil from at least 3 separate locations within the stockpile for a total of 1 litre of soil or as specified by the laboratory.
- .4 Soil testing and professional recommendation shall determine the agricultural capability of the proposed soils used. This includes as a minimum; particle size analysis, soil textural classification, NPK (nitrate-nitrogen, available phosphorus, available potassium), extractable sulphur, soil pH, salinity (EC), SAR (sodium adsorption ratio) % of OM (organic matter).
- .5 Subject to the results of soil testing and professional recommendation, the Contractor shall make modifications as recommended to make the soil acceptable for use in the Work. Any modifications or additives required will be considered incidental to the Work.
- .6 When a source of such topsoil is exhausted, topsoil from a new source shall not be used until tested and approved by the Engineer.

1.5 Measurement Procedures

- .1 Fine grading will not be measured.
- .2 Topsoil placed and prepared from on-site sources will not be measured.
- .3 Imported topsoil will not be measured unless it is placed and prepared for sodding in which case it will be measured by the square meter for the depth specified. Free haul to be unlimited.
- .4 Herbicide applied according to manufacturer's recommendations will be considered incidental to the preparation of the topsoil. There will be no separate payment for herbicide.
- .5 Fertilizing and watering will not be measured.

2. PRODUCTS

2.1 Materials

- .1 Topsoil imported: A fine friable medium loam, capable of sustaining good agricultural growth, meeting accepted horticultural practices and approved by Engineer. Topsoil shall meet the following requirements:
 - .1 Contain a minimum 4% organic matter for clay loams and minimum 6% for sandy loams to a maximum of 20%.
 - .2 Acidity range pH of 6.5 to 7.5.
 - .3 Free of subsoil, roots, vegetation, clods, sticks, concrete, gravel, stones larger than 20mm in greatest dimension, or any other extraneous material. Imported topsoil is to be screened. On-site source topsoil to be cleaned and these undesirable materials removed from the site and disposed of appropriately.
 - .4 Electrical conductivity rating not more than 2 dS/m (deci-Siemens per meter) for acceptable salinity.
 - .5 Topsoil containing known and actively growing noxious weeds is not acceptable
- .2 Herbicide: "Round-Up" or other approved chemical base glyphosate equal.

3. EXECUTION

3.1 Preparation

- .1 Apply herbicide ten (10) days in advance of grading to kill existing weeds and grasses on-site, if required by the Engineer.
- .2 Fine grade subgrade, within 25mm of design roughgrade.
- .3 Fine grade subgrade, eliminating uneven areas and low spots. Remove debris, roots, branches, stones more than 30mm diameter, and other refuse or construction materials. Remove subsoil that has been contaminated with oil, gasoline, or other deleterious substances.

3.2 Spreading Topsoil

- .1 Spread dry topsoil during dry weather over approved, dry, unfrozen subgrade, where indicated.
- .2 Bring topsoil up to finished grade.
- .3 Apply topsoil to 150mm minimum depth after settlement for boulevards, school sites and PUL's. Minimum 200mm for intended Park Development sites.
- .4 Manually spread topsoil around existing trees and plants to prevent damage by grading equipment.
- .5 Care must be taken not to raise existing soil levels within drip line of existing plant material.
- .6 Apply 10-47-0 or equivalent fertilizer at a rate of 450 kg/ha.
- .7 Prepare loose friable seed bed by means of rototilling or the use of a gill or soil conditioner to a depth of 100mm.
- .8 Dispose of debris.
- .9 Level surface to final design grades within a tolerance of 15mm and ensure positive drainage.
- .10 Ensure that the topsoil is properly blended into the adjacent property.

3.3 Timing

- .1 Generally, work shall not commence in the spring until the ground has completely thawed.
- .2 Topsoil shall be placed after it has been tested and approved, and only when seeding can proceed immediately afterwards.

3.4 Existing Utility Appurtenances and Features

- .1 All existing utility appurtenances shall be adjusted to final finished grade elevations prior to top soiling of site.
- .2 Prevent damage to all existing features: fencing, trees, landscaping, natural features, buildings, culverts and utility lines which are to remain. Repair any damage.

3.5 Clean-up

- .1 Remove all waste materials and debris from the site on a regular basis. Burying of debris is not permitted. Leave site and surrounding public and private properties completely free of all debris.

1. GENERAL

This Section specifies requirements for supplying and sowing grass seeds.

1.1 Related Work

- | | | |
|----|------------------------------------|---------------------|
| .1 | Topsoil Placement and Grading | Section 32 91 19.13 |
| .2 | Landscape Maintenance Requirements | Section 32 94 14 |

1.2 Measurement for Payment

- .1 Payment for seeding will not be measured and shall be included in the appropriate unit price bid item in the Tender Form Unit Price Schedule.

2. PRODUCTS

2.1 Materials

- .1 Mulch
- .1 Fibres: 99% organic content.
 - .2 Free of growth inhibiting ingredients.
 - .3 1000% potential water uptake by weight.
 - .4 Capable of dispersing in water to form homogeneous slurry.
 - .5 Capable of forming an absorptive mat ground cover allowing water percolation.
- .2 Erosion control blanket to be specified by Engineer.
- .3 Erosion control blanket anchors:
- .1 Staples: single or double prong "U" type, with minimum 2.5 mm diameter wire, minimum 150 mm high.
 - .2 Pegs: wooden, minimum 25 mm x 25 mm x 200 mm high.
- .4 Water: free of impurities that would inhibit germination and growth.

2.2 Grass Seed

- .1 General
Fine Grass Mixture: Canada "Certified" seed, "Canada No. 1 Lawn Grass Mixture" shall be in accordance with Government of Canada Seeds Act and Seeds Regulations.
Supply in packages individually labelled in accordance with Seeds Regulations and indicating name of supplier and date bagged.
- .2 Arterial / Collector Roadway Boulevard and Landscape Entry Features
A turfgrass mixture should be used that is capable of withstanding salt splash, drought conditions, limited fertility and northern winters & mechanical sweeping. The Seed Mixture to be confirmed based on the availability of noted products/blends. The mixture on a weight basis shall be:

30% Puccinellia distans	-Alkali grass (Fults)
30% Poa pratensis	-Kentucky Bluegrass (Banff, Julia, Touchdown)*
30% Festuca longifolia	-Hard Fescue (Biljart, Spartan)*
10% Lolium perenne	-Perennial Rye Grass, Turf-type (Low-Grow, Norlea)

*Use a 50/50 mix of two of the cultivars listed

Note: This mixture is subject to change, based on evaluation of test sites.

.3 Miscellaneous Use

All other areas: Walkway-Trails, and Public Utility Lots.

A low maintenance turfgrass mixture shall provide good durability. Turf must be vigorous, have a rapid recuperative potential and maintain a high density under relatively low heights of cut. The Seed Mixture to be confirmed based on the availability of noted products/blends.

The recommended mixture on a weight basis is:

35% Poa pratensis	-Kentucky Bluegrass (Banff, Touchdown, Limousine, Julia, Challenger)*
60% Festuca rubra ssp rubra	-Creeping Red Fescue (Jasper, Boreal, Dawson)*
5% Lolium perenne	-Perennial Turf Ryegrass (Low-grow, Norlea)

*Use a 50/50 mix of two of the cultivars listed.

.4 Ornamental Lawns

Turf must be uniform in colour, texture and growth habit.

The Seed Mixture to be confirmed based on the availability of noted products/blends.

The seed mixture of the sod on a weight basis shall be:

40% Poa pratensis	-Kentucky Bluegrass (Banff, Touchdown, Limousine, Nugget)*
60% Festuca rubra ssp rubra	-Creeping Red Fescue (Jasper, Boreal)*

*Use a 50/50 mix of two of the cultivars listed.

.5 Sport Field Developments

Turf grasses mixtures within areas designated for sport fields will be designated in special provisions.

2.3 Fertilizer

Fertilizer shall be stored in standard containers clearly marked with the name of the manufacturer, weight, and specified composition. It shall be kept dry at all times.

- .1 Seeded/Sodded Areas prior to installation:
Fertilizer shall be standard commercial grade with a guaranteed chemical analysis. Fertilizer shall be water-soluble granular type.
Fertilizer content requirements are:
 - 12% Total Nitrogen
 - 51% Available Phosphoric Acid
 - 0% Potash
- .2 Seeded/sodded areas:
Spring application during maintenance period.
Fertilizer shall be standard commercial grade with a guaranteed chemical analysis. Fertilizer shall be water-soluble granular type.
Fertilizer content requirements are:
 - 26% Total Nitrogen
 - 13% Available Phosphoric Acid
 - 6% Potash
 - 6% Sulphuror 26 - 13 - 6 - 2, depending upon soil analysis.

3. EXECUTION

3.1 Workmanship

- .1 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .2 Arterial / collector roadway boulevards and entry features shall be seeded only in May and June unless otherwise approved by the Engineer as detailed in the Contract Special Provisions. All other areas may be seeded in between May and September.
- .3 Remove and dispose of weeds, debris, stones greater than 50 mm in diameter and larger, soil contaminated by oil, gasoline, and other deleterious materials.

3.2 Preparation of Surface

- .1 Verify that grades are correct. If discrepancies occur, notify Engineer and do not commence Work until instructed by Engineer.
- .2 Fine grade surface free of humps and hollows to smooth, even grade, to elevations indicated to tolerance of plus or minus 25 mm.
- .3 Ensure areas to be seeded have been scarified to depth of placed topsoil before seeding. Fine grade free of humps and hollows and free of deleterious and refuse materials.

3.3 Seed Placement

- .1 For mechanical seeding:
 - .1 Use "Brillion" type mechanical landscape seeder with sand discs which accurately places seeds at specified depth and rate and rolls in single operation.
 - .2 Use equipment and method acceptable to Engineer.
- .2 For manual seeding:
 - .1 Use "Cyclone" type manually operated seeder.
 - .2 Rake surface to ensure seed is properly embedded.
 - .3 Remove any topsoil lumps in excess of 50 mm in size.
 - .4 Use equipment and method acceptable to Engineer.
- .3 On cultivated surfaces, uniformly spread grass seed at the recommended rate of the seed supplier and not less than a rate of 250kg/ha.
- .4 Blend applications 150 to 300 mm into adjacent grass areas and previous applications to form uniform surfaces.
- .5 Sow half of required amount of seed in one direction and remainder at right angles.
- .6 Embed seed into soil to depth of 6 to 10 mm. Not less than 85% of seed to be placed at specified depth and covered by soil.
- .7 Consolidate mechanically seeded areas by rolling area if soil conditions warrant, or if directed by Engineer, with equipment approved by Engineer immediately after seeding.
- .8 Consolidate manually seeded areas by rolling area with equipment approved by Engineer immediately after seeding.
- .9 Protect seeded areas against damage. Remove protection material after lawn areas have been established and accepted by Engineer.

3.4 Maintenance Prior to Construction Completion Certificate

- .1 Maintain seeded area from start of installation until acceptance.
- .2 The grass to shall be maintained to a cutting height of 75mm and shall not be permitted to exceed a height of 150mm. Remove clippings that will smother grassed areas.
- .3 Maintain disturbed areas free of noxious or prohibited noxious weeds.

3.5 Acceptance for Issue of Construction Completion Certificate

- .1 Seeded areas will be accepted by Engineer provided that:
 - .1 Areas are uniformly graded and seeded to Clauses 3.1, 3.2, and 3.3 of this Section.
 - .2 Areas are free of noxious and prohibited noxious weeds as defined under the Alberta Weed Control Act, rocks, and debris.
- .2 Deficiencies to be corrected prior to issuance of the Construction Completion Certificate.

1. GENERAL

1.1 Related Work

- .1 Topsoil and Finish Grading Section 32 91 19.13

1.2 Source Quality Control

- .1 Contractor to nominate the source of the sod.

1.3 Scheduling

- .1 Schedule sod laying to coincide with topsoil operations.

1.4 Measurement Procedures

- .1 Sodding will be measured by the square meter. Maintenance and pegging sod in place on steep slopes as required by this Section is incidental to this work and no additional payment will be made.

2. PRODUCTS

2.1 Materials

- .1 Nursery sod: quality and source to comply with standards outlined in "Guide Specification for Nursery Stock", published by Canadian Nursery Landscape Association (www.canadanursery.com). The seed mixture to be confirmed based on the availability of noted products/blends.

90% Poa pratensis 3-4 varieties -Kentucky Bluegrass (recommend: 30% Banff, 20% Touchdown, 30% Alpine).

10% Festuca rubra ssp rubra 2-3 varieties -Red Fescue (Jasper, Boreal, Dawson)*

OR

10% Festuca rubra commutata 1 variety -Chewings Fescue (Victory)

Broken, dry, discolored pieces will be rejected by Engineer.

- .2 Fertilizer: complete synthetic slow-release fertilizer with maximum 35% water soluble nitrogen.
- .3 Herbicide: the type, application rate and method of application shall be as per manufacturer recommendation and subject to Municipal approval.

2.2 Water

- .1 Free of impurities that would inhibit growth.
- .2 Supplied by Contractor.

3. EXECUTION

3.1 Workmanship

- .1 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standingwater.
- .2 Remove and dispose of weeds, debris, stones 30mm in diameter and larger and soil contaminated by oil, gasoline, or other deleterious materials.

3.2 Preparation of Surface and Installation

- .1 Verify that grades are correct. If discrepancies occur, notify Engineer, and do not commence Work until instructed by Engineer.
- .2 Fine grade surface free of humps and hollows to smooth, even grade, to elevations indicated to tolerance of plus or minus 25 mm with a minimum topsoil depth as specified.
- .3 Ensure areas to be sodded have been scarified to depth of placed topsoil. Fine grade free of humps and hollows and free of deleterious and refuse materials.
- .4 Lightly roll topsoil and broadcast fertilizer. Moisten soil prior to sod placement.
- .5 Lay sod in rows, perpendicular to slope, and with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Butt new sod closely to existing grassed areas and structures.
- .6 Cut out and replace irregular or thin sections of sod and cut sod as necessary to tie into existing structures and grassed lawn areas. Cut

existing grassed lawn areas to provide an appropriate mating face. Utilize sharp implements to cut the sod.

- .7 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.
- .8 Fertilize and water sod immediately after laying to obtain moisture penetration into the top 100mm of topsoil.

3.3 Laying of Pegged Sod

- .1 Place mesh on top of topsoil of slopes as indicated. Secure mesh in place with wooden pegs at maximum intervals of 1000mm. Cover mesh lightly with topsoil.
- .2 Lay sod sections perpendicular to slopes steeper than 3:1, or as indicated, and secure with wooden pegs. Place pegs three per square meter, 100mm below top edge to prevent shifting of sod and drive pegs flush with top of sod soil. Place six pegs around entire edge of each square meter of sod in drainage swales.

3.4 Maintenance of Sodded Areas

- .1 Maintain sodded area from start of installation until substantial performance and until the new sod has established root systems into the underlying soil, whichever is later.
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain soil under sod continuously moist to depth of 70 to 100 mm.
- .3 The grass to shall be maintained to a cutting height of 75mm and shall not be permitted to exceed a height of 150mm. Remove clippings that will smother grassed areas.
- .4 Maintain sodded areas free of noxious or prohibited noxious weeds.
- .5 Notify the adjacent property Owner and the Municipality upon expiry of the Contractual obligation for maintenance and include suggestions for continued proper care and maintenance.

3.5 Acceptance for Issue of Substantial Performance Certificate (S.P.C.)

- .1 Sodded areas will be accepted by Engineer provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots, rutting and areas of settlement, and without noxious or prohibited noxious weeds as defined under the Alberta weed Control Act.
 - .3 No surface soil is visible when grass has been cut to a height of 50mm.
- .2 Areas sodded in the fall will be accepted after June 30 the following year provided that the acceptance conditions are fulfilled.

3.6 Maintenance During Warranty Period

- .1 Maintenance obligations shall be assumed by the adjacent property Owners and the Municipality following acceptance of the sodded areas.

1. GENERAL

.1 Related Work

- .1 Carry out all pruning in accordance with International Society of Arboriculture Standards Tree Pruning Guidelines, except where specified otherwise.
 - .1 Clearing and Grubbing Section 31 11 00
 - .2 Landscape Maintenance Requirements Section 32 94 14

.2 Scheduling

- .1 Prior to commencing pruning:
 - .1 Schedule timing of work with Engineer.
 - .2 Inform the Engineer seven day in advance.
 - .3 Review extent of work with Engineer on site.

.3 Pruning Ban

There is a province wide ban on pruning of all Elm trees between April 1 and September 30.

2. PRODUCTS

.1 Disinfectant

- .1 Twenty percent (20%) solution of sodium hypochlorite or 70% solution of ethyl alcohol.

3. EXECUTION

.1 Sample Pruning

- .1 Commence pruning by completing sample pruning operation to demonstrate technique and selection process used to establish desired form and shape.

.2 Tool Maintenance

- .1 Ensure that tools are clean and sharp throughout pruning operation.
- .2 On diseased plant material, disinfect tools with disinfectant before each cut.

.3 Annual Thinning

- .1 Remove dead, dying, diseased and weak growth from plant material as a result of the project works, in order to promote healthy growth. Retain natural form and shape of plant material, if possible.
- .2 For branches under 150 mm in diameter:
 - .1 Make cuts smooth and just outside the branch collar. Do not cut lead branches unless necessary.

SECTION 93 43.01

Tree Pruning

- .3 For branches greater than 150 mm in diameter:
 - .1 Make first cut on lower side of limb 300 mm from trunk, one third diameter of limb.
 - .2 Make second cut on upper side of limb 500 mm from trunk until limb falls off.
 - .3 Make final cut adjacent to and outside limb collar.
- .4 Ensure that trunk bark and limb collar are not damaged or torn during limb removal.
- .5 Remove one of crossed or rubbing branches. Where removal may affect natural form or health of plant, resolve pruning action with Engineer.
- .6 Remove exposed portion of girdling root after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

- .4 Timing of Pruning**
 - .1 Prune plant material at times designated as indicated in the Contract.

- .5 Heading Back**
 - .1 Head back plant material designated in the Contract.

- .6 Coniferous Evergreens**
 - .1 Prune plant material designated in the Contract.

- .7 Hedges**
 - .1 Prune plant material designated in the Contract.

- .8 Care of Wounds**
 - .1 Shape bark around wound to an oblong configuration ensuring minimal increase in wound size.
 - .2 Treat wounds as necessary to minimize wound growth and potential for infection.

- .9 Clean-up**
 - .1 Collect and dispose of pruned material daily and remove from site to an appropriate disposal site.

- .10 Report**
 - .1 Report to Engineer condition detrimental to health of plant material.

4. PAYMENT

All cost associated with pruning of trees and shrubs during and following the construction operations shall be compensated by the lump sum bid for pruning in the Contract Tender Form Schedule.

1. GENERAL

This section specifies the requirements for the provision of temporary sanitary sewer service and the control of sanitary or storm sewer flows using by-pass pumping.

1.1 Related Sections

CIPP Relining of Sewer Mains and Laterals	: Section 33 01 30
Milling and Cleaning Sewer Pipes	: Section 33 01 32
Inspection of Sewer Pipes	: Section 33 25

1.2 Work Content

The work includes supplying all equipment, labour, material, and services for the following:

- .1 Engineering services for the proposed temporary by-pass scheme.
- .2 Mobilization and demobilization.
- .3 Traffic control and maintenance of access to properties.
- .4 Providing alternate sanitary servicing to residents.
- .5 By-passing flow.
- .6 Reinstatement of permanent sanitary services and normal flows.

1.3 Constraints

- .1 Existing sewer services shall not be shut off for more than eight (8) consecutive hours.
- .2 Only the services along a single section of main from manhole to manhole shall be out of service at one time, unless specifically authorized by the Owner.

2. PRODUCTS

None Applicable

3. EXECUTION

3.1 Flow Control

When sewer flows are too high to effectively conduct inspection or relining, one or more of the following methods of flow control or isolation shall be used.

- .1 Plugging and Blocking
A sewer line plug shall be inserted into the line at a manhole upstream from the section to be isolated. The plug shall be so designed that all or a portion of the sewage flows can be released. During the isolation portion of the operation, flows shall be shut off or substantially reduced in order to execute required work. After work is completed flows shall be returned to normal.
- .2 By-passing Flow in Sewer Lines
 - a) When adequate flow control cannot be obtained by the plugging method, pumps or siphons shall be used to divert all or a portion of the sewage flows, as may be necessary to perform the specified inspection or relining. Excess sewage flows shall be transported through a closed pipeline or

using tank trucks provided by the contractor. Trucks shall go to the nearest or most economical approved disposal site.

- b) The Contractor shall provide a detailed scheme to deal with mainline flows for the Owner's approval, taking into account the following:
 - i. Pumps and bypass lines shall be of adequate capacity to handle the peak flows, and ensure that no upstream flooding occurs during isolation period.
 - ii. Equipments shall conform to the applicable noise bylaws.

3.2 Monitoring

- .1 Provide continuous monitoring of water levels in upstream and downstream manholes. Ensure that there is no contamination of basement, ditches, roadways or sidewalks with raw sewage. In the event of such contamination, immediate action shall be taken to eliminate the source of contamination. Proper clean-up of the affected area shall be followed, and no work shall recommence until a reevaluation of the complete process has been carried out by the Owner. No rehabilitation work shall be undertaken unless authorized by the Owner.
- .2 Where the Contractor has used a flow control procedure to limit flows during an inspection, the Contractor shall note on the inspection report the depth of normal flow and the duration the flow control was in effect.

3.3 Safety

- .1 The Contractor shall pay strict attention to the Alberta Occupational Health and Act and Regulations and other construction safety measures as outlined in Occupational Health and Safety Requirements, General Requirements.
- .2 Contractors shall provide a cope of their confined space entry procedures prior to commencing work.

3.4 Temporary Sanitary Service

- .1 The Contractor shall provide temporary facilities as required to divert sewage from the sanitary service connections for commercial and apartment buildings affected by the work. Temporary facilities, for example portable toilet units, are not acceptable unless the residents sign a release.
- .2 The Contractor shall supply residents of single family houses or duplexes affected by the work with temporary portable sanitary facilities outside the house for the entire duration of the work and shall ensure that they are properly maintained during operation and removed when work is completed.
- .3 Inform affected residents in writing of the length of disruption to service, details of alternate services that will be provided, any traffic-related constraints, noise levels to be expected, hours of work and safety concerns.
- .4 Attend meetings with residents as required.

3.5 Clean-up

- .1 Upon completion of the work clean up and restore the affected surface areas to the condition existed prior to commencement.
- .2 Remove and haul debris to an approval disposal site.

PART 1 GENERAL

1.01 DESCRIPTION

The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

1.02 REFERENCES

Section 02620 – High Density Polyethylene Piping shall be used as a reference.

1.03 QUALITY ASSURANCE

The requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Engineer's approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

1.04 SUBMITTALS

A. Work Plan

Prior to beginning work, the Contractor must submit to the Engineer a general work plan outlining the procedure and schedule to be used to execute the project. Plan should document the thoughtful planning required to successfully complete the project. This plan must include an emergency response plan for potential frac-out or release of deleterious substances to the water body and a contingency plan in case drilling procedures fail.

B. Equipment

The Contractor will submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project.

PART 2 PRODUCTS

2.01 MATERIALS

Specifications on material to be used shall be submitted to Engineer. Material shall include the pipe, fittings and any other item which is to be an installed component of the project.

2.02 EQUIPMENT

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing & delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

2.03 DRILLING SYSTEM

A. Drilling Rig

The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations.

B. Drill Head

The drill head shall be steerable by changing it's rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

C. Mud Motors (if required)

Mud motors shall be of adequate power to turn the required drilling tools.

D. Drill Pipe

Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.04 GUIDANCE SYSTEM

The Guidance System shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

2.05 DRILLING FLUID (MUD) SYSTEM

A. Mixing System

A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be sized for adequate storage of the mud. Mixing system shall continually agitate the drilling fluid during drilling operations.

B. Drilling Fluids

Drilling fluid shall be composed of clean water and an appropriate additive. Water shall be from a clean source with a pH of 8.5 – 10 and/or as per mixing requirements of the Manufacturer. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall.

C. Delivery System

The mud pumping system shall have a minimum capacity to supply mud in accordance with the drilling equipment pull-back rating at a constant required pressure. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage facilities.

2.06 OTHER EQUIPMENT

A. Pipe Rollers

Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

B. Pipe Rammers

Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of the Engineer.

C. Restrictions

Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

PART 3 EXECUTION

3.01 GENERAL

The Engineer must be notified 48 hours in advance of starting work. The Directional Bore shall not begin until the Engineer is present at the job site and agrees that proper preparations for the operation have been made. The Engineer approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of the Engineer to provide inspection personnel at such times as appropriate without causing undue hardship by reason of delay to the Contractor.

3.02 PERSONNEL REQUIREMENTS

- A. All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety.
- B. All personnel involved with pipe fusion shall have a current fusion ticket (obtained or renewed in the last 12 months). Two sample fusions under field conditions shall be performed.

3.03 DRILLING PROCEDURE

A. Drill Path Survey

Entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings.

B. Environmental Protection

The Contractor shall adhere to all Provincial, Federal and Local Environmental Regulations and all operations shall be conducted in a conscientious manner.

The Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, provincial, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. The Contractor shall adhere to all applicable environmental regulations. Fuel or oil may not be stored in bulk containers within 100m of

any water-body or wetland.

C. Safety

The Contractor shall adhere to all applicable provincial, federal and local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly with a written record of attendance and topic submitted to the Engineer.

D. Pipe

Pipe shall be fused together in one length, if space permits. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.

E. Pilot Hole

1. Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 30m. In the event that pilot does deviate from bore path more than 5% of depth in 30m, contractor will notify the Engineer. The Engineer may require the Contractor to pull-back and re-drill from the location along bore path before the deviation.
2. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, the Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and then wait another 30 minutes. If mud fracture or returns loss continues, contractor will cease operations and notify the Engineer. The Engineer and Contractor will discuss additional options and work will then proceed accordingly.

F. Reaming

Upon successful completion of pilot hole, contractor will ream bore hole to a minimum of 25% greater than the outside diameter of the pipe using the appropriate tools. The Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

G. Pull-Back

1. After successfully reaming bore hole to the required diameter, the Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel. Once pullback operations have commenced, operations must continue without interruption until the pipe is completely pulled into the bore hole. During pull-back operations, the Contractor will not apply more than the maximum safe pipe pull pressure at any time.
2. In the event that pipe becomes stuck, the Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, contractor will notify the Engineer. The Engineer and Contractor will discuss options and then work will proceed accordingly.

3.04 SITE RESTORATION

Following drilling operations, contractor will de-mobilize equipment and restore the work-site to original condition. All excavations will be backfilled and compacted to 95% of original density. Landscaping will be restored to original. All mud shall be disposed of by the Contractor.

3.05 RECORD KEEPING

A. As-Builts

The Contractor shall maintain a daily project log of drilling operations and a guidance system log with a copy given to the Engineer at completion of the project.

Reference stakes shall be placed at the entry and exit holes and the Engineer shall be notified to tie-in the location prior to their removal.

PART 4 MEASUREMENT AND PAYMENT

4.01 CROSSING OTHER UTILITIES

Crossing gas service lines, underground power, Fiber Optic, cable T.V., telephone and other private overhead, shallow or deep utilities will not be paid for directly but shall be considered a subsidiary obligation of the Contractor under trench excavation, bedding & backfill.

4.02 MECHANICAL AUGERING AND/OR DIRECTIONAL DRILLING

Measurement of mechanical augering and/or directional drilling will be horizontally along the centre line of the hole for the augered distance at design depth as staked by the Engineer.

Payment for mechanical augering and/or directional drilling will be made at the unit price bid in the Tender Form Schedule(s) and shall be considered full compensation for supply of all labour, supervision, equipment, and materials necessary for augering or drilling, supply & installation and jointing of the pipes through the auger hole, to the adjoining pipes and all other costs incidental thereto including testing and cleanup.

No additional payment will be made for multiple attempts at augering to obtain a successful hole.

If open cut excavation is required due to unsuccessful attempts to auger, payment will only be made for the higher unit price of open cut trenching or directional drilling, per the unit price tendered for the pipe size installed and shall be considered full compensation for supply of all labour, supervision, equipment and materials necessary for completion of the work.

PART 1 GENERAL

1.01 DESCRIPTION

This specification includes but is not limited to high-density polyethylene (PE 4710) (iron pipe size O.D) pressure pipe primarily intended for the transportation of water and sewage either buried or above grade.

1.02 REFERENCES

<u>Reference:</u>	<u>Title:</u>
ANSI/AWWA C091	Polyethylene (PE) Pressure Pipe & Tubing, 13mm (½") through 76mm (3") for water service
ANSI/AWWA C906	Polyethylene (PE) Pressure Pipe & Fittings, 100mm (4") through 1,600mm (63") for water distribution and transmission
AWWA C901	Polyethylene (PE) Pressure Pipe & Tubing, 12.5mm (½") through 75mm (3") for water service
AWWA C906	Polyethylene (PE) Pressure Pipe & Fittings, 100mm (4") through 1,600mm (63") for water distribution
ASTM F905	Standard Practice for Qualification of Polyethylene Saddle-Fused Joints
ASTM F1055	Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe
ASTM D1238	Melt Flow Index
ASTM F1290	Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings
ASTM D1505	Density of Plastics
ASTM F1962	Standard Guide for Use of MaxiHorizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles Including River Crossings
ASTM F2164	Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
ASTM F2206	Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock, or Block Stock
ASTM F2620	Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
ASTM D2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
ASTM D2737	Standard Specification for Polyethylene (PE) Plastic Tubing
ASTM D2837	Hydrostatic Design Basis
ASTM F2880	Standard Specification for LapJoint Type Flange Adapters for Polyethylene Pressure Pipe in Nominal Pipe Sizes ¾ in. to 65 in.
ASTM D3035	Standard Spec for PE Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM F3124	Standard Practice for Data Recording the Procedure used to Produce Heat Butt Fusion Joints in Plastic Piping Systems or Fittings
ASTM D3261	Butt Heat Fusion PE Fittings for PE pipe & tubing
ASTM D3350	Standard Specification for PE pipe & fittings materials
NSF Std.#14	Plastic Piping Components & Related Materials

1.03 GENERAL

A. Use

High Density Polyethylene (HDPE) pipes/fittings shall be allowed for use as water, wastewater and reclaimed water pressure pipe where compatible with the specific conditions of the project. The use of material other than HDPE pipe may be required by the Engineer if it is determined that HDPE pipe is unsuitable for the particular application. All material used in the production of water main piping shall be approved by the National Sanitation Foundation (NSF).

B. Documentation

1. Documentation from the resin's manufacturer showing results of the following tests for resin identification:

(a) Melt Flow Index ASTM D1238

(b) Density ASTM D1505

C. Manufacturer

All HDPE pipe and fittings shall be from a single manufacturer, who is fully experienced, reputable and qualified in the manufacture of the HDPE pipe to be furnished. The pipe shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications. Qualified manufacturers shall be Polyubes, KWH Pipe or approved equal.

D. Finished Product Evaluation

1. Production staff shall check each length of pipe produced for the items listed below. The results of all measurements shall be recorded on production sheets, which become part of the manufacturer's permanent records.

- a. Pipe in process shall be checked visually, inside and out for cosmetic defects (grooves, pits, hollows, etc.)
- b. Pipe outside diameter shall be measured using a suitable periphery tape to ensure conformance with ASTM F714 or ASTM D3035, whichever is applicable.
- c. Pipe wall thickness shall be measured at 12 equally spaced locations around the circumference at both ends of the pipe to ensure conformance with ASTM F714 or ASTM D3035, whichever is applicable.
- d. Pipe length shall be measured.
- e. Pipe marking shall be examined and checked for accuracy.
- f. Pipe ends shall be checked to ensure they are cut square and clean.
- g. Subject inside surface to a "reverse bend test" to ensure the pipe is free of oxidation (brittleness).

E. Stress Regression Testing

The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific polyethylene resin being utilized in the

manufacture of this product. This stress regression testing shall have been done in accordance with ASTM D2837 and the manufacturer shall provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 1,600 psi as determined in accordance with ASTM D2837.

F. Compatibility

Contractor is responsible for compatibility between pipe materials, fittings and appurtenances.

G. Warranty

The pipe MANUFACTURER shall provide a warranty against manufacturing defects of material and workmanship for a period of ten years after the final acceptance of the project by the OWNER. The MANUFACTURER shall replace at no expense to the OWNER any defective pipe/fitting material including labor within the warranty period.

PART 2 PRODUCTS

2.01 MATERIALS FOR PIPE SIZES 100MM (4") DIAMETER AND LARGER

- A. Materials used for the manufacture of polyethylene pipe and fittings shall be made from a PE 4710 high density polyethylene resin compound meeting cell classification 445474C per ASTM D3350; and meeting Type III, Class C, Category 5, Grade P34 per ASTM D1238.
- B. High Density Polyethylene (HDPE) pipe shall comply with AWWA Specifications C906.
- C. If rework compounds are required, only those generated in the Manufacturer's own plant from resin compounds of the same class and type from the same raw material supplier shall be used.
- D. Dimensions and workmanship shall be as specified by ASTM F714. HDPE fittings and transitions shall meet ASTM D3261. HDPE pipe shall have a minimum density of 0.955 grams per cubic centimeter. All HDPE pipe and fittings shall have a Hydrostatic Design Basis (HDB) of 1,600 psi (11.03 MPa).
- E. HDPE pipe 100mm diameter and larger, shall be 100 psi at 73.4 °F meeting the requirements of Standard Dimension Ratio (SDR) 17 as minimum strength or as required per the drawings and tender schedule. Fittings shall have an Equivalent Dimension Ratio (EDR) of 11.
- F. The pipe Manufacturer must certify compliance with the above requirements.

2.02 MATERIALS FOR PIPE SIZES 75MM (3") DIAMETER AND LESS

- A. Materials used for the manufacture of polyethylene pipe and fittings shall be made from a PE 4710 high density polyethylene resin compound meeting cell classification 445474C per ASTM D3350; and meeting Type III, Class C, Category 5, Grade P34 per ASTM D1238.

- B. High Density Polyethylene (HDPE) pipes shall comply with AWWA Specifications C901.
- C. If rework compounds are required, only those generated in the Manufacturer's own plant from resin compounds of the same class and type from the same raw material supplier shall be used.
- D. Dimensions and workmanship shall be as specified by ASTM D3035. HDPE fittings and transitions shall meet ASTM D3261. HDPE pipe shall have a minimum density of 0.955 grams per cubic centimeter. All HDPE pipe and fittings shall have a Hydrostatic Design Basis (HDB) of 1,600 psi (11.03 MPa).
- E. HDPE pipe 75mm (3") and less in diameter, shall be 100 psi at 73.4 °F meeting the requirements of Standard Dimension Ratio (SDR) 17 as minimum strength or as required per the drawings and tender schedule. Fittings shall have an Equivalent Dimension Ratio (EDR) of 11.
- F. The pipe Manufacturer must certify compliance with the above requirements.

2.03 FITTINGS

- A. All molded fittings and fabricated fittings shall be fully pressure rated to match the pipe SDR pressure rating or greater. All fittings shall be molded or fabricated by the manufacturer. No Contractor fabricated fittings shall be used unless approved by the Engineer.
- B. The manufacturer of the HDPE pipe shall supply all HDPE fittings and accessories as well as any adapters and/or special items required to perform the work as shown on the Drawings and specified herein.
- C. All fittings shall be installed using butt-fused fittings, thermo-fused fittings/couplings, or flanged adapters and must be approved by the Engineer. No size on size wet taps shall be permitted.
- D. All transition from HDPE pipe to stainless steel, ductile iron or PVC shall be made per the approval of the Engineer and per the HDPE pipe manufacturer's recommendations and specifications. A molded flange connector adapter within a carbon steel back-up ring assembly shall be used for pipe type transitions. Ductile iron back-up rings shall mate with cast iron flanges per ANSI B16.1. A 316 stainless steel back-up ring shall mate with a 316 stainless steel flange per ANSI B16.1.
 - 1. Transition from HDPE to ductile iron fittings and valves shall be approved by the Engineer before installation.
 - 2. No solid sleeves shall be allowed between such material transitions.
 - 3. Fittings and transitions shall be as manufactured by the pipe manufacturer or approved equal.
 - 4. The pipe supplier must certify compliance with the above requirements.

2.04 PIPE IDENTIFICATION

- A. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 1.5 meters (5 feet):
1. Name and/or trademark of the pipe manufacturer.
 2. Nominal pipe size.
 3. Dimension ratio.
 4. The letters PE followed by the polyethylene grade in accordance with ASTM
 5. D1248 followed by the hydrostatic design basis in 160's of psi, e.g., PE 4710.
 6. Manufacturing standard reference, e.g., ASTM F714 or D-3035, as required.
 7. A production code from which the date and place of manufacture can be determined.
- B. Tracing Wire: Tracing Wire in trenched areas shall be 14-gauge solid conductor copper c/w 0.4mm (1/64") insulation adequately jointed to provide continuous conductivity 12 gauge wire shall be used for directionally drilled areas. The wire shall be taped to the water piping with standard electrical tape as required to facilitate installation unless installing via chain trenching operations.
- Conductivity wire risers shall be "tee" spliced onto the continuous tracer wire and extended to 1.0m above ground surface at all valves and marker posts (where necessary) to provide adequate conductivity for location of all lines.
- All splices shall be crimped and sealed with an approved waterproof heat shrink sleeve.
- C. Marking Tape: Marking tape shall be installed per the Engineer approval.

PART 3 EXECUTION

3.01 JOINTING METHOD

- A. The pipe shall be joined with butt, heat fusion joints as outlined in ASTM D2657. All joints shall be made in strict compliance with the manufacturer's recommendations. A factory qualified joining technician as designated by pipe the manufacturer or experienced, trained technician shall perform all heat fusion joints.
- B. Lengths of pipe shall be assembled into suitable installation lengths by the butt-fusion process. All pipe so joined shall be made from the same class and type of raw material made by the same raw material supplier. Pipe shall be furnished in standard laying lengths not to exceed 15.24m (50') and no shorter than 6.1m (20') for pipe of 150mm (6") diameter and larger. Smaller diameter pipe may be supplied on standard reel lengths as per manufacturer.
- C. On days butt fusions are to be made, the first fusion shall be a trial fusion. The following shall apply:
1. Heating plates shall be inspected for cuts and scrapes. The plate temperature shall be

measured at various locations to ensure proper heating/melting per manufacturer's recommendations and approval by the Owners representative.

2. The fusion or test section shall be cut out after cooling completely for inspection.
 3. The test section shall be 300mm or 30 times (minimum) the wall thickness in length and 25mm or 1.5 times the wall thickness in width (minimum).
 4. The joint shall be visually inspected as to continuity of "beads" from the melted material, and for assurance of "cold joint" prevention (i.e. – joint shall have visible molded material between walls of pipe). Joint spacing between the walls of the two ends shall be a minimum of 1.6mm (1/16") to a maximum 4.8mm (3/16").
- D. The polyethylene flange adapters at pipe material transitions or valve connections shall be backed up by ductile iron flanges or stainless steel flanges, mating with equivalent material types and be shaped as necessary to suit the outside dimensions of the pipe. The flange adapter assemblies shall be connected with corrosion resisting bolts, washers and nuts of Type 316 Stainless Steel as specified in ASTM A726 and ASTM A307. All bolts shall be tightened to the manufacturer's specified torques. Bolts shall be tightened alternatively and evenly. After installation apply a bitumastic coating to bolts and nuts.

3.02 INSTALLATION

- A. High Density Polyethylene (HDPE) Pipe shall be installed in accordance with the instruction of the manufacturer, as shown on the Drawings and as specified herein. A factory qualified joining technician as designated by the pipe manufacturer shall perform all heat fusion joints.
- B. HDPE shall be installed either by Open Trench Construction or Directional Bore Method as outlined in Section 3.02 Installation, Item Q – Open Trench Installation or Item R – Directional Bore Installation.
- C. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe shall be repaired as directed by the Engineer. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at his own expense.
- D. Under no circumstances shall the pipe or accessories be dropped into the trench or forced through a directional bore upon "pull-back".
- E. Care shall be taken during transportation of the pipe such that it will not be cut, kinked or otherwise damaged.
- F. Ropes, fabric or rubber protected slings and straps shall be used when handling pipes. Two slings spread apart shall be used for lifting each length of pipe.

- G. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects, which could damage the pipe. Stacking of the polyethylene pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.
- H. Pipe shall be stored on clean level ground to prevent undue scratching or gouging. The handling of the pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. The maximum allowable depth of cuts, scratches or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges or scratches.
- I. Pipe shall be laid to lines and grade shown on the Drawings with bedding and backfill as shown on the Drawings.
- J. When laying is not in progress the open ends of the pipe shall be closed by fabricated plugs, or by other approved means.
- K. Sections of pipe with cuts, scratches or gouges exceeding 10 percent of the pipe wall thickness shall be removed completely and the ends of the pipeline rejoined.
- L. The pipe shall be joined by the method of thermal butt fusion, as outlined in PART 3 – Execution, Section 3.01 Jointing Method. All joints shall be made in strict compliance with the manufacturer’s recommendations.
- M. Mechanical connections of the polyethylene pipe to auxiliary equipment such as valves, pumps and tanks shall be through flanged connections which shall consists of the following:
1. A polyethylene flange shall be thermally butt-fused to the stub end of the pipe.
 2. A 316 stainless steel back up ring conforming to ANSI B16.1 shall mate with a stainless steel flange.
 3. A536 ductile iron backup ring conforming to AWWA C207 and ANSI B16.5/B16.47 shall mate with cast iron flanges.
 4. 316 stainless steel bolts, washers and nuts shall be used.
- N. Flange connections shall be provided with a full-face neoprene gasket.
- O. All HDPE pipe must be at the temperature of the surrounding soil at the time of backfilling and compaction.
- P. If a defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner. All pipe and fittings shall be thoroughly cleaned before installation, shall be kept clean until they are used in the work and when laid, shall conform to the lines and grades required.

Q. Open Trench Installation:

1. Section 02221 – Trench Excavation, Bedding & Backfill shall apply in its entirety.
2. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 5 mm per meter of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.
3. Good alignment shall be preserved during installation. Deflection of the pipe shall occur only at those places on design drawings and as approved by the Engineer. Fittings, in addition to those shown on the Drawings, shall be used only if necessary or required by the Engineer.
4. Each length of the pipe shall have the assembly mark aligned with the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place. Joints shall not be “pulled” or “cramped”.
5. Precautions shall be taken to prevent flotation of the pipe in the trench.
6. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below top of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, pipe bedding shall be placed to fill any voids created and the backfill shall be recompact to provide uniform side support for the pipe.
7. Restrained joints shall be installed where shown on the Drawings or as directed by the Engineer.

R. Directional Bore Installation: Refer to Section 02320 - Horizontal Directional Drilling in its entirety.

3.03 CLEANING

At the conclusion of the work, thoroughly clean all of the new pipe lines to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. All flushing shall be coordinated with the Owner’s representative. Debris cleaned from the lines shall be removed from the job site.

3.04 TESTING

- A. Pressure testing shall be conducted per Manufacturer’s recommendations and as approved by the Engineer.
- B. All HDPE water mains shall be disinfected prior to pressure testing.

- C. All HDPE mains shall be field-tested. The Contractor shall supply all labor, equipment, material, gauges, pumps, meters and incidentals required for testing. Each main shall be pressure tested upon completion of the pipe laying and backfilling operations.
- D. All mains shall be tested at 150 percent of the operating design pressure of the pipe unless otherwise approved by the Engineer.
- E. Pressure testing procedure shall be per Manufacturer's recommendations or as follows:
1. Fill line slowly with water. Maintain flow velocity less than 0.6 meters per second.
 2. Expel air completely from the line during filling and again before applying test pressure. Air shall be expelled by means of taps at points of highest elevation.
 3. Apply initial test pressure and allow to stand without makeup pressure for two to three hours, to allow for diametric expansion or pipe stretching to stabilize.
 4. After this equilibrium period, apply the specified test pressure and turn the pump off. The final test pressure shall be held for one to three hours.
 5. Upon completion of the test, the pressure shall be bled off from a location other than the point where the pressure is monitored. The pressure drop shall be witnessed by the resident project representative and Owner's representative at the point where the pressure is being monitored and shall show on the recorded pressure read-out submitted to the Engineer of Record.
- F. Allowable amount of makeup water for expansion during the pressure test shall conform to Chart 6, Allowance for Expansion Under Test Pressure, Technical Report TR 31/9-79, published by the Plastic Pipe Institute (PPI). If there are no visual leaks or significant pressure drops during the final test period, the installed pipe passes the test.
- G. If any test of pipe laid disclosed leakage significant pressure drop greater than the manufacturer's recommended loss, the Contractor shall, at his/her own expense, locate and repair the cause of leakage and retest the line. The amount of leakage, which will be permitted, shall be in accordance with AWWA C600 Standards.
- H. All visible leaks are to be repaired regardless of the amount of leakage.
- I. The Contractor must submit his plan for testing to the Engineer for review at least 10 days before starting the test and shall notify the Owner's representative a minimum of 48 hours prior to test.

PART 4 MEASUREMENT AND PAYMENT

- 4.01 Measurement and payment shall be horizontally along the length of the installed pipe as staked by the Engineer.

1.1 GENERAL

This specification details the installation of Cathodic Protection for steel pipe, fittings, valves, curb stops and hydrants. All steel appurtenances that are in areas where servicing of these items is under the road surface, shall be cathodically protected. Cathodic Protection shall be included on all valves, hydrants, and appurtenances.

Mechanical fittings shall be avoided. However, in the event that they cannot be avoided, all metallic fittings shall have cathodic protection, Denso tape and paste.

1.2 MATERIALS

.1 STEEL PIPE

a) All steel pipe shall be cathodically protected as per the Typical Detail Drawings with high potential magnesium anodes as specified below:

High Potential magnesium anodes shall have the following chemical composition:

- Al 0.02% maximum
- Mn 0.80% to 1.5% maximum
- FE 0.03% maximum
- Ni 0.002% maximum
- Cu 0.003% maximum
- Zn 0.02% maximum
- Other 0.001% maximum
- Mg Remainder

Perforated galvanized steel core not to exceed 0.15 kg per metre of core.

b) Lead wire No. 10AWG is to be 3 m long.

c) Permeable cloth bag, containing the anode and backfill material is to consist of:

- Ground Hydrated Gypsum 75%
- Powdered Wyoming Bentonite 20%
- Anhydrous Sodium Sulphate 5%
- The grain size limits are:

- 100% passing the 850×10^{-6} m sieve size
- 50% or more retained by the 150×10^{-6} m sieve size

The mixture shall be firmly packaged around the anode by means of adequate vibration. Backfill material should be of sufficient quantity to cover all parts of the anode to a minimum thickness of 25mm. Anodes packaged in cloth bags shall be shipped in a plastic or heavy paper bag of sufficient thickness to permit normal handling without tearing.

d) Anodes may be packaged in cardboard tubes provided approval is received from the Municipal Engineer. Cardboard tubes shall conform to the following:

- 100 mm (4 inch) tubes, 3-ply, 4.3 mm (0.017 inch), absorption paper
- 150 mm (6 inch) tubes, 4-ply, 4.3 mm (0.017 inch), absorption paper

Cardboard tubes shall have devices to hold the anode in the centre of the tube. The size and type of anode shall be clearly marked on the container.

The shipping container shall be watertight plastic. The plastic shipping container is to

be removed prior to installation. Anodes shall carry a label identifying the manufacturer, type of anode, metal and backfill composition, and the net weight of the anode.

.2 BURIED FITTINGS, VALVES AND HYDRANTS

All buried fittings, valves and all hydrants shall be cathodically protected with a 5.5kg (12 lb.) zinc anodes as per the Typical Detail Drawing. Zinc anodes are to be supplied as specified below:

Zinc Anodes shall conform to ASTM B418-73 Type II and shall have the following composition:

- Aluminum 0.005% maximum
- Cadmium 0.003%
- Iron 0.001%
- Zinc remainder

The packaged zinc anode shall be supplied with 2 m of AWG #10/7 copper wire.

The shipping container shall be watertight plastic and is to be removed prior to installation. Anodes shall carry a label identifying the manufacturer, type of anode, metal and backfill composition, and the set weight of the anode.

.3 EXTERIOR BOLTS ON VALVES, HYDRANTS AND COUPLINGS

All exterior bolts on valves, hydrants and couplings shall be Stainless Steel 304 or approved equivalent.

1.3 INSTALLATION

.1 STEEL PIPE

a) Based upon a soil resistivity analysis conducted along the length of the pipeline, the Contractor shall install the weight and spacing of anodes as shown on the Typical Detail Drawings.

b) Watermain

Use at least one 7.7 kg (17 lb.) magnesium anode at each end of water main as specified by the Municipal Engineer.

Wires shall be connected to steel pipes and fittings with a cadweld.

Magnesium anodes shall be installed as per the Typical Detail Drawing.

A minimum of 10L (2 gallons) of water shall be poured on each anode to initiate the anode's operation.

c) Test Stations

The Contractor shall provide test wire leads No. 10 AWG solid copper wire with CSA Type TWH or better insulation. The lead wire shall be wrapped and soldered to the anode core according to the manufacturer's standard practice. The connection shall be stronger than the wire and shall be completely insulated with electrical potting compound. The lead wire is to be coiled for protection during handling. Test stations shall be in accordance with the Typical Detail Drawings. Test points should be installed at all isolation locations with one lead bonded on each side of the isolator so that isolation integrity can be checked.

.2 BURIED FITTINGS, VALVES AND HYDRANTS

A minimum of 4 L (1.0 gallon) of water is to be poured on each 2.3 kg (5 lb.) or 5.5 kg (12 lb.) anode to initiate the anode operation. An alternative is to soak the above anodes in water for a minimum of 10 minutes.

.3 CONNECTIONS TO EXISTING PIPES

All old steel, cast iron, or ductile iron being connected to must have at least two 7.7 kg (17 lb.) magnesium anodes at point of connection as specified by the Municipal Engineer.

1.4 TESTING REQUIREMENTS OF THE CONTRACTOR

.1 PRE-INSTALLATION

The Contractor shall undertake whatever testing is necessary to safeguard and protect existing utilities and structures.

Where test stations have been installed, the contractor will provide test data to verify that the Cathodic protection systems are providing the required level of protection. This information shall be provided on an annual basis during the warranty period until the work has received Final Acceptance.

1.5 PAYMENT

.1 CATHODIC PROTECTION

Payment for Cathodic Protection is to be considered incidental to the installation of all fittings, valves and hydrants. No additional payment will be made for this item.

Payment for cathodic protection of steel pipe shall be by the unit installed.

.2 TESTING REQUIREMENTS OF THE CONTRACTOR

There shall be no payment for Testing required by the Contractor.

1. GENERAL

1.1 SCOPE

- .1 This section specifies requirements for the inspection of gravity sewer lines, including:
 - a) Closed circuit television (CCTV)
 - b) Manhole, catch basin, main line and service inspections.
- .2 The purpose of the sewer inspection may be for the requirements of a construction completion certificate (C.C.C.)
- .3 The work of this section includes:
 - a) Supply of all materials, equipment, labour and supervision.
 - b) Cleaning of sewers immediately before inspection.
 - c) Inspection of manholes, catch basins, lateral connections, anomalies and deficiencies where specified.
 - d) All private service laterals shall be CCTV inspected and recorded onto digital format prior to and after cleaning and lining.

1.2 GENERAL

- .1 The work shall include television inspection of sewer mains between manholes including a digital or audio commentary on location and distance encoding, written report and still photographs of problem areas.
- .2 The equipment, materials and methods used must produce suitable video records and logs for the identification and categorization of deficiencies, as well as the determination of the location, extent and seriousness of each deficiency.
- .3 Video inspections are to be performed by a National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) certified inspector unless otherwise approved by the Municipality. Valid certificates must be provided upon request.
- .4 All software utilized for inspections must meet the latest version of NASSCO PACP Software Certification unless otherwise approved by the Municipality.

1.3 SAFETY PROCEDURES

- .1 The Contractor shall pay strict attention to the Alberta Occupational Health and Safety Act and Regulations and other construction safety measures.

1.4 MEASUREMENT PROCEDURE

- .1 Payment shall be full compensation for the procurement of all permits and processes, the supply and the installation of all materials, equipment.
- .2 labour, supervision and incidentals necessary to complete the work to these specifications.
- .3 Television inspection of sewers shall be measured in lineal metres from/to the center of the manhole(s). Only one payment shall be made for the successful inspection of each section of sewer main, regardless of the number of attempts made.

2. PRODUCTS

2.1 CLOSED CIRCUIT TELEVISION INSPECTION EQUIPMENT

- .1 Television equipment shall consist of a self-contained camera and a monitoring unit connected by a coaxial cable. This equipment shall be specifically designed and constructed for such inspection purposes. The camera shall be mounted on adjustable skids, or wheels, or have a height adjustment to facilitate the inspection of different sizes of pipe and to allow for visual judgment of ovality, by centering the camera within the pipe. The camera shall be waterproof and shall have a remote-controlled self-contained lighting system capable of producing effective illumination for all sizes of pipe. The lighting system shall be capable of lighting the entire periphery of the pipe.
- .2 For inspection of existing sewers, new connections, manholes and catch basins, the camera shall have pan and tilt capabilities. A Pan and Tilt camera view shall be conducted for each lateral, manhole, catch basins, defect or anomaly. Still photos shall be taken for each defeat or anomaly. Lighting for the pan and tilt camera or side wall scanning camera shall provide a clear picture of the entire periphery of the existing sewer.
- .3 Recorded picture quality and definition shall be to the satisfaction of the Owner. Provide televising equipment with an on-screen date and time clock, to permit the verification of the date and time of the television inspection.
- .4 Hemispherical head or fish-eye lens cameras are not permitted.
- .5 Distance measurement system used shall be regularly calibrated by the contractor. Provide televising equipment equipped with an on-screen distance meter, capable of registering distances in the sewer from the starting manhole, and accurate to the nearest 0.1 metre stationing, to facilitate in the locating of sewer features and/or defects from the ground surface.
- .6 Equipment shall be mounted in appropriate vehicle. Electrical power for the system shall be self-contained and shall not require removal for each set-up. External power sources from public or private residences shall not be permitted. Sound dampening shall be applied to the vehicle and equipment.
- .7 Stub lines and other locations where access is limited to one manhole shall be televised using a crawler equipped camera.
- .8 The Owner shall not be responsible for any loss or damage to the Contractor's equipment. The Contractor shall carry all necessary insurance to cover loss, damage, and/or retrieval during inspection. The Contractor shall be responsible for any damages due to sewer back-up or flooding that are caused by his cleaning or inspection operations. The Contractor shall promptly inform the Owner if any such damages occur.
- .9 A digital video shall be provided accompanied by an inspection report. It shall be a record of the condition of the mains, laterals, manholes and catch basins. The reference location for distance measurements shall be the centerline of the launch manhole (chainage 0+00). If the inspection includes an intermediate manhole, chainage shall be reset to 0+00 in the centre of the intermediate manhole. Each manhole to manhole section of pipe shall be located on the report form in such a way as to be readily identifiable. Identify such items as name of subdivision, street names, manhole numbers, type of pipe, joint length, direction of flows, pipe diameter, manhole depth, inspection date, names of the inspection technician, persons viewing, and videotape identification numbers. If applicable, Lot and block numbers and / or house address for all services shall be provided.

- .10 Two copies of the final CCTV report with corresponding video shall be provided to the Engineer within two weeks after the completion of the inspection. The report shall be submitted on USB memory drives. All drives shall be numbered and cross-indexed to the written report. Video footage shall indicate the size of the sewer, the manhole to manhole segment being inspected, the street address or location and any pertinent features observed during the televised inspection (service locations, leaking or faulty joints, debris in the line, offset joints, etc.). In addition, record this information on a written log or record.
- .11 To ensure photographic quality in reports, colour printers shall be used.

3. EXECUTION

3.1 CLEANING (FOR CCTV INSPECTION)

- .1 All sewer lines shall be flushed and cleaned prior to video inspection. Lines, including stubs, must be inspected with either actual flow or simulated flow produced by adding water at an upstream manhole or riser pipe. The simulated flow must produce a visible, laminar flowing stream in the line for the full length of the line being inspected. Inspections will be rejected where the simulated flow exceeds one-third the diameter of the pipe.
- .2 Roots, encrustation, refuse, sludge, dirt, sand and other debris resulting from the cleaning operations shall be removed from the downstream manhole of the section being cleaned. Passing material from the section being cleaned to the downstream sewer section shall not be permitted. All debris flushed from the lines shall be removed and the Contractor shall be responsible for the proper disposal of the material.
- .3 Water for flushing is generally made available from fire hydrants located near the job site or the local truck fill. The Contractor shall make arrangement with the Owner.

3.2 FLOW CONTROL

If possible, the video inspection shall take place during low flow conditions. When sewer flows are too high, generally more than 1/3 of the pipe diameter, to effectively conduct the inspection, flows shall be controlled as defined in Section 02952 — Temporary Flow Control.

3.3 CLOSED CIRCUIT TELEVISION INSPECTION

- .1 The CCTV inspection shall provide a full record of the condition of the pipes, manholes, catch basins and appurtenances along the designated section of sewer.
- .2 The Contractor shall not attempt a CCTV inspection if water levels in the pipe obstruct the camera's view unless instructed by the Owner/Engineer. At no time during video inspection shall the depth of flow exceed 1/3 of the pipe diameter. Camera travel shall be in the same direction as the flow, at all times, unless impractical or when a reverse run is necessary.

- .3 Transport the camera equipment through the sewers by means of mechanical or hand operated winches, coordinated to provide speed and directional control necessary to fully observe the sewer interior. When required, a small diameter polyethylene rope or similar line shall be installed in the sewer in advance of the inspection in order that the camera traction cable may be drawn through the sewer. This line shall be installed on a manhole to manhole basis with the line being tied off at each individual manhole to facilitate the quick removal of the equipment should the need arise due to mainline sewer blockages or other emergency situations.
- .4 The camera shall be positioned centrally in the pipe with a tolerance of +/- 10%. If conditions within the pipe do not allow for this configuration, a greater tolerance may be allowed upon approval from the Engineer. Chainages for the video inspection shall begin at the center of the starting manhole and terminate at the center of the ending manhole.
- .5 If for any reason, the video camera unit will not pass from one manhole to another then a reverse run shall be done at no extra cost.
- .6 Newly constructed pipes are to be video inspected with simulated flow by running water into an upstream manhole or clean-out.
- .7 Chainages for the video inspection shall begin at the inside face of the starting manhole wall and terminate at the inside face of the end manhole wall.
- .8 Direct communication shall be established between the monitoring station and the camera towing device operator. No loudspeaker devices shall be allowed.
- .9 The CCTV inspection shall document a complete visual survey of the sewer line from manhole to manhole or manhole to catch basin.
- .10 On completion the Contractor shall provide television reports and digital media as detailed above.

3.4 VIDEO SUBMITTALS

- .1 Video records are to be supplied by the Contractor and shall be in digital (USB memory stick) format and in colour.
- .2 All video inspections are to be done in colour and with sufficient lighting to result in clear high-quality picture.
- .3 The video inspection of each section of sewer line shall begin with a digital or audio commentary describing the following:
 - a) Time and date.
 - b) Weather.
 - c) Project / Development Description and/or Phase.
 - d) Location description in an on-from-to format as described on the list of lines to be inspected.
 - e) Manhole numbers as provided by the Owner or Engineer.
 - f) Size and use of sewer including pipe material.
 - g) Direction of flow / inspection.
 - h) Inspection Company / Technician.
 - i) This information shall also be written on the video report sheet.

- .4 The Contractor must also provide an 11" x 17" plan with an Index of video runs to pipe element or manhole numbers. Manhole numbers shall be as prescribed by the Engineer and, in the absence of such, the manhole numbers on the Detailed Engineering Drawings shall be used. The manhole numbers from the Detailed Engineering Drawings shall be on a plan showing the location and the number of the manholes and is to be bound in with the video and index sheet.

3.5 REPORT SUBMITTALS

- .1 A television work report, in log form, shall be completed during the inspection.
- .2 This log shall indicate the measured location of line elements and faults including, but not limited to:
 - a) Open joints.
 - b) Broken, cracked, collapsed or ovaled pipe.
 - c) Accumulation of debris or obstructions.
 - d) Root penetration and root rating (1 to 9 root rating system).
 - e) Infiltration and mineral deposits.
 - f) Water depth variation and sags.
 - g) Protruding gaskets.
 - h) Service connections and type (saddle, in-line or inserta-tee).
- .3 The reference location shall include the distance away from the reference manhole and also the position of the fault as referred to the crown of the pipe using the clock face notation. Significant faults are to warrant audio commentary on the video tape duplicating report information. The camera shall be stopped briefly at these locations. Colour photographs shall be taken of all sewer defects. The photographs shall be coordinated with the written report by reference numbers. Photographs of all deficiencies are required. Additional photographs shall be taken as deemed necessary.
- .4 One copy of the final digital report with corresponding photographs and one copy of the video inspection shall be furnished to the Engineer or the Municipal Engineer within one week after completion of the inspection.
- .5 All video inspection shall be numbered and cross indexed to the typewritten report. Reports shall be bound and if more than one report is submitted in one binding, then there shall be an index sheet provided with the binding indicating the contents. Separate reports shall be submitted for mains and for services.

1. GENERAL

This Section specifies requirements for supplying and installing storm sewer pipe.

1.1 Related Work

.1	Excavating, Trenching and Backfilling	Section 31 23 33.01
.2	Manholes and Catch Basins	Section 33 05 13
.3	Utility Pipe Jacking	Section 33 05 23.16
.4	Storm Sewer Connections	Section 33 41 16.02
.5	Cast in Place Concrete	Section 03 30 00
.6	Aggregate Materials	Section 31 05 16
.7	Concrete Reinforcement	Section 03 20 00

1.2 Scheduling of Work

- .1 Schedule work to minimize interruptions to existing services.
- .2 Maintain existing flow during construction.
- .3 Submit schedule of expected interruptions to Engineer for approval and adhere to approved schedule.

1.3 Measurement Procedures

- 1 Storm sewer mains and catch basin leads will be measured horizontally along the centerline of the pipe from the main, pipe connection or inside wall of the catch basin or manhole in meters of each size and class of pipe supplied and installed. Unit price bid shall be full compensation for all work necessary for supply and installation of storm sewer; including pipe laying, jointing, connections to existing pipes, manholes and catch basins, testing of system, including costs associated with camera inspection.
- 2 Trench excavation, bedding, initial backfill, and compaction will be measured under Section 31 23 33.01.
- 3 Connections to proposed manholes and catch basins to be incidental to this Section. No separate payment to be made.
- 4 Connection to existing mains and leads to be incidental to this Section including all materials, labour, equipment, supervision and all incidentals necessary to complete the work. No separate payment to be made.
- 5 Measure standard manholes and catch basin manholes as follows:
 - .1 Measure frames and covers, grade rings, slab top manhole barrels and base in vertical metres from the top of the frame and cover to the lowest invert elevation.
 - .2 The number of catch basins and manholes installed in any one project shall be recorded.

2. PRODUCTS

2.1 Concrete Pipe

- .1 Sulfate resistant (Type 50) pipe.
- .2 Non-reinforced circular concrete pipe and fittings to ASTM C14 Class III specification designed for flexible rubber gasket joints to ASTM C443.
- .3 Reinforced circular concrete pipe and fittings to ASTM C655 designed for flexible rubber gasket joints to ASTM C443.
- .4 Lifting Holes
 - .1 Pipe 900 mm and less in diameter, no lift holes.
 - .2 Pipe greater than 900 mm in diameter, lift holes not to exceed two in a piece of pipe.
 - .3 Provide prefabricated plugs to effectively seal lift holes after installation of pipe.

2.2 Plastic Pipe

- .1 All 200mm and 250mm storm sewer pipe shall be P.V.C SDR35.
- .2 Polyvinyl Chloride (PVC) to CSA B182.2, ASTM D3034, CAN3-B182.1, and CAN3-B182.2.
 - .1 Standard dimensional ratio (SDR), 35.
 - .2 Separate gasket and integral bell system.
 - .3 All joints to meet requirements of specification for joints for drain and sewer plastic pipes using flexible elastomeric seals (ASTM 03212).
- .3 Ultra-rib PVC pipe and fittings to meet CSA B182.4, ASTM F794 and Uni-Bell Uni-B-9.
 - 1 Minimum pipe stiffness to be 320 kPa as measured in accordance with ASTM Standard D2412.
 - 2 Gaskets shall be as designed for Ultra-rib pipe and shall meet the requirements of ASTM F477.

2.3 Cement Mortar

- .1 Portland cement to CAN3-A5-M sulphate resistant (Type 50).
- .2 Aggregate: to CAN3 – A82.56.
- .3 Masonry Cement: to CAN/CSA-A3000-A8, sulphate resistant, Type 50.

Concrete grout and mortar used for patching, filling and repairing holes, cracks and joints in concrete manholes shall be a pre-mixed, non-shrink, cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing agent and accelerating agents, which have been formulated for vertical or overhead use. It shall not contain chlorides, gypsum plaster, iron particles, aluminum powder or gas forming agents or promote the corrosion of steel it may come into contact with. Set time shall be less than 30 minutes. One-hour compressive strength shall be a minimum of 13 MPa (200 psi) and the ultimate compressive strength shall be a minimum of 35 MPa (5000 psi). Bond strength shall be a minimum of 11.5 MPA (1700 psi).

3. EXECUTION

3.1 Preparation

- .1 Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site.

3.2 Trenching, Bedding, and Backfilling

- .1 Do trenching, bedding, and backfill work in accordance with Section 31 23 33.01.
- .2 Trench line and depth as established by the Engineer.

3.3 Installation

- .1 Mains and catch basin leads.
 - .1 Lay and join pipe in accordance with manufacturer's recommendations.
 - .2 Handle pipe by approved methods. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
 - .3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
 - .4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
 - .5 Do not exceed maximum joint deflection or maximum bending radius recommended by pipe manufacturer.
 - .6 Do not allow water to flow through pipes during construction except as may be permitted by Engineer.
 - .7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
 - .8 Position and join pipes by approved methods. Do not use excavating equipment to force pipe sections together.
 - .9 Install gaskets as recommended by manufacturer.
 - .10 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .11 Align pipes carefully before joining.
 - .12 Bell and spigot pipe shall be laid with the spigot end pointing downstream. Concrete pipe shall be joined with confined O-ring joints. Pipe shall be joined with couplers and neoprene gaskets installed as per the manufacturer's recommendations.
 - .13 Where the pipe connects to or passes through a manhole the pipe shall have a joint connection within 1.5 metres measured from the outside wall of the manhole. The length of incoming pipe that cannot be bedded and supported by undisturbed soil shall be set in an approved concrete cradle or be supported with base stabilization rock as approved by the Engineer. The concrete to be an approved controlled low strength

material using 14mm maximum size aggregate with a 28-day compressive strength of 8MPa maximum or similar approved by the Engineer. Backfilling above the concrete cradle can commence once the concrete can withstand a person's weight.

- .14 It is the Contractor's responsibility to locate and protect all other structures, buried or above ground, in the vicinity of the work.
- .15 The pipe shall extend into manholes or catch basins a minimum distance of 10cm, maximum up to one quarter of the catch basin or manhole that it is entering.
- .16 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .17 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
- .18 Complete each joint before laying next length of pipe.
- .19 Minimize joint deflection after joint has been made to avoid joint damage.
- .20 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .21 When any work stoppage occurs, block pipes as directed to prevent "creep" during down time.
- .22 Plug lifting holes with approved prefabricated plugs set in non-shrink grout.
- .23 Cut pipes as required for special inserts, fittings or closure pieces in a neat manner, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.
- .24 Make watertight connections to manholes and catch basins. Use non-shrink grout when suitable gaskets are not available.

3.4 Testing

- .1 Camera Testing
 - .1 Camera Testing to be done as specified in Section 33 25.
- .2 Deflection Testing
 - .1 Deflection Testing to be done as specified in Section 01 45 16.13. Testing to be carried out on all sections over 2 joints in length.
- .3 Leakage Testing
 - 1 Where deemed necessary by the Municipal Engineer an exfiltration and/or infiltration test shall be conducted to ASTM E1003. These tests shall not be required if video inspections are done immediately after sewer construction and no deficiencies are observed. Any deficiencies shall be corrected by the Contractor and those portions of sewer affected shall be subject to an additional video inspection.

- 2 Infiltration or exfiltration shall not exceed following limits in litres per hour per 100 m of pipe, including service connections:
Allowable leakage = 4.61 litres per mm of pipe per 1000m per day, including manholes.
- .4 Alignment and Grade
 - .1 Sewer main and catch basin leads will be checked for alignment during construction. Any deviation from design alignment greater than 50 mm shall be corrected prior to backfilling.
 - .2 Sewer main design grade to be maintained as directed by Engineer. Any apparent discrepancies are to be reported immediately. Grade to be continuous through manhole. Invert elevation shall be within 50 mm of design elevation at all manholes and catch basins.

1. GENERAL

This Section specifies requirements for supplying and installing catch basin leads.

1.1 Related Work

- .1 Excavating, Trenching and Backfilling Section 31 23 33.01

1.2 Measurement Procedures

- .1 Trench excavation, bedding, initial backfill, backfill, and compaction to Section 31 23 33.01.
- .2 Catch basin leads will be measured horizontally along the center line of the pipe from the center of the main, pipe connection or inside wall of the manhole or catch basin in meters for each size and type of pipe supplied and installed. Unit price bid shall be full compensation for all work necessary for supply and installation of catch basin leads including pipe laying and jointing.
- .3 Connections to manholes, catch basins and existing pipes to be incidental to this Section. No separate payment to be made.

2. PRODUCTS

2.1 Plastic Pipe

- .1 Ultra-Rib PVC pipe and fittings to meet CSA B182.4, ASTM F794 and Uni-bell Uni-B-9 having a diameter of 250 mm
- .2 DR-35 PVC Pipe
- .3 Minimum pipe stiffness to be 320 kPa as measured in accordance with ASTM D2412.
- .4 Gaskets to be designed for Ultra-Rib pipe and shall meet ASTM F477.

3. EXECUTION

3.1 Trenching, Bedding, and Backfill

- .1 Trenching, bedding, and backfill to Section 31 23 33.01.
- .2 Trench line and grade as established by Engineer.
- .3 Do not backfill until pipe grade and alignment inspected by Engineer.

3.2 Laying Catch Basin Lead

- .1 Commence laying at manhole.
- .2 Lay and join pipe in accordance with manufacturer's recommendations.
- .3 Ensure bottom of pipe is in contact with shaped bed throughout its length.
- .4 Do not allow water to flow through pipes during construction except as permitted by Engineer.

3.3 Joints

- .1 Install rubber gaskets and couplers in accordance with manufacturer's instructions.

3.4 Connection to Catch Basins and Manholes

- .1 Break out opening to suit pipe diameter.
- .2 Cut pipe to conform to inside wall of manhole or catch basin.
- .3 Grout pipe in place.
- .4 Cradle first 0.5 m of concrete pipe in concrete. Thickness of encasement to be one half pipe diameter or 150 mm, whichever is greater.
- .5 Support pipes at manholes and catch basins with base stabilization rock.

.1 GENERAL

The construction of all sanitary sewer mains and related sewerage structures shall be in accordance with these specifications and all other relevant specifications.

Sewer mains shall refer to the supply and installation of pipe, manholes, bedding, including, but not limited to the cleaning and testing of sewer pipe in accordance with these specifications.

Sewer force mains shall refer to the supply and installation of pipe, manholes, bedding, valves, air releases, pigg ports, including, but not limited to the cleaning and testing of force main pipe in accordance with these specifications.

.2 MATERIALS

2.1 PIPE

a) Poly vinyl Chloride (PVC) pipe

- Conforming to CSA B182.2-M1983 and ASTM D 3034.
- Standard Dimension Ratio (SDR) shall be 35. For sanitary mains in larger than 1050 mm SDR 41 may be used, subject to the written approval of the Municipality. Approvals for SDR 41 shall be based on considerations such as depth, soil conditions and groundwater elevations.
- Jointing shall be bell and spigot type with rubber gaskets conforming to ASTM D 3212.

b) Concrete pipe (may be used with approval from the Municipality)

- Non-reinforced concrete pipe conforming to the Standard Specification ASTM C- 14 Class III.
- Reinforced concrete pipe in accordance with ASTM C-76, or Reinforced Concrete D-load pipe conforming to ASTM C-655.
- All concrete pipe to be manufactured with sulphate resistant (SR) cement Type V.
- Gasketed joints or confined O-rings as per ASTM C-443 requirements.

c) Force Main

- Poly Vinyl Chloride (PVC) pipe
 - Conforming to CSA B137.3 (series 160)
 - Dimension Ratio (DR) shall be 26.
 - Jointing shall be Bell and Spigot type with rubber gaskets conforming to the above standards or fused as per the manufacturer's specifications conforming to ASTM D 2152.
 - To facilitate location of force mains a tracing wire or approved equivalent shall be placed along all forcemains at the time of installation.
- High Density Polyethylene pipe (HDPE)
 - Conforming to AWWA C901 or AWWA C906
 - DR11 for pipe less than 150mm o DR 17 for pipe 150mm and larger
 - Heat fusion or insert with pack joint fitting conforming to CSA B137.1 for fittings less than 100 mm and conforming to AWWA C906 for fittings larger than 100 mm.

- Jointing of polyethylene pressure pipe greater than 100 mm shall be by thermal butt fusion process. Procedures recommended by the pipe manufacturer shall be followed.
- Jointing of polyethylene pressure pipe smaller than 100 mm shall be joined with heat fusion as recommended by the manufacturer.
- To facilitate location of force mains a tracing wire or approved equivalent shall be placed along all forcemains, low pressure sewer at the time of installation.

Any proposed alternate materials must be approved in writing by the Municipality.

2.2 INSULATION FOR SANITARY SEWERS

Insulation used shall be a minimum of 50 mm thick and be composed of rigid polyurethane foam which is formed onto the pipe. The insulation shall have a thermal conductivity of 0.161 @ 0.174 kcal/cm/h/m²/°C and have a minimum service temperature of -45°C. As an alternative a frost box can be installed using 50 mm foam panels as per the Typical Detail Drawing.

2.3 MANHOLES/CHAMBERS

- a) Body shall be Pre-cast reinforced sulphate resistant concrete barrel(s) and conical top with minimum 1200 mm inside diameter unless otherwise specified, conforming to ASTM C478. Slab tops are only allowed upon prior written approval by the Municipality.
- b) Bases shall be manufactured as per the Concrete Specifications with ASTM type V (Sulphate Resistant) concrete with a minimum 28-day compressive strength of 25 MPA. Manhole connections shall be either A Lok gaskets or booted connections.
- c) Frame and Cover - F-39 manhole covers shall be used unless specified otherwise by the Municipality. Sealed frames and covers shall be used in all ponding areas.
- d) Grade Rings shall be concrete. Bricks, shims, concrete blocks, rubber and steel riser rings and excessive amounts of rubberneck shall not be used to adjust manhole frames and covers. Concrete grade rings shall be manufactured as per the Concrete Specifications with ASTM type V (Sulphate Resistant) concrete with a minimum 28-day compressive strength of 25 MPA.
- e) Rungs - Manhole safety rungs shall be 20mm diameter ribbed extruded aluminum or hot dipped galvanized.
- f) Concrete - Cement to be ASTM TYPE V (Sulphate resistant) 28-day strength of 25MPa.
- g) O-Ring Confined Gaskets conforming to ASTM C – 443

- h) Bituminous Gasket-Type Sealant conforming to ASTM C – 990
- i) If specified, each manhole shall be sealed with an external rubber wrapping similar to the Infi-Shield Gator Wrap approved equivalent. Ground conditions may require manholes to be completely wrapped.
- j) Insulation - In cases where manholes are shallower than 2.50 meters, manhole bases, barrels and cones shall be insulated with 50mm thick and be composed of rigid polyurethane foam which is formed onto the barrels and cone. The insulation shall have a thermal conductivity of 0.161 @ 0.174 kcal/cm/h/m²/°C and have a minimum service temperature of -45°C. (see details). Chambers shall be insulated regardless of depth. Frost covers shall be pre-manufactured PVC a minimum of 75mm or approved equivalent.
- k) Chamber Isolation Valves All chambers shall have isolation gate valves placed outside the chambers within 2 to 3 meters of the chambers on each line. No services shall be located within 4 meters of the chambers.

2.4 BEDDING

a) Specified

Granular bedding (B1) shall have an even gradation falling within the following limits:

Screen Size (microns)	Allowable Passing (percent)
20,000	95 to 100
12,500	75 to 95
5,000	40 to 60
2,000	25 to 45
400	10 to 25
80	2 to 10

b) Optional Granular

i) Sand bedding shall have an even gradation falling within the following limits:

Sieve Size (microns)	Allowable Passing (percent)
5,000	100
2,000	70 to 95
400	30 to 65
160	10 to 25
80	2 to 10

ii) Select Native Material shall be well graded soil selected by the Contractor from the excavated trench material. It shall contain no particles larger than 32 mm in its largest dimension. It shall contain no frozen soil, roots or other objectionable material in quantities that might cause pipe damage, excessive settlement or

inadequate compaction. The moisture content shall be such as to allow proper placing and compaction.

- iii) Concrete shall be sulphate resistant, with a compressive strength of 25 MPa at 28 days, and a slump of 25-75 mm.

2.5 CONCRETE, GROUT, AND MORTAR

Concrete grout and mortar used for patching, filling and repairing holes, cracks and joints in concrete manholes shall be a pre-mixed, non-shrink, cement-based patching material consisting of sulphate resistant hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, which have been formulated for vertical or overhead use. It shall not contain chlorides, gypsum's, plasters, iron particles, aluminum powder, or gas forming agents or promote the corrosion of steel it may come into contact with. Set time shall be less than 30 minutes. One-hour compressive strength shall be a minimum of 1.5 MPa and the ultimate compressive strength shall be a minimum of 35 MPa. Bond strengths shall be a minimum of 12 MPa." Repair material shall be applied as per manufactures specifications. The Contractor shall submit the repair method to Engineer prior to repair.

2.6 AIR RELEASE VALVES

Air release valves shall be installed at locations approved by the engineer. Air release valves shall be non-corrosive single acting type. Each air release valve shall be installed in a chamber or manhole and be provided with an isolation valve between the air release valve and the main.

3 INSTALLATION

3.1 PIPE

a) Placement

- i) All pipe laying and connecting shall be in strict accordance with the manufacturer's recommended practice unless otherwise specified by the Engineer. Pipe shall be laid at the depth and location shown in the Detailed Engineering Drawings or as specified by the Engineer. The Municipality must be notified prior to backfill if the minimum pipe depth cannot be achieved.
- ii) The Contractor shall remove all water from the trench or tunnel prior to and during the installation of sewer mains and sewerage structures. All foreign material shall be kept out of the pipe before, during and after installation. When pipe laying is not in progress the pipe shall be temporarily plugged to prevent entry of water or other foreign material.
- iii) Bell and spigot pipe shall be laid with the spigot end pointing downstream.
- iv) The length of incoming pipe that cannot be bedded and supported by undisturbed soil shall be set in an approved concrete cradle. (see Detail 61-02)
- v) All insulated pipes shall be installed as per manufacturer's guidelines unless otherwise directed by the Engineer.

- vi) It is the Contractors responsibility to locate and protect all other utilities in the vicinity of the work.
- b) Open Cut Installation Refers to pipe installation in an open trench. Designed trench widths must be maintained to reflect appropriate loading on the pipe.
- c) Augured Installation refers to the installation of pipe into an uncased tunnel or hole. Refer to Section 13 – Trenchless Technologies (Auger/Bore) for detailed requirements.

3.2 MANHOLES

Manholes shall be constructed in strict accordance with the manufacturers' recommended practice unless otherwise specified in the Detailed Engineering Drawings or these Specifications. Upon request the consultant shall supply the Engineer with shop drawings for unique manholes prior to installation.

Manhole barrels showing signs of repair shall be rejected unless the repair has been completed by the manufacturer and approved by the Engineer. The repair shall be sound, properly finished and cured.

Manhole barrels shall be substantially free of fractures and shall be rejected for the following:

- Damage to the manhole barrel during the transportation and installation stages of construction. The damaged manhole may be repaired as noted above
- Bell and spigots that are broken for more than 5% of the external circumference

a) Placement / Body

- i) The Body shall be pre cast sulphate resistant reinforced concrete. All manholes shall be plumb with no leaning permitted.
- ii) For tee-risers or perched manholes a maximum of one precast concrete manhole riser or barrel section shall be placed on a freshly poured concrete bases and no further work shall be done for a minimum of 12 hours allowing time for the concrete base to set sufficiently.
- iii) The inside manhole wall shall be finished to a smooth surface. No voids or jagged edges of binding mortar at the joints will be permitted. Riser rings shall not be finished with mortar unless directed by the Engineer.
- iv) The joints for precast concrete manholes are to be of the confined o-ring type conforming to ASTM C443 or current version thereof. Conical tops, flat tops and grade rings which come without gasket are to be fully sealed to ensure the manhole will be completely water-tight. The contractor shall use an approved flexible bituminous gasket- type sealant. This shall be placed between all the grade rings and between the frame and the top grade ring. The sealant between the cone and the first grade ring and all other grade rings shall be 25mm. The joint seals shall be installed as per manufacturer's specified guidelines. Each manhole, all grade rings and barrel joints shall be sealed with an external rubber wrapping similar to the Infi-Shield Gator Wrap or approved equivalent.
- v) Stubs for future extensions shall be a minimum of 1.5m from the outside wall of the manhole, unless otherwise directed by Engineer. All stubs shall be plugged to

prevent the entry of water or other foreign material. The stub shall have positive grade toward the manhole, matching the grade of the future extension of the line. Stubs that grade toward the plug (future downstream manhole) shall be plugged at both ends of the section of pipe installed.

- vi) The incoming and outgoing pipes at a manhole shall be supported by an approved concrete cradle of an appropriate length to properly support the pipe. The cradle will be constructed in such a manner that will not hinder the future extension of the main. (see Detail 61-02)

When tying into existing stubs, the Engineer and Contractor shall field verify that the grade of the existing stub is not back graded. In the event that the stub is back graded, the Developer will be responsible to correct the grade of the stub, before tying into the existing stub. Any costs associated with the re-grading of a stubbed sewer line shall be borne by the Developer.

Drop manholes shall be installed on all drops where the space available between the inlet and outlet is suitable for the fittings required. If a suitable amount of space is not available, the grade of the incoming pipe is to be increased or the entire profile lowered to eliminate any drops. Where the inlet and outlet pipes are of similar diameter, the desirable drop across manholes is 3 cm and 6 cm where a change of direction occurs. Where the pipes are of dissimilar diameters, the crowns of the pipes are to be the same elevation.

Internal drop structures shall be outfitted with Reliner inside drop components.

The bowl size shall be determined by incoming pipe size and flow rates. The bowl shall be installed as per manufacturer's instructions using stainless steel fasteners. The appropriately sized drop pipe of SDR 35 PVC shall be securely attached to the manhole wall using stainless steel Reliner adjustable clamping brackets and stainless steel fasteners. Bracket interval shall be 1.2m maximum (minimum of 2 brackets). The connection of drop bowl to drop pipe shall be by flexible external pipe coupler (Fernco or approved equivalent). The turn-out at the base end of the drop pipe shall be accomplished with an appropriately angled PVC pipe elbow (45 degree recommended).

b) Concrete Base

i) Pour in Place

The concrete base shall be poured on level undisturbed soil. The concrete base shall have a minimum thickness of 150mm. A maximum of one-barrel section shall be placed on a freshly poured concrete base and no further work shall be done for a minimum of 12 hours allowing time for the concrete base to set sufficiently. The benching of the manhole outside the channel shall be smooth and slope toward the channel with not less than 2% grade. All channels shall be troweled smooth.

ii) Precast

All bases shall be sulphate resistant reinforced concrete. The precast base shall be set on 150 mm of compacted 20 mm gravel sub-base extending 150 mm beyond the perimeter of the precast base. The sub-base shall be constructed on level and undisturbed soil. The benching of the manhole outside the channel shall be smooth and slope toward the channel with not less than 2% grade. All channels shall be troweled smooth.

c) Frame and Cover

Frames and covers shall be installed as per the manufacturer's recommendations. The elevation of the frame after installation shall be as per the Detailed Engineering Drawings or as indicated by the Developer's Engineer. Where the frame elevation is not specified, they shall be set level to the existing ground or as directed by the Engineer. When the frame and cover are in a landscaped area there shall be positive grade sloping away from the manhole.

d) Ladder

For manholes the ladder rungs to be installed so that they align with the opening in the conical or flat top. The first rung should be within 750 mm of the manhole cover and continued with a 400mm O/C spacing all the way to the benching. All sharp edges on the ladder shall be smoothed to prevent injury. Ladder rungs shall not be installed over the inlet or outlet of the manhole wherever possible. It is preferable that where manholes are located within roadways that the ladder rungs are positioned such that when entering the manhole they face oncoming traffic where traffic is in one direction on the roadway. Where the roadway has two-way traffic the ladder rungs should be positioned perpendicular to the flow of traffic. No ladder rungs shall be installed within the grade rings.

e) Pipe Junction

The edge formed between the intersection of the pipe and the inside of the manhole wall shall be flush with the inside of the manhole wall and channel, and be well- rounded and mortared to form a water tight seal. Any spaces and gaps shall be mortared, and the top half of the pipe will be trimmed flush to the manhole wall. Where sewer mains pass through or enter manholes, the invert channel shall be troweled smooth and semi-circular in cross-section. It may be formed directly in the concrete of the manhole base, or may be constructed by laying sewer mains continuously through the manhole, and then removing the top exposed section of pipe after the surrounding concrete has hardened, and neatly trimming the edges.

Manhole suppliers normally offer a precast concrete base manhole with a gasket outlet to accommodate smooth-walled Ring-Tite and Enviro-Tite PVC pipe. (IPEX Centurion's ODs must be specified prior to order.) The installer must simply specify the appropriate outside diameter of the pipe to ensure a properly sized gasket will be cast into the manhole. The Ring-Tite and Enviro-Tite pipe should be chamfered and lubricated before insertion.

f) Grout Adapters

These fittings are manufactured from a stub of Ring-Tite, Enviro- Tite and Centurion pipe that has been coated externally with a sand, epoxy, cement- mortar mixture. A watertight connection can be made by placing the adapter into a manhole outlet followed by filling the annular space around the adapter with a non- shrink grout. The special coating is required because grout will not form a watertight bond with the PVC. Where the pipe enters the manhole, the pipe shall be made flush with the inside manhole barrel and openings shall be mortared flush with the pipe and inside manhole wall.

When placing a manhole over an existing PVC line, the existing PVC main shall be

adequately prepared (primed) and coated with sand, epoxy, cement mortar mixture where connections are to be made to the concrete manhole barrel.
Grout adapter stubs shall not be manufactured on site when approved materials are available.

g) Change of Flow Direction

Changes of direction of flow within manholes shall be made with a smooth curve with as long a radius as possible.

h) Elevation Adjustment

A minimum of 100 mm and a maximum of 300 mm with a quantity range of 1 - 3 precast various thickness grade rings shall be used to support the manhole frame unless otherwise specified by Municipality. Manhole covers are to be set accurately to grade as given in the Detailed Engineering Drawings. Where the frame and cover are in a landscaped area there shall be positive grade away from the manhole. Where the cover elevation is not specified, they shall be set level to the existing ground. The minimum thickness of concrete grade ring used in the construction of manholes is 75mm.

i) Backfill

The excavated cavity surrounding the completed manhole shall be backfilled as per the Trenching and Backfill specifications applicable to the pipe entering and/or exiting the manhole, whichever is more stringent.

j) Link Seals

When installing the link seal, the bolt heads shall be installed inside the manhole, so they are accessible for adjustments after installation is complete.

3.3 BEDDING

a) Placement

- i) Bedding shall refer to and include all Material placed from the bottom of the trench to 300mm above the pipe. Unless otherwise specified, bedding shall be placed by hand up to 300 mm above the crown of the pipe. This material shall be well tamped, in uniform 150 mm lifts, with hand tools along both sides of the pipe and compacted to 97% Standard Proctor Density unless otherwise specified. A minimum of 1 test per trench is required and shall be continued in 75 lineal metre intervals, which includes sanitary mains and services. The Municipality reserves the right to extend the maintenance period if inadequate testing is provided.
- ii) No bedding shall be laid in water or frozen ground or in any condition considered unsuitable by the Engineer.
- iii) The bedding shall be shaped so as to provide a uniform and continuous support for the pipe and fittings. Proper allowance shall be made for bells and couplings such that the coupling does not bear directly on the bedding or support the weight of the pipe.
- iv) Where granular bedding is specified (B1), a sand approved by the Municipality may be used as a substitute provided the pipe diameter is less than or equal to 375 mm and the pipe has water tight joints.

- v) Concrete bedding shall be placed only to the spring line of the pipe. When using concrete bedding the contractor shall wait 12 hours prior to backfilling.
- vi) Specifications for the various classes of bedding are illustrated in the Typical Detail Drawings at the end of this Section.

3.4 CONNECTIONS TO EXISTING SEWER SYSTEMS

a) Construction Bulkheads

Prior to extending an existing sanitary sewer, the Contractor shall notify the Municipality 48 hours in advance and, install a watertight bulkhead or seal, in the existing sewer immediately downstream of the point of connection, or the most practical location as determined by Municipality. This location is to be identified on the approved for construction drawings. This bulkhead or seal shall remain in place until the sanitary sewer has been cleaned of all accumulated water and debris and has been accepted by the Municipality. For pipes up to or equal to 375 mm in diameter the contractor shall contact the Municipality at least 48 hours in advance to install a plug or seal. For sanitary lines greater than 375 mm the contractor shall install a water tight bulkhead or seal. These shall remain in place until issuance of a construction completion certificate and/or the roadworks or other grading work has been completed. After issuance of a CCC, the Municipality will remove the plug or seal, or the contractor will be notified to remove the bulkhead.

During all work stoppages in construction of the sanitary sewer, the open face of the last pipe installed shall be plugged with a watertight seal to prevent sand, water, earth, or other materials from entering the pipe.

b) Tie-In to Existing System

The work under this item shall consist of removing existing plugs and making the connection as required to existing pipes or manhole stubs and shall include all trenching, bedding, laying and jointing of pipe, fittings, adapters, backfilling and clean-up, and other items necessary to complete the work as specified. Any damages during this work shall be repaired to the satisfaction of the Municipality.

c) Break-in to Existing Sewer Main or Manhole

The work under this item shall consist of breaking into existing manholes or sewer mains and connecting the new sewerage structure to the existing manhole or main. Break-in shall include all trenching, bedding, laying and jointing of pipe, fittings, adapters, backfilling and clean-up, and other items necessary to complete the work as specified. Any damages during this work shall be repaired to the satisfaction of Municipality.

3.5 CROSSING OTHER PIPELINES OR UTILITIES

Where the sewer main being installed crosses another pipeline or utility, the minimum clearance shall be 500 mm. The void between the two lines shall be completely filled with a minimum of 500 mm of granular or sand material compacted to 97% Standard Proctor unless otherwise approved by the Municipality. When crossing under an existing AC water main, a section of that water main (minimum 4m) shall be removed and replaced

with PVC. When crossing water mains, water services, sanitary sewer mains and sanitary sewer service lines by Auguring refer to Section 13 – Trenchless Technologies (Auger/Bore).

3.6 CLEANING

The Contractor shall clean all sewerage structures of sand, dirt, gravel, asphalt and other debris, and shall flush them clean before the maintenance period begins.

3.7 OFFSITE MARKER POSTS

Steel marker posts shall be required on all sanitary appurtenances located off site. The marker post shall be a 63mm diameter x 2600mm steel post painted green and embedded between 900mm and 1200mm below finished ground level. The marker post shall be installed 1m away from the sanitary appurtenance.

4 TESTING REQUIREMENTS OF THE CONTRACTOR

4.1 PRE-INSTALLATION

a) Materials

If pipe loading is within 10% of recommended pipe strength capacity and/or the soil conditions are highly variable in terms of moisture content, making design trench width difficult to maintain; the Municipality may require additional pipe loading calculations which take into consideration the trench width.

The contractor shall be responsible to inspect all materials delivered to site for condition, damage, roundness of pipes and conformance with these standards.

b) System

The Contractor shall undertake whatever testing is necessary to safeguard and protect existing utilities and structures.

4.2 INSTALLATION

a) Materials

The Contractor shall, upon request by the Municipality, provide documentation that material being delivered to or constructed at the site is consistent with the material specified.

b) System

No testing required.

4.3 POST INSTALLATION

a) Material

No testing required.

b) Deflection Testing

Deflection testing may be required by the Municipality either during construction and/or following construction. This may be done on any section of installed sewer main prior to final acceptance. The allowable deflection in PVC pipe is 7.5% of the base diameter as measured not less than 30 days following completion of construction. The base diameter is to be calculated in accordance with ASTM D3034.

c) Closed Circuit Television Inspection

All sewer mains shall be tested in accordance to Section 25 (Closed Circuit Television Inspection of Sewer lines)

d) Leakage Test

Where deemed necessary by the Municipality, an exfiltration and/or infiltration test shall be conducted. These tests shall not be required if video inspections are done immediately after sewer construction and no deficiencies are observed. Any deficiencies shall be corrected by the Contractor and those portions of sewer affected shall be subject to an additional video inspection.

Infiltration or exfiltration shall not exceed following limits in litres per hour per 100m of pipe, including service connections.

Nominal Pipe Diameter in mm	Make Up Water PVC Pipe
100	3.88
125	4.62
150	5.51
200	7.45
250	9.39
300	11.33

Nominal Pipe Diameter in mm	Make Up Water PVC Pipe
350	13.27
400	14.91
450	16.84
500	18.78
550	20.72
600	22.80

e) Pressure Testing

Pressure testing of HDPE forcemains shall be in accordance with the latest version of ASTM F2164. The test pressure shall be 1.0 times the rating of the pipe, but not to exceed the pressure rating of the lowest rated component in the test section, unless these components can be isolated. A Municipality representative shall be contacted to schedule to witness the test. When testing to a pressure lower than 1.0 times the pipe rating, the specifications for the lowest rated component shall be provided with the test results. Pressure testing of PVC forcemains shall be in accordance with Section 91.4.3-Post Installation. The contractor shall supply all necessary labour, materials, equipment, tools and incidentals to complete the tests in accordance with these specifications.

f) Tracer Wire

Tracer wire installation shall be considered complete and acceptable when the

Municipality can locate the forcemain using locating equipment.

.5 PAYMENT

5.1 PIPE

Payment for sanitary sewer mains shall be at the unit prices per lineal metre (L.M.) of pipe, including couplers, shown in the Tender for the various pipe sizes and bedding classes. Measurement shall be made along a straight line between centre line of the upstream manhole and centre line of the downstream manhole.

5.2 MANHOLES (Including drop-manholes)

Payment for manholes shall be at the unit price per vertical meter (V.M.) shown in the Tender Form measured to the nearest centimetre. The measurement for payment will be from the lowest invert to the top of the manhole frame. The items included shall be the supply of all materials, the construction of the complete manholes, including base, stubs and plugs, steps, frame and cover, excavation, backfill and clean-up, and all incidentals necessary to complete the work in accordance with these specifications.

5.3 BEDDING

Bedding is considered incidental to pipe installation, and unless specified otherwise, shall be included in the pipe unit price.

5.4 CONNECTIONS TO EXISTING SEWER SYSTEMS

Payment for tying into an existing system will be at the unit price per tie shown in the Tender Form. Such payment will be full compensation for all materials, fittings, adapters, labour, equipment, supervision and all work incidentals necessary to complete the work in accordance with these specifications.

5.5 CROSSING OTHER PIPELINES OR UTILITIES

Payment for crossing other pipelines or utilities will be at the unit price shown in the Tender Form. Such payment will be full compensation for all materials, fittings, adapters, labour, equipment, supervision and all work incidentals necessary to complete the work in accordance with these specifications.

5.6 CLEANING

Cleaning is considered incidental to the Work. There shall be no separate payment for cleaning.

5.7 TESTING REQUIREMENTS OF THE CONTRACTOR

a) Video Inspection

Video inspection of sewers shall be measured in lineal metres (L.M.) from the centre to centre of manholes. Payment for television inspection of sewers shall be at the tender price. Only one payment will be made and any subsequent inspections required by the Municipality will be at the Contractor's cost.

b) Other Testing

There shall be no payment for any other testing required to be undertaken by the Contractor.

.1 GENERAL

Building service connections for water and sewer shall be installed in accordance with these Specifications and/or approved Detailed Engineering Drawings.

.2 MATERIALS

2.1 COPPER AND PLASTIC SERVICE PIPE

No	Manufacturer	Model/Type	Size (mm)*	Remarks
1	CERO	K	19 to 50	Third Party Certified to ASTM B88 and CSA HC7.6-1978
2	Halstead	K	19 to 50	Third Party Certified to ASTM B88 and CSA HC7.6-1978
3	Great Lakes Copper	K	19 to 50	Third Party Certified to ASTM B88 and CSA HC7.6-1978
4	Poly Tubes	Municipal Tubing	19 to 50	CAN/CSA – B 137.10

* Approvals are based on nominal diameter. Servicing Standards are based on internal diameter.

2.2 MAIN STOP (Corporation Stop)

Conforming to: AWWA C800 Cambridge model 301, ball valve corporation stop (or equivalent) with compression type connections.

2.3 WATER SERVICE SADDLES

Robar type 2706 (bronze) or equivalent Double stainless steel straps.

2.4 CURB STOP (Curb Cock or CC)

Conforming to: AWWA C800 Ford model BC44-333SW-Q (or equivalent) with compression type connections.

2.5 SERVICE BOX

Service boxes shall be extension type for 2.4m to 3.0m bury, Trojan or approved equal.

The top box shall be 32mm, schedule 40 standard galvanized steel pipe complete with cap, 32mm brass pentagon head plug and 10mm set screw.

The casing shall be 25mm, schedule 40 standard galvanized steel pipe.

Bottom box shall be cast or ductile iron complete with a 10mm diameter stainless steel set screw. Casting shall have the manufacturer's name or identification marks distinctly cast upon them. The interior and exterior of the bottom box shall be epoxy coated in accordance with AWWA C 673. All coated elements shall carry a label identifying the name of the coating applicator.

The operating rod shall be a 12.7mm stainless steel rod for 20mm and 25mm curb stops, for 40mm and 50mm curb stops the operating rod shall be a 16.0mm stainless steel rod,

AIST type 304, attached to manganese bronze clevis, SAE 34, with a 3.5mm brass or stainless steel rivet. The manufacturer shall supply and insert the brass cotter pin into the clevis and apply sufficient bending to prevent the cotter pin from falling out of the clevis.

2.6 SEWER SERVICE PIPE

Poly Vinyl Chloride (PVC) Type PSM, Minimum 100 mm dia. & 150mm Conforming to CSA B182.1 M1983. Standard Dimension Ratio 28 Bell and Spigot type joints.
If the service is pre-insulated Urecon pipe it may conform to SDR-35 Poly Vinyl Chloride (PVC) Type PSM, greater than 150mm Conforming to CSA B182.1 M1983. Standard Dimension Ratio 35 Bell and Spigot type joints.

2.7 SEWER SERVICE FITTINGS

Tee or wye fittings connecting sewer services to PVC sewer mains shall conform to: CSA B182.2 M1983 Poly Vinyl Chloride (PVC) Type PSM Standard Dimension Ratio 28 Bell and spigot type joints.

2.8 INSULATED PIPE AND FITTINGS

Insulation for pipe and fittings shall be foam insulation a minimum of 50 mm in thickness. The insulation shall be Urecon insulated products or their equivalent. Kits to field insulate the fittings may be used as long as manufacturer's specifications are adhered to at all times.

As an alternative the Contractor may construct a Frost Box to the dimensions and materials shown on the Typical Detail Drawing 61-05, "Pipe Insulation Detail" in Section 61, Sanitary Sewer System.

2.9 BEDDING

For all open trench excavation services, such services shall be laid on granular bedding (B1) meeting the following gradation:

- a) Specified Granular (B1)

Granular bedding shall have an even gradation falling within the following limits:

Sieve Size (CGSB Spec.)	Allowable Passing (percent)
20,000	95 to 100
12,500	75 to 95
5,000	40 to 60
2,000	25 to 45
400	10 to 25
80	2 to 10

- b) Optional
 - i) Sand

Sand bedding shall have an even gradation falling with the following limits:

Sieve Size (CGSB Spec.)	Allowable Passing (percent)
5,000	100
2,000	70 to 95
400	30 to 65
160	10 to 25
80	2 to 10

- ii) Select Native Material

Shall be well graded soil selected by the Contractor from the excavated trench material. It shall contain no particles larger than 32 mm in its largest dimension. It shall contain no frozen soil, organics, roots or other objectionable material in quantities that might cause pipe damage, excessive settlement or inadequate compaction.

2.10 RINK HYDRANT VALVE OPERATING ASSEMBLY

The valve casing is to be constructed of 100mm ABS pipe. The operating rod shall be the same as a main valve rod. The CC shall be fitted with a 2" gate valve operating nut (QT67 style or approved equivalent). The top end of the rod is to be fitted with a 90mm diameter rock guard bolted to the operating rod with a 50mm square operating nut.

.3 INSTALLATION

Service connections shall be installed along the alignment approved in the Detailed Engineering Drawings. The Water and Sewer services shall be laid in a common trench unless otherwise specified.

3.1 AUGERING/TRENCHING

All services shall be open trenched across roadways. Augering may be allowed subject to written approval by the Municipality. Where the water service is 50 mm or smaller in size, the water and sanitary services may be installed in a common trench or augered tunnel if approved by the Municipality.

3.2 BEDDING

All services in open cut trenches shall be laid on 75 mm of granular B1 Bedding, and shall have the bedding placed up to a level of 300 mm above the crown of the highest service in the trench. B1 bedding shall meet the same gradation as specified in this section. Approved sand may be used with the approval of the Engineer provided the pipe diameter is less than 375 mm and the pipe has water tight joints.

3.3 WATER SERVICE CONNECTION

- a) Water service pipes shall be installed such that a minimum 2.75 metres cover is provided on the pipe at the property line.
- b) The main stop (corporation stop) shall be installed with a service saddle as specified in the Materials Section. Maximum service pipe sizes are 20mm for 150mm main and 25mm for 200mm main. This applies to direct tapping only. All main stops shall be at least 300 mm from the end of the water main joint. All main stops shall be at least 300 mm from another main stop and on a different plane. Main tapping shall be at an angle of 45° from the horizontal as illustrated in the Typical Detail Drawings and shall in no case be made in the top 1/4 of the water main.
- c) Tapping and installation of the main stop shall be in accordance with the manufacturer's specifications. Tapping for service connections shall be done with full operating pressure in the main unless otherwise approved by the Engineer.
- d) The service pipe, adjacent to the main stop shall be bent to form a gooseneck as illustrated in the Typical Detail Drawing and the bend shall be in the horizontal plane.
- e) Curb stops and service valves shall be installed in the designated location at or below the maximum elevation. The curb stops shall be placed on a preserved wood block or brick with a washed rock sump of same aggregate gradation as fire hydrant sump and of dimensions 1m x 0.5m x 0.30m. The rod shall be 300 – 900 mm below finished grade. A 50mm x 100mm, 2000mm long, marker stake painted blue shall be placed at all services. Services valves shall be installed in accordance with 91.3.4
- f) Curb stops shall be installed at the locations shown on the drawings or as directed by the Municipality. Generally, curb stops shall be located 300mm from property line in front street serviced areas and 500mm from property line in areas service from PUL's.
- g) Service box caps shall be embossed with water or sewer as applicable. All water caps shall be painted blue and all sewer caps shall be painted green prior to initial installation and re-painted prior to FAC inspection.
- h) Water services are to be extended onto private property such that they are a minimum of 1.0m beyond the outer limit of the easement and properly crimped watertight or plugged/capped.

3.4 SEWER SERVICE

- a) All sewer service connections to new PVC sewer mains shall be made using in-line tee or wye fittings as specified in the Material Specifications.
- b) When connecting to existing mains Insert-a-tee brand or PVC saddles may be used.
- c) Sewer service pipes shall have a minimum of 2.6m of cover at the property line.
- d) Sewer service connections to deep sewer mains shall be made using risers as shown in the Typical Detail Drawings. Service Risers shall be put on all services where the main is deeper than 4.5m, as measured from the final grade to the obvert of the pipe.
- e) The sewer line shall be kept free of soil, mortar and other foreign material during installation of the sewer service. Upon completion of installation the end of the sewer pipe shall be plugged with an approved plug.
- f) Sewer services shall be extended 1.0m beyond the easement boundary and shall be

properly capped.

- g) A 35mm by 90mm (2"x4") by 1500mm (5') timber marker stake painted green shall be placed at the plug. The stake must be placed in the ground so that it remains free standing and allows operation of the valve.
- h) Sewer service connections may be connected directly to manholes, if approved by the Municipality, dependent on the size of manhole and number of main connections to a manhole, the maximum number of services connected to a manhole shall be four (4). The seal between the service pipe and the manhole shall be water tight. Flow transition from sewer service lines into the main flow channel is to be made in the same manner as intersecting sewer mains. In general, the service pipe is to be extended to the main channel, matching pipe obverts, the top half of the service pipe removed and cemented into the benching.

3.5 CLEANING AND TESTING WATER SERVICE

A sufficient flow of water shall be put through the curbstop to ensure proper cleaning of all pipes and fittings. Water Services shall be subjected to the cleaning and testing imposed on the water mains to which they are connected.

3.6 CLEANING AND TESTING SEWER SERVICE

Sewer Services shall be subjected to the cleaning and testing imposed on the mains to which they are connected.

3.7 RINK HYDRANTS

Rink Hydrants are to be installed to the dimensions shown in the Typical Detail Drawings. The water tap, copper pipe and fittings are to be installed in accordance with the Service Connection Specifications. The valve casing is to be installed plumb. The operating rod is not to be pinned to the curb stop to facilitate removal of the rod from ground level.

.4 TESTING REQUIREMENTS OF THE CONTRACTOR

Refer to Testing Section for details.

4.1 PRE-INSTALLATION

If bedding material is different from that used for the sanitary sewer and/or the watermain, the Contractor shall provide a sieve analysis of the material proposed to be supplied.

4.2 INSTALLATION

Water and Sanitary Sewer service connections shall not be backfilled until inspected by the Engineer.

4.3 POST-INSTALLATION

The water service system will be tested in conjunction with the Water Distribution System. The sewer service is subject to the same test requirements as the sewer main it is connected to, including CCTV video inspection. Refer to Section 25 for details.

.5 PAYMENT

Payment shall be full compensation for the procurement of all permits and processes, the supply and the installation of all materials, the supply and use of all equipment, the supply and use of all labour and supervision; all being necessary to complete the work to specification at the construction site.

5.1 AUGERING/TRENCHING

Augering/trenching is considered incidental to the Work and no separate payment shall be made.

5.2 BEDDING

Bedding is considered incidental to the Work and no separate payment shall be made.

5.3 WATER SERVICE

Payment will be made per lineal metre (L.M.) of water service pipe installed for the unit prices submitted on the Tender Form and shall include augering/trenching and bedding.

5.4 SEWER SERVICE

Payment will be made per lineal metre (L.M.) of sewer service pipe installed for the unit prices submitted on the Tender Form and shall include augering/trenching and bedding.

5.5 FITTINGS

Main stops, service saddles, curb stops, service boxes, plugs, tees, wyes and bends shall be paid for on a unit basis and such payment shall be full compensation for the supply and installation of the specified fittings.

5.6 SERVICE RISERS

Service Risers shall be paid for on a unit basis and such payment shall be full compensation for the supply and installation of the specified CSP, concrete, spacers, compacted sand and any other materials or labour above what is required for a standard sewer service.

5.7 CLEANING

Cleaning shall be considered incidental to the work and shall not be paid separately.

5.8 TESTING REQUIREMENTS OF THE CONTRACTOR

There shall be no payment for the testing requirements of the Contractor except for the closed circuit TV inspection which will be paid under the Sanitary Sewer System inspection.

.1 GENERAL

The construction of all waterworks and appurtenances shall be in accordance with these specifications. Trenching and backfilling components are in a separate Section in this manual or refer to the appropriate Municipalities Standards.

Water mains shall refer to the supply, installation, testing, and cleaning of pipe and bedding in accordance with these specifications.

.2 MATERIALS

2.1 PIPE

Poly Vinyl Chloride (PVC) type CIOD (Cast Iron Outside Diameter) pipe meeting the specifications of AWWA C-900-89 (100 - 300 mm), AWWA C-905 (350 - 600 mm) and CAN3-B137.3-M86 latest version thereof.

The pipe must be CSA approved with a pressure rating of 1035 kPa (class 150). Dimension Ratio (SDR) shall be 18. Jointing shall be Gasketed bell-end, Gaskets shall conform to ASTM D1869, latest version thereof.

In cases where pipe is shallower than 3.0 meters, pipes shall be insulated. Insulation used shall be a minimum of 50 mm thick and be composed of rigid polyurethane foam which is formed onto the pipe. The insulation shall have a thermal conductivity of 0.161 @ 0.174 kcal/cm/h/m²/°C and have a minimum service temperature of -45°C.

2.2 FITTINGS

a) PVC

PVC Injection Moulded Gasketed Fittings meeting the specifications of Can/CSA- B137.2-M89 and AWWA C-907-91, latest version thereof. (Fittings of 300 mm or less).

Fittings shall be CSA approved with a pressure rating of 1035 kPa (class 150).

Dimension Ratio (DR) shall be 18. Colour coded blue.

Fabricated PVC reducers and fittings are not allowed.

b) Cast Iron

Will only be allowed if the fitting is not readily available in injection moulded PVC. (Fittings greater than 300 mm).

Conforming to AWWA C110.71 Class 1725 kPa. Jointed with push-on rubber rings.

Cathodic Protection shall be required.

2.3 TRANSITION COUPLINGS

Transition couplings to connect dissimilar pipe materials are to be robar style, or approved equivalent. The transition coupling shall have sleeves and end plates made of ductile iron conforming to ASTM A536. Bolts, nuts and washers shall be stainless steel type 304. Gaskets shall be made of vulcanized rubber conforming to the latest issue of ASTM D2000. The corrosion protective coating shall be applied to the sleeves and end plates and shall be factory coated with 3M scotchkote 206N or equal in accordance with AWWA C-213, coatings in contact with potable water. All coated elements shall carry a label identifying the name of

the coating applicator. The couplings shall be packaged and delivered as a complete unit (c/w sleeve, gaskets, end plates, nuts, bolts and washers).

2.4 VALVES

Cast Iron body and bronze mounted with grade of bronze used to be completely resistant to de-zincification by water have a pH of 9.0
Resilient seat gate valve type conforming to AWWA C-509.
Operating pressure shall be 1,200 kPa.
Push-on rubber ring connectors.
Non-rising stems, type 304 stainless steel. O-ring stem seals.
50 mm cast iron operating nut. All exterior nuts, bolts, and washers shall be type 304 stainless steel. All bolts and nuts shall have hexagonal heads.
Valves shall open in a counter clockwise direction.
Those portions of valves in contact with potable water shall be coated with 3M skotchkote 206N or approved equal in accordance with AWWA C213, coatings. All coated elements shall carry a label identifying the name of the coating and the coating applicator.
Internal and External portions of valves shall be coated with epoxy coating.

2.5 VALVE BOXES

Cast iron body, two section, bituminous coated.
Trojan Industries Type A or equivalent adjustable to 3.0 metre bury.
Comes with extension spindle and 50mm flange nut and cap and shall have a 2 inch top nut bolted to the rod with a stainless steel bolt. The rock catcher shall fit through the housing in any size casing.
Must be of sufficient length to provide adjustments of 300mm in up or down direction.
Extensions shall be cast iron suitable for use with valve boxes installed.
Lifter rings shall be Trojan Industries Type A or approved equivalent.

2.6 HYDRANTS

Conforming to AWWA C502.80 - Fire hydrants for ordinary waterworks service.
Canada Valve hydrants will be accepted.
Hydrants to be supplied with a minimum of one 300mm lower barrel extension. The combined length of the lower barrel and the 300mm extension shall allow at least 2.9 metres depth of bury for the watermain.
150 mm inlet connection with compression type push-on rubber ring joint to suit the watermain pipe.
Hydrants shall be supplied with break-away type ground level flanges.
Hydrants shall have two 63.5 mm hose nozzles threaded to conform to the Alberta Mutual Aid Thread Standard of 8 threads per 25.4 mm and open in a counter clockwise direction.
Hydrants shall also have a single pumper nozzle with an integral 125mm Stortz coupling and nozzle cover conforming to CSA CAN4-S543-M84 standard for internal lug quick connection couplings for fire hose. All nozzle caps and operating nuts shall be pentagonal in shape.
All hydrants are to have bolt down tops. Nozzle covers are to be painted the same colour as

the hydrant barrel.

Hydrants shall be equipped with a threaded drain which shall not be plugged unless so directed by the Municipality in consideration of the water table.

All flange nuts and bolts shall be stainless type 304 steel with hexagonal heads conforming to ASTM standards. Bolts and nuts shall be the size and length recommended by the valve and flange manufacturer. All bolts shall be installed with the bolt head on top.

A 2 mil. filter fabric shall be required at the top of the sump. The sump shall be constructed with washed crushed gravel meeting the following specifications:

Sieve Size	% Passing
25,000	100
20,000	60 - 95
16,000	35 - 65
12,500	10 - 30
10,000	5 - 15
5,000	0 - 5

2.7 **BEDDING**

a) Sand

Sand bedding shall have an even gradation falling within the following limits:

Sieve Size (CGSB Spec)	Allowable Passing (percent)
5,000	100
2,000	70 to 95
400	30 to 65
160	10 to 25
80	2 to 10

b) Granular (B1)

Granular bedding shall have an even gradation falling within the following limits:

Sieve Size (CGSB Spec)	Allowable Passing (percent)
20,000	95 to 100
12,500	75 to 95
5,000	40 to 60
2,000	25 to 45
400	10 to 25
80	2 to 10

c) Select Native

Shall be well graded soil selected by the Contractor from the excavated trench material. It shall contain no particles larger than 32mm in its largest dimension. It shall contain no frozen soil, roots or other objectionable material in quantities that might cause pipe damage, excessive settlement or inadequate compaction. The moisture content shall be such as to allow proper placing and compaction.

d) Concrete

Shall be 25 MPa concrete ASTM Type 50, slump 25-75mm, air 3%.

2.8 THRUST BLOCKING

Thrust blocking shall be done with 25 MPa ASTM Type 50 sulphate resistant concrete only. The dimensions of the thrust blocking shall be as shown in the Typical Detail Drawings.

2.9 CATHODIC PROTECTION

Ground Bed, Test station and access chamber, as shown in Typical Detail Drawings or an equivalent approved by the Municipality (see section 19 & standard details).

2.10 WATER CHAMBERS

Shall be constructed with min of 50mm insulation to a depth of 2.75m, in accordance with the approved design drawings.

All Chambers shall be water tight.

Chambers shall not be constructed in ponding areas.

.3 INSTALLATION

3.1 PIPE

a) Placement

i) All pipe laying and connecting shall be in strict accordance with the manufacturer's recommended practice unless otherwise specified.

Pipe shall be laid at the depth and location shown in the Detailed Engineering Drawings and verified by the Engineer.

Municipality must be notified prior to backfill if the minimum pipe depth cannot be achieved.

ii) The Contractor shall remove all water from the trench prior to and during the installation of water mains and appurtenances.

All foreign material shall be kept out of the pipe before, during and after installation. When pipe laying is not in progress the pipe shall be temporarily plugged to prevent entry of water or other foreign material.

iii) It is the Contractor's responsibility to locate and protect all other structures, buried or above ground, in the vicinity of the work.

b) Stubs

Stubs extending past the valve and terminating with a plug shall be a minimum of 6 m in length.

c) Open Cut Installation

Refers to the installation of pipe in an open trench.

d) Augered Installation

Augered Installation refers to the installation of pipe into a cased or uncased tunnel or hole. Refer to Auger Specifications for detailed installation procedures.

e) Link seals (when connecting pipe through concrete chamber walls)

When installing the link seal, the bolt heads shall be installed inside the manhole, so they are accessible for adjustments after installation is complete.

3.2 FITTINGS

Fittings shall be installed in the watermain at the required location. Pipe shall be cut and the joints made to provide a watertight pipeline. All fittings shall have thrust blocking installed.

3.3 TRANSITION COUPLINGS

Transition Couplings shall be installed at all locations where the water pipes are of dissimilar materials. Any portion of the protective coating which is damaged before or while being put into service shall be repaired with the appropriate repair kit recommended by the coating manufacturer. All transition couplings shall be wrapped with "Denso" tape.

The use of transition couplings will not be permitted when connecting PVC pipe sections, where PVC couplings are manufactured for this purpose.

3.4 VALVES

Valves shall be installed in the watermain at the required location. Pipes shall be cut and the joints made to produce a water-tight pipeline. Concrete thrust blocks shall be constructed at all valves. All valves are to be wrapped with Denso Tape.

3.5 VALVE BOXES

Valve boxes shall be installed centered and plumb over the wrench nut of the gate valve, and shall be supported in a manner such that strain or shock cannot be transmitted to the valve. The valve box cover shall be set 5 to 15 mm below flush with the existing pavement or ground surface unless otherwise approved by the Municipality. The rock disk nut shall be 300 – 900mm below finished grade. Rock disks shall be bolted onto the operating rod. Valve boxes shall be sliding type.

3.6 HYDRANTS

a) Placement

Hydrants shall be installed in the designated locations at the required elevations. All hydrants shall stand plumb with the hose nozzles parallel to the street centreline and the pumper nozzle at right angles to and facing the street. Concrete thrust blocks shall be constructed at hydrants.

b) Sump/Hydrant Drain Hole

A coarse gravel sump the width of the trench, from the back of the trench to 450 mm in front of the hydrant and 600 mm deep shall be placed around the hydrant after the pouring and placement of thrust block and base. Top of the sump to be 150 mm above the hydrant drain holes and covered with a 2 mil filter fabric to prevent intrusion of clay or silt into the gravel. The hydrant drain shall be clear of obstructions. Where the water table is above the bottom of the hydrant, the Engineer shall identify which hydrants are to be plugged and the sump will not be required, based on geotechnical design & field conditions.

3.7 BEDDING

a) Placement

The bedding shall be shaped so as to provide a uniform and continuous support for the pipe and fittings. Proper allowance shall be made for bells and couplings such that the coupling does not bear directly on the bedding or support the weight of the pipe.

Bedding shall refer to and include all soil or concrete material placed from the bottom of the trench to 300 mm above the pipe. Concrete bedding shall be placed only to the springline of the pipe.

No Bedding shall be laid in water or on frozen ground or in any conditions considered unsuitable by the Engineer.

Unless otherwise specified bedding shall be placed by hand up to 300 mm above the crown of the pipe. This material shall be well tamped with hand tools along both sides of the pipe and compacted to 97% Standard Proctor Density unless otherwise specified.

b) Alternative Material

Where granular bedding is specified, an approved sand may be used provided the pipe diameter is less than 375 mm and the pipe has water tight joints.

c) Classes

Specifications for the various classes of bedding are illustrated in the Typical Detail Drawing. Unless otherwise approved, Class B Bedding shall be used.

3.8 THRUST BLOCKING

Concrete thrust blocking shall be provided at valves, tees, wyes, bends, caps and plugs, and where changes in pipe diameter occur at reducers and fittings. It shall be placed

between undisturbed soil and the fittings, and the area of thrust block bearing shall be as shown on the Typical Detail Drawings. The fitting shall be wrapped in a plastic bond breaker so that the concrete is not in direct contact with the fitting. The blocking shall be placed so that the pipe at fitting joints and the bolts at flanged joints will be accessible for repairs. Thrust blocking will be considered part of the installation of valves, fittings and hydrants. The concrete shall have a minimum 12 hour set time before backfilling. (See 103.6.4 Inspection and Testing for thrust blocking HDPE watermains)

3.9 TIE-IN TO EXISTING WATERMAIN

The work under this item shall consist of removing existing plugs or fittings and making the connections as required to the existing pipe or fitting and shall include all trenching, bedding, laying and jointing of pipe, backfilling and clean-up, and other items necessary to complete the work as specified including all necessary adapters and fittings. All connections to existing pipelines shall be made with Ring-tite joints in accordance to manufacturer's recommendations. Should a transition coupling be required to connect pipes of dissimilar materials it shall be Robar style or equivalent.

3.10 CUT-IN TO EXISTING WATERMAIN

The work under this item shall consist of cutting into existing pipes in order to install fittings to make the connections as required and shall include all trenching, bedding, laying and jointing of pipe, backfilling and clean-up, and other items necessary to complete the work as specified including all necessary adapters and fittings.

3.11 RELOCATION OF EXISTING WATER MAIN

Relocation of an existing water main shall be carried out in accordance with the Material Specifications, installation of Waterworks Specifications, and all other relevant Specifications and Detailed Engineering Drawings.

An existing waterline shall only be relocated in the event that the pipe being laid comes within 500 mm of intersecting the existing pipe. Relocation shall only be carried out with the express approval of the Municipality. It shall be the Contractor's responsibility to obtain approval from the authority maintaining the existing pipe prior to relocation. Unless otherwise directed by the Engineer an existing waterline shall be relocated below the new crossing line with a minimum separation of 500 mm between the two pipes.

The bedding for the pipe passing below shall be class B with compacted granular material or non-shrinkable fill completely filling the void between the two pipes. The bedding between the two crossing pipes shall be firmly compacted to a density of 97% Standard Proctor Density.

3.12 CATHODIC PROTECTION

Cathodic protection shall be placed on all buried metallic pipe, fittings or appurtenances unless a geotechnical report recommends otherwise. Cathodic Protection is required on existing metallic pipes, hydrants and valves. Installation shall be as per Typical Detail

Drawings. Denso tape and paste shall also be applied to all metallic fittings and parts. The entire fitting shall be wrapped.

3.13 CROSSING OTHER PIPELINES OR UTILITIES

Where the watermain being installed must cross another pipeline or utility the void between the two lines shall be completely filled with granular or sand material compacted to 97% Standard Proctor Density. Under normal conditions, watermains shall cross above sewers with a sufficient vertical separation to allow for proper bedding and structural support of the water and sewer mains.

Where the watermain and the existing pipe or utility cross within 500mm of each other, the watermain shall be lowered to cross under the existing pipe or utility such that a clearance of 500mm is obtained between the two. The void between the two lines and the excavated portion of the crossed pipe or utility shall be filled with approved granular material; hand placed and compacted to 97% Standard Proctor Density or non-shrinkable fill. There shall be no connections or joints in the watermain being laid within 1000mm of the pipeline crossing.

3.14 DISINFECTION AND CLEANING

At the Contractor's expense and before placing into service all potable water mains, fittings and appurtenances shall be thoroughly cleaned and disinfected. Methods used must be approved by the Municipality and Alberta Environmental Protection. Where a line is plugged and cannot be flushed through an existing hydrant, a suitable flush point designed by the consultant and in accordance with AWWA requirements shall be installed at the end of the line. The flush point is to be removed once the line is extended into future development phase. If the water main is to remain a dead end by design, the blow off shall remain in place permanently.

All temporary injection points used as part of the disinfection process shall be stainless steel service saddles, Robar 2606 series or equivalent. Upon completion of the disinfection process and approval by the Municipality, the corporation stop shall be turned to the off position and the service line cut and crimped if copper, or plugged if plastic, approximately 150mm from the corporation stop.

.4 TESTING REQUIREMENTS

The Contractor shall co-ordinate all testing (flushing, pressure testing, superchlorination and bacteriological) with the Engineer and Municipality. The Municipality shall be contacted by the Contractor to schedule for metering, and operation of the isolation valve(s). Under no circumstances shall the isolation valve(s) be operated by anyone other than the Municipality without first having obtained consent. The Engineer and Municipality must be provided 48 hours' notice to have representatives available for system testing and operation of the existing water system.

4.1 PRE-INSTALLATION

- a) The Contractor shall provide copies of sieve analysis of bedding material.

4.2 POST-INSTALLATION

a) Potable Water Pipe Cleaning

Before filling, pressurizing, testing, and disinfecting the installed line, the contractor shall ensure the line is clean in conformance with AWWA C605-13 & ANSI/AWWA C651. To facilitate effective disinfection and minimize the chlorine dosage needed, pre-disinfection flushing shall continue until the discharge turbidity is reduced to acceptable levels.

b) Hydrostatic and Leakage Tests

All water mains shall be tested in accordance with AWWA C605-13, PVC Water Main Testing, or the latest revision thereof.

Each section of pipeline shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The pump, pipe connection, taps, gauges and all other materials and labour shall be furnished by the Contractor.

During the filling of the pipe and before applying the specified test pressure, all air shall be expelled from the pipeline. To accomplish this, taps shall be made, if necessary, at points of highest elevation, and after completion of tests the taps shall be killed, unless otherwise specified. The test shall be made in sections containing no more than 100 joints or as directed by the Engineer. Hydrostatic test pressure shall not exceed 1035 kPa (150 psi) at the lowest point in the system for a period of two hours. For PVC pipe, the overall leakage for the section of line tested shall not exceed the rate of leakage specified in the Table below. The Contractor shall in the presence of the Engineer, examine the entire pipe and repair leakage as required to the satisfaction of the Engineer. The hydrostatic test shall be repeated until the results are satisfactory. Water loss values shall be supported with detailed calculations.

(Also see 103.6.5d, 1,2,3,4 for HDPE Material)

TABLE: Maximum Allowable Leakage (L/100 Joints/Hour) For PVC Pipe

Pipe Dia.	Test Pressure (kPa/psi)							
	345/50	515/75	690/100	860/125	1035/150	1380/200	1550/225	1724/250
100 mm (4")	1.46	1.77	2.00	2.28	2.46	2.90	3.07	3.28
150 mm (6")	2.17	2.65	3.07	3.43	3.76	4.34	4.60	4.82
200 mm (8")	2.90	3.54	4.09	4.57	5.02	5.79	6.14	6.46
250 mm (10")	3.62	4.42	5.12	5.71	6.27	7.34	7.67	8.10
300 mm (12")	4.34	5.30	6.14	6.86	7.52	8.69	9.20	9.70
350 (14") mm	5.07	6.19	7.16	8.00	8.77	10.13	10.74	11.33
400 (16") mm	5.79	7.07	8.19	9.14	10.03	11.58	12.27	12.94
450 (18") mm	6.51	7.96	9.21	10.28	11.28	13.03	13.80	14.56

Allowable leakage calculation is based upon the following formula:

$$\text{PVC pipe } L = ND(p^{0.5})/128,320$$

- L - allowable leakage in litres per hour
- N - number of joints
- D - nominal diameter (mm)
- P - test pressure (kPa) (1.0 psi = 6.9 kPa)

The Engineer shall be contacted when leaks or repairs are conducted & specified area shall be inspected prior to backfill.

c) **Chlorine Residual and Bacterial Testing**

All the watermains shall be disinfected in accordance with the latest version of AWWA Specification C651.

Minimum residual chlorine after 24 hours shall be 10 mg/L free chlorine.

After final flushing, following the primary disinfection period, and before the new water main is connected to the distribution system, bacteriological samples, taken at least 24 hours after disinfection flushing, shall be collected from the new main. At least one set of samples shall be collected from each 366m of the new main, plus one set from the end of the line and one set from each branch. All samples shall be tested for bacteriological quality in accordance with the Standard Methods for the Examination of Water and Wastewater and shall show the absence of coliform organisms. Samples for bacteriological analysis shall be collected from blow-offs, service taps or hydrants. Bacterial Test results and the disinfection records are to be submitted to the Engineer and Municipality for review and approval. Upon approval, the Municipality will place new water lines into service by opening the isolation valves. Bacteriological tests must

be performed by the Provincial Laboratory (ProvLab) for temporary, existing, and new water systems. The Contractor shall coordinate with the Owner to obtain and send water samples to ProvLab.

d) Disinfection Procedures and Testing Chlorine Residual and Bacteriological Testing

Water Pipe Disinfection

1. Inspect materials to ensure integrity
2. Prevent contamination of material during construction
3. Flush water pipe with potable water to remove contaminants prior to disinfection
4. Chlorinate water pipe
5. Flush super chlorinated water from water pipe

Methods of Chlorination

There are three methods for chlorination for water distribution pipes.

1. Continuous Feed Method
2. Tablet Method
3. Slug Method

The use of the continuous feed method is preferred. Tablet or slug method may be used upon written approval of the Engineer.

Continuous Feed Chlorination Method

1. Flush water pipe with potable water to remove contaminants prior to chlorine injection.
2. Water supplied from an existing potable water source shall be fed through a backflow prevention device.
3. At a point designated by the Engineer, chlorine shall be applied at a rate not less than 25 mg/L. Free chlorine tests shall be taken at regular intervals to ensure a consistent concentration of chlorine has been applied throughout the water pipes.
4. Operate all valves to ensure contact of chlorine to all surfaces.
5. When uniform chlorination is achieved, free chlorine residual tests shall be taken from test points designated by the Engineer. The free chlorine residual shall exceed 25 mg/L.
6. After a time period greater than 24 hrs, free chlorine residual tests shall be taken from the respective designated test points and shall be at levels equivalent to the existing water system. The free chlorine residual shall not be less than 10 mg/L. If the free chlorine residual is less than 10 mg/L, the line shall be thoroughly flushed with potable water and the chlorination procedure repeated.
7. Following disinfection of all the water pipes, all super chlorinated water shall be flushed completely from all water pipe, in an acceptable manner.
8. Upon completion of flushing super chlorinated water, free chlorine residuals shall be taken from designated test points and shall be at levels equivalent to the existing water system. After 24 hours, obtain samples shall be tested for bacteriological quality in accordance with the Standard Methods for the Examination of Water and Wastewater and shall show the absence of coliforms organisms.
9. Test results shall be submitted to the Engineer and Municipality for review and approval.

e) Disinfection and Bacteriological Test Reporting Procedures

Forms are provided in the back of this section for reporting results obtained from the Primary Disinfection Period and Chlorine Residual and Bacteriological Sampling. These reports are to be completed in full and submitted to the Engineer along with other test results, prior to construction completion. The report for the Primary Disinfection Period must have a sketch showing the test area, the chlorine application point, chlorine sampling points, the disinfection method employed and initial and 24 hour residual concentrations of free chlorine. The Chlorine Residual and Bacteriological Sampling Report shall include a sketch showing the test area, bacteriological sampling locations, total and free chlorine residuals and the results from bacteriological samples which must accompany the report.

Drinking water category shall be indicated by the Contractor on the chain of custody forms upon submission of samples to labs.

Drinking water category shall be identified by the lab on the test results or reports submitted with test package.

f) Flushing and Dechlorination

After the applicable retention period is over, heavily chlorinated water should not remain in prolonged contact with the pipe and should be flushed from the line as soon as possible to prevent damage to the pipe itself. Flushing of the line should continue until chlorine measurements show that the water leaving the main is no higher than that which is generally prevailing in the distribution system or is at an acceptable level for domestic use.

Discharge of heavily chlorinated water shall be neutralized by chemicals and apparatus suitable for that purpose. If approved by the Municipality, the chlorinated water may be discharged directly into the sanitary sewer.

After filling, pressurizing, testing, and disinfecting the installed line, the contractor shall ensure the line is clean in conformance with AWWA 605-13 & ANSI/AWWA C651. Post-disinfection flushing shall continue until the discharge turbidity drops below 2 NTU. The Municipality shall be contacted to obtain and test the water samples.

- g) Any failed bacteriological tests may require re-disinfection of the failed section as per the procedures as stated from above(c) to (e).

.5 PAYMENT

5.1 PIPE

Payment for water mains, system testing and disinfection shall be paid as one item at the unit prices per lineal metre shown in the Tender Form for the various types of installation, pipe type, bedding and pipe sizes indicated. Such payment will be full compensation for all materials, labour, equipment, supervision and all incidentals necessary to complete the work to these specifications. The length of the main shall be taken as the assembled length of pipe installed.

5.2 FITTINGS

Payment for the supply of all materials and the installation of all fittings, including thrust blocking, will be the unit price for each shown in the Tender Form. Such payment will be full compensation for all materials, labour, equipment, supervision and all incidentals necessary to complete the work to these specifications.

5.3 TRANSITION COUPLINGS

Transition Couplings shall be considered part of the connections to existing systems and there shall be no additional payment for Transition Couplings.

5.4 VALVES

Payment for the supply of all materials and the installation of all valves will be the unit price for each shown in the Tender Form. Such payment will be full compensation for all materials, labour, equipment, supervision and all incidentals necessary to complete the work to these specifications.

5.5 VALVE BOXES

Valve Boxes shall be considered part of the installation of valves and there shall be no additional payment for valve boxes.

5.6 HYDRANTS

Payment for the supply of all materials and the installation of all hydrants will be at the unit price for each shown in the Tender Form. Such payment will be full compensation for all materials, labour, equipment, supervision and all incidentals necessary to complete the work to these specifications.

5.7 THRUST BLOCKING

Thrust and Anchor blocking shall be considered part of the installation of valves, fittings, and hydrants and there shall be no additional payment for thrust blocking.

5.8 CONNECTIONS TO EXISTING SYSTEMS

Payment for connections to existing system will be at the lump sum price for tie-ins shown on the drawings. Such payment will be full compensation for all materials, fittings, adapters, labour, equipment, supervision and all incidentals necessary to complete the work to these specifications.

5.9 WATERMAIN CROSSING OTHER UTILITIES

There shall be no additional payment for crossing other buried pipelines or utilities beyond the normal payment made for Watermain installation.

5.10 CATHODIC PROTECTION

There shall be no additional payment for cathodic protection. Cathodic protection shall be considered incidental to Watermain installation.

5.11 DISINFECTION AND CLEANING

There shall be no additional payment for disinfection and cleaning. It is considered incidental to Watermain installation.

5.12 TESTING REQUIREMENTS OF THE CONTRACTOR

There shall be no additional payment for testing required by the Contractor. It is considered incidental to Watermain installation.

**PRESSURE TEST – PVC (2 hour test) FOR
MUNICIPAL ENGINEERING**

DEVELOPER/OWNER: _____ SUBDIVISION: _____

CONSULTANT: _____ DATE: _____

CONTRACTOR: _____ PUMP LOCATION: _____

LOCATION: _____

The Contractor shall co-ordinate all testing (flushing, pressure, chlorine, bacteriological) with the Engineer and the Municipality.

Note: _____

Time	Read Pressure psi/kPa	Length	Size	Material Type	# of Joints	Make up water
Start	_____	_____m	_____mm	_____	_____	_____L
	_____	_____m	_____mm	_____	_____	_____L
Finish	_____	_____m	_____mm	_____	_____	_____L
	_____	_____m	_____mm	_____	_____	_____L
Number of Hydrants						_____
Total Allowable Make up water						_____
Total Actual Make up water						_____
Contractor-Tester Name: _____						
Consulting Engineer Name and Signature: _____						
Municipal Representative Name and Signature: _____						

**CHLORINE RESIDUAL REPORT
MUNICIPAL ENGINEERING**

DEVELOPER/OWNER: _____ SUBDIVISION: _____

CONSULTANT: _____ DATE: _____

CONTRACTOR: _____ PUMP LOCATION: _____

LOCATION: _____

The Contractor shall co-ordinate all testing (flushing, pressure, chlorine, bacteriological) with the Engineer and the Municipality.

LOCATION	SUPER CHLORINATION METHOD USED:		POST- SUPER CHLORINATION		LINE FLUSHING	
	TEST DATE AND TIME Day 1	FREE CL ₂ (mg/L) High End	TEST DATE AND TIME Day 2	FREE CL ₂ (mg/L) Low End	FREE CL ₂ (mg/ L)	TOTAL CL ₂ (mg/L)
1)						
2)						
3)						
4)						
5)						
6)						
7)						
8)						

Note: _____

Contractor – Tester Name: _____

Consulting Engineer Name and Signature: _____

Municipal Representative Name and Signature: _____

**BACTERIAL SAMPLING REPORT FOR
MUNICIPAL ENGINEERING**

DEVELOPER/OWNER: _____ SUBDIVISION: _____
CONSULTANT: _____ DATE: _____
CONTRACTOR: _____ PUMP LOCATION: _____
LOCATION: _____

The Contractor shall co-ordinate all testing (flushing, pressure, chlorine, bacteriological) with the Engineer and the Municipality.

LOCATION	FIRST TEST SAMPLE DATE, TIME AND REFERENCE #	SECOND TEST SAMPLE DATE, TIME AND REFERENCE #
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		

Note: _____

Contractor – Tester Name: _____

Consulting Engineer Name and Signature: _____

Municipal Representative Name and Signature: _____

1. GENERAL

1.1 Related Work

.1	Concrete Reinforcing	Section 03 20 00
.2	Concrete Work	Section 32 16 15
.3	Manholes and Catch Basin Structures	Section 33 05 13
.4	Standard Details	Division 50

1.2 Reference Standards

- .1 Supply of ready-mixed concrete in accordance with CSA-A23.1 and testing of ready-mixed concrete in accordance with CSA-A23.2 except where specified otherwise.

1.3 Measurement Procedures

- .1 No measurement to be made under this Section.

2. PRODUCTS

2.1 General

Concrete shall consist of the following components:

- .1 Aggregates
 - .1 Coarse aggregate: greater than 5 mm particle size;
 - .2 Fine aggregate: less than 5 mm particle size of natural or approved manufactured sand.
- .2 Paste
 - .1 Portland Cement;
 - .2 Supplementary cementing materials;
 - .3 Water;
 - .4 Air-entraining admixture;
 - .5 Additional admixtures where permitted by the Engineer.

2.2 Aggregate Materials

- .1 General
 - .1 Upon request by the Engineer and prior to establishing a source of aggregates, the Contractor shall have the aggregate sampled at the source of supply by an independent appointed testing firm. The source of supply will be approved if the samples submitted meet the requirements of these Specifications.

- .2 Records of the testing of all aggregates used for the production of concrete must be maintained and be disclosed to the Municipal Engineer upon request.

.2 Fine Aggregate

- .1 Fine aggregate shall meet the requirements of CSA-A23.1 except as modified by the following paragraphs:
- .2. Fine aggregate shall be natural sand or approved manufactured sand, washed clean, having hard, strong, sharp, durable uncoated grains, and shall be free from injurious amounts of dust, lumps, soft or flaky particles, mica, shale, alkali, organic matter, loam, or other deleterious substance. Sand shall be tested for impurities by colorimetric test in conformity with CSA Test Method 123.2-7A and sand giving a colour darker than the reference standard colour will be subjected to CSA Test Method A23.2-4A to determine its acceptability.

- .3 Aggregate sizing shall conform to CSA-A23.1, Section 5, Table 4, FA 1:

<u>SIEVE SIZE</u>	<u>TOTAL PASSING SIEVE % BYMASS</u>
10 mm	100
5 mm	95 - 100
2.5 mm	80-100
1.25 mm	50-90
630 um	25-65
315 um	10-35
160 um	2-10

- .4 Deleterious materials within the fine aggregates shall be limited as follows:

- Ironstone: 1%
- Clay: 1%
- Coal and Lignite: 0.5%
- Shale: 0.5%
- Material Smaller than 80 microns: 3%
- Organic Impurities: CSA-A23-2-7A

- .5 Should the necessity for frequent rejections occur, no further sand will be accepted from that source and another approved source will be required.

.3 Coarse Aggregate

- .1 Coarse aggregate shall conform to the requirements of CSA-A23.1 except as modified by the following paragraphs:
- .2 Coarse aggregate shall consist of gravel or broken stone composed of strong, hard, durable uncoated pebbles, or rock fragments, washed clean and free from injurious amounts of shale, coal, clay, lumps, soft fragments, dirt, glass, and organic, or other deleterious substances.

- .3 Aggregate sizing shall conform to CSA-A23.1, Section 5, Table 5, Group 1 (20-5):

<u>SIEVE SIZE</u>	<u>% PASSING BY WEIGHT</u>
28 mm	100
20 mm	85-100
10 mm	25-60
5 mm	0-10
2.5 mm	0-5

- .4 Deleterious materials within the fine aggregates shall be limited as follows:

- Ironstone: 1%
- Soft Fragments: 5%
- Coal and Lignite: 0.5%
- Shale: 1.5%
- Clay: 0.25%
- Materials Smaller than 63 microns: 3%

- .5 Aggregates shall be kept clean and free from all other materials during transportation and handling. The aggregates shall be kept separated from each other at the Site, until measured and placed in the mixer.

2.3 Portland Cement and Concrete Materials

.1 General

- .1 Portland Cement shall conform to CSA-A5 for the following types:

<u>NAME</u>	<u>TYPE</u>
Normal	10(GU)
High Early Strength	30(HE)
Sulphate Resistant	50(HS)

- .2 The cement manufacturer's mill test reports must be submitted to the Engineer upon request.

.2 Air-Entraining Admixture

- .1 An air-entraining admixture conforming to CSA-A266.1 must be added to the batch independently. Sufficient air-entraining admixture shall be added to produce the air content as specified herein. No additional payment will be made for the use of air-entraining admixture.

- .3 Water Reducing Admixture
 - .1 Water reducing admixture, if approved by the Municipal Engineer, shall conform with the requirements of ASTM C494. Before using a water reducing admixture the concrete supplier shall furnish evidence that it will be compatible with the brand of air-entraining admixture he proposes to use. No additional payment will be made for the use of water reducing admixture.
 - .2 Superplasticizing admixture is referred to as "water-reducing, high range admixture" in ASTM Standard C 494. Chemical admixtures shall conform to the requirements of ASTM Standard C 494 or C 1017 when flowing concrete is applicable.
- .4 Calcium Chloride Admixture
 - .1 Calcium chloride conforming to ASTM C494 shall only be used when approved by the Engineer, but in no case will the amount added be greater than 2% of the cement weight. It shall not be used when the air temperature is above 4°C.
- .5 Use of Chemical Admixtures in Concrete
 - .1 The use, chemical composition and classification of admixtures, the effects of admixtures, and the application of admixtures for use in concrete shall be as detailed in CSA-A266.2 and CSA-A266.4. Use of chemical admixture must be approved by the Engineer. No additional payment will be made for the use of chemical admixtures unless approved by the Engineer.
- .6 Water
 - .1 Water conforming to CSA-A23.1 to be used, and shall be furnished from sources approved by the Engineer. The Contractor shall make his own arrangements for the supply and payment of all water used on the work.
- .7 Supplementary Cementing Materials
 - .1 Pozzolanic mineral or fly ash shall conform to the requirements of CSA-A23.5, Supplementary Cementing Materials and their use in Concrete Construction. Fly ash to be Type C or Type F. No additional payment will be made for the use of pozzolanic mineral or fly ash.

2.4 Decorative Coloured / Stamped Concrete

Select colouring agents, coloured admixture, pigmented release agent, joint sealant, clear surface sealant, stamping equipment, and all material required to construct coloured, stamped concrete surfaces from the following supplier list or propose an alternate source to the Engineer for approval. Secure the approval for the final colour selection for all colouring agents from the Engineer prior to beginning production.

- .1 Colouring Agent
 - .1 Colour as approved by the Municipality.
 - .2 Produce the coloured concrete using an iron oxide type pigmented admixture conforming to ASTM C 979 added at the concrete batch plant and dry-shake colour hardeners added in place. The amount of colour pigments added to a concrete mixture should not be more than 10% of the mass of the cement (grey cement powder). In air-entrained concrete, the addition of pigment may require an adjustment in the amount of air-entraining admixture to maintain the desired air content.
- .2 Clear Acrylic Surface Sealant
 - .1 Apply a low-lustre, matte finish, clear coating recommended by the stamping system manufacturer to protect the imprinted concrete surface.
- .3 Joint Sealant
 - .1 Seal all joints with a premium-quality, three component, gun-grade, colour-matched, low-modulus sealant for dynamically moving joints for exterior applications as recommended by the stamping system manufacturer.

2.5 Concrete Mix

- .1 Mix Design Properties
 - .1 The mix design is to be completed by a qualified testing laboratory licensed to practice in Alberta and submitted for written approval to the Developer's and/or the Municipal Engineer prior to concrete being poured.
 - .2 Except as specified otherwise, the concrete mix shall provide:

Compressive Strength at 28 days	30 MPa (Min)
Class of Exposure	C-2
Maximum Water Cement Ratio (by mass)	0.45
Fine aggregate	CAN3-A23.1, Section 5, Table 4, FA 1
Coarse aggregate	CAN3-A23.1, Section 5, Table 5, Group 1, 20-5 nominal size
Entrained air	5.5 – 8.0 %

Slump at point of discharge:

- Cast-in-Place 80mm ± 20mm
- Extruded 35mm ± 10mm

Maximum fly ash content

20% by mass of cement, with no flyash permitted after September 15

Minimum cement content

- Cast-in-Place 325 kg/m³
- Extruded 305 kg/m³

.3 Where the 7-day strength is less than 65% of specified 28-day strength, additional curing and changes to the mix proportions are to be provided to ensure specified 28-day strength is attained.

.2 Mix Design Approval

- .1 Upon request, the Contractor shall submit the mix design to the Municipal Engineer for approval.
- .2 The Municipal Engineer will require up to 5 working days from the time of receipt of the mix design, for evaluation.
- .3 Where required by the Municipal Engineer, for any change in the nature of sources of the aggregates, or where a new mix design is desired by the Contractor, the Contractor shall provide a separate and complete mix design. This new mix design shall be subject to the approval of the Municipal Engineer.
- .4 No concrete mix produced prior to the Contractor receiving written approval of the mix design by the Municipal Engineer will be accepted.
- .5 The Contractor shall be totally responsible for the production of aggregates and mixes in conformance with the contract.

.3 Synthetic Reinforcing Fibres

- .1 Synthetic reinforcing fibres such as fibremesh or equivalent may be used as an alternative to steel wire mesh upon written approval of the Engineer.
- .2 Synthetic reinforcing fibres shall meet the following specifications:
 - .1 To be used with Class B or C Concrete only.
 - .2 Fibre shall be polypropylene.
 - .3 Fibre tensile strength shall be a minimum of 550 MPa.
 - .4 Fibre content shall be a minimum of 1 kg/cubic metre.
 - .5 Fibre length shall be the following:

Fibre Length	Aggregate top size
50 mm	40 mm
50 mm	25 mm
38 mm	15 mm

2.6 Concrete Mix Design

- .1 An independent testing firm shall prepare concrete mix designs which will be submitted to the Engineer for each source of concrete supply prior to the commencement of the Contract. Concrete suppliers may submit their own mix designs, provided they submit documentation to show that they have been approved by an independent testing firm.
- .2 Trial mixes shall be prepared in the batch plant and/or truck mixed in accordance with Specifications. In each case where there is a change in the materials used, a new trial mix will be required.
- .3 Concrete supplied shall conform with the following minimum requirement.

**TABLE 1
CONCRETE DESIGN REQUIREMENTS**

Concrete Class	Concrete Strength (MPa)	Air Content (%)	Maximum Slump (mm) ±20mm	Cement Type	Maximum Flyash Content (%)	Maximum Water/Cement Ratio (by Mass)	Minimum Portland Cement Content (Kg/m ³)
A	30	5.5 - 8	80	10, 50	20	0.45	325
B	30	5.5 - 8	80*	10, 50	0	0.45	335*
C	30	5.5 - 8	80*	10, 30, 50	20	0.45	325*
D	25	5.5 - 8	80	50	20	0.5	275
E	5 - 10	5 - 7	150	10	20	N/A	150
F	0.5	4 - 6	150	10	20	N/A	25

*For extruded concrete:

- Maximum slump is 35mm ± 10mm
- Class B - minimum cement content is 315 kg/m³
- Class C - minimum cement content is 305 kg/m³

.4 Application of concrete classes:

Concrete Class	Application/Uses
A	Traffic Davit Base
B	Cold Weather Installation Sidewalk, Curb and Gutter, Swales, Slabs, Lane & Commercial Crossings, Medians, Bus Pads, Bus Pull-outs
C	Sidewalk, Curb and Gutter, Swales, Slabs, Lane & Commercial Crossings, Medians, Bus Pads, Bus Pull-outs
D	Manhole and Catch- basin Bases and Benching, Thrust Blocks, Class A Bedding and Underground Ducts, Cast-In-Place Foundations (Post, Playground Equipment, Park Furniture)
E	Lean Concrete Slurry Mix for Road Repairs
F	Fill Concrete for Trench Backfill

3. EXECUTION

3.1 Seasonal and Cold Weather Requirements

- .1 Seasonal and cold weather requirements shall conform to the requirements of CSA A23.1-21.2.3 unless specified otherwise.
- .2 Cold weather concrete is concrete poured with an air temperature at or below 5°C. In situations of this nature the Contractor shall conform to the requirements of CSA-A23.1 for Cold Weather Protection. In no instance is concrete to be placed on frozen subgrade or subbase. If metal forms are used they shall be heated as directed by the Engineer. Concrete delivered to the site shall have a temperature between 15°C and 32°C.
After September 15 all concrete placed shall attain its specified 28 day strength in 7 days.
During the curing process it is necessary to maintain concrete surface temperatures of 10°C for a period of 7 days by use of insulation or hoarding and heating around concrete. If accelerating admixtures are to be used they shall comply with CSA-A266.2, CSA-A266.4 and shall only be used upon written approval by the Engineer.
- .3 When the air temperature is at or below 5°C or is likely to drop below 5°C within 24 hours of placing concrete, the temperature of the concrete immediately after being deposited in the forms, is not less than 16°C nor more than 32°C. To accomplish this, the mixing water, and if necessary the fine aggregates, shall be heated. Aggregates shall not be heated above 65°C and all frozen lumps of aggregate shall be excluded from the mix.

When the exposure is severe, either due to low air temperature, location of the work, or thin sections of concrete, the temperature of the concrete shall approach the higher 32°C limit.

- .4 To avoid the possibility of flash set when either water or aggregate is heated to a temperature in excess of 38°C, water and aggregate shall come together first in the mixer in such a way that the temperature of the combination is reduced to below 38°C before cement is added. For mass concrete, the minimum temperatures stated above may be reduced at the discretion of the Engineer.
- .5 Hot weather concrete is concrete poured with an air temperature at or above 25°C. In situations of this nature the Contractor shall conform to the requirements of CAN3-A23.1 for Hot Weather Protection. In no instances is the concrete temperature to exceed 30°C. If retarding admixtures are to be used they shall comply with CAN3-A266.2, CAN3-A266.4 and shall only be used upon written approval by the Engineer.

3.2 Testing Procedures and Specifications

- .1 Concrete supplied for this Contract will be tested by a recognized testing laboratory appointed by the Engineer which will test according to CSA-A23.2 testing procedures unless otherwise specified for the following:
 - .1 Methods of Test for Concrete: CSA-A23.2
 - .2 Sampling of plastic concrete: CSA-A23.2-1C
 - .3 Temperature of freshly mixed Hydraulic Cement Concrete CSA-A23.2-17C
 - .4 Making and curing concrete compressions and Flexural test specimens CSA-A23.2-3C
 - .5 Air Content of plastic concrete by pressure method: CSA-A23.2-4C
 - .6 Slump of concrete: CSA-A23.2-5C
 - .7 Density, yield, and cement factor of plastic concrete: CSA-A23.2-6C
 - .8 Compressive strength of cylindrical concrete specimens: CSA-A23.2-9C
 - .9 Obtaining and testing drilled cores for compressive CSA-A23.2-14C
 - .10 Recommended practice for Microsopical Determination of Air-Void content and parameters of the Air-Void system in hardened concrete: ASTM C457
- .2 Where reference is made to an ASTM designation or a CSA standard, the current standard applies.
- .3 There shall be at least one strength test, slump test, and air content test, for each 25 cubic metres of concrete, or fraction thereof, and in any event, not less than one test for each class of concrete used each. For the purposes of this Section, each test shall represent the total volume of concrete placed on the day the test cylinders were cast, divided by the number of tests taken that day for each class of concrete.
- .4 When making tests on fresh concrete, not less than three specimens for each test shall be molded for compressive tests. One cylinder is to be tested at seven days and two at 28 days. The Engineer may require more tests than

- outlined above.
- .5 When the temperature is below 0°C during concrete placement, or is likely to fall below 0°C within 24 hours after a placement, two additional cylinders will be made for each test. These two cylinders will be field cured in a manner that simulates curing of the concrete placed.
 - .6 A minimum of two field cured cylinders will be required for any cast-in-place concrete which is to be post-tensioned.
 - .7 The Contractor shall give the Engineer 24 hours notice prior to any concrete placement or any work requiring testing in order that the Owner may arrange for required testing. The Owner shall be reimbursed by the Contractor for any charges to the Owner by testing agency as a result of testing agency being called out prematurely or as a result of having to wait for the Contractor for any reason.
 - .8 The foregoing does not apply to preparation of concrete mix designs for projects which the Contractor shall engage an independent testing agency. Cost of such mix design shall be borne by the Contractor. Copies of mix designs shall be submitted to Engineer for approval, however, such approval does not constitute acceptance of final product which shall meet requirements set forth elsewhere in this Section.
 - .9 If testing indicates substandard materials or workmanship, the Engineer and Contractor must be notified immediately and further testing, as approved by the Engineer, shall be completed at the Contractor's expense.
 - .10 The Contractor shall supply, as part of the Contract, all materials, scaffolding, labour, etc. required to facilitate testing services on a job site.
 - .11 All concrete testing personnel shall be certified by ACI or CSA/CCIL.

3.3 Testing Reports

- .1 Reports for concrete testing shall contain the following information:
 - .1 Job to which concrete is being supplied.
 - .2 Date of sampling.
 - .3 Air temperature when sampling.
 - .4 Temperature of mix.
 - .5 Name of supplier.
 - .6 Exact location in which the concrete is being placed.
 - .7 Specimen number.
 - .8 Test number.
 - .9 Slump.
 - .10 Age of test.
 - .11 Cylinder strength.
 - .12 Method of curing.
 - .13 Air content.
 - .14 Type of cement.
- .2 Upon completion of any test, the testing results shall be provided within five

(5) business days to the Municipality, the Engineer, the Supplier and the Contractor.

3.4 Defective Work

- .1 Concrete is defective when:
 - .1 It fails to meet any requirement of this specification.
 - .2 It contains excessive honey combing or embedded debris.
 - .3 Average of two 28-day strength tests from one set of cylinders is less than the specified strength.
- .2 When concrete strength of any set of test cylinders is less than the specified strength, price paid for work represented by deficient cylinders shall be determined as follows:

Amount Under Specified Strength	Unit Price Reduction
Specified Strength or Greater	No reduction or 0%
0.01 MPa to 1.0 MPa	2%
1.01 MPa to 2.0 MPa	5%
2.01 MPa to 3.0 MPa	10%
3.01 MPa to 4.0 MPa	15%
4.01 MPa to 5.0 MPa	25%
5.01 MPa to 6.0 MPa	40%
6.01 MPa to 10 MPa	100% Reduction
More than 10 MPa	Remove & Replace

- .3 All concrete which fails to meet any requirement of this specification shall be rejected prior to placement, or will be removed and replaced at the Contractor's expense.
- .4 The application of an adjusted unit price does not relieve the Contractor of the Contract maintenance requirements.

3.5 Appeal Cores

- .1 If the 28 day lab cure cylinders fail to meet the requirements of CSA A23.1-17.6.7.1, appeal cores may be collected using a Municipal approved testing

agency. The contractor has a maximum of 28 days from the date of the 28 day compressive strength test, to take appeal cores from the failed section. One set of three cores may be taken within 3 meters of the failed test location. The cores will be taken in accordance with CSA A23.2-14C and conditioned using the dry conditioning method. The concrete section will be deemed adequate if the field core average strength is greater than 85% of the estimated design strength at the time of testing. If the requirements are not satisfied, then the unit price reduction will be calculated using the original lab cured cylinders for the representative section of concrete. The area may be delineated with a maximum of one set of three cores obtained in each direction of the failed concrete section. Appeal core holes to be filled with concrete immediately.

3.6 Supply and Delivery of Concrete

.1 Mixing and Delivery

- .1 Ready mixed concrete shall be mixed and delivered in accordance with the requirements of A.S.T.M. designation C-94, CSA-A23.1.3 and subject to all provisions herein relative to materials, strength, proportioning, consistency, measurement and mixing unless noted otherwise.
- .2 If concrete placing is interrupted for a period of more than one-half hour, the work shall be removed back to the last surface cut and a construction joint shall be formed.

.2 Retempering

- .1 Concrete shall not be retempered if test values are within specifications at the time of delivery to the site.
- .2 Concrete may be retempered at the job site with water and/or an air-entraining admixture if the following requirements are met:
 - .1 **Addition of Water on the Job Site** - Water may be added by the concrete supplier to bring the concrete up to the designated slump provisional to the following requirements:
 - .1 The specified water-to-cementing materials ratio is not exceeded.
 - .2 No more than 60 minutes has elapsed from the time of batching.
 - .3 Not more than the lesser of 16L/m³ or 10% of the mixing water shall be added.
 - .2 **Air Adjustment on the Job Site** - The adjustment of air on site may be permitted under the following conditions.
 - .1 Retempering on site with an approved air-entraining admixture shall only be performed under the supervision by a quality control technician working for the concrete supplier or the Contractor. Dry, powdered, bagged or premeasured liquid air-entraining admixtures may be added by the concrete truck operator under the direction of the supplier's quality control technician. For retempering

purposes the concrete supplier shall use a comparable air-entraining admixture to what was originally approved for use in the mix design. Rotate the drum until the mix is uniform, after the addition of the air entraining admixture.

- .2 The quality assurance technician shall perform an air content test on each load of concrete retempered with air-entraining admixtures and shall immediately provide the test results to the Engineer and Contractor.
- .3 Guidelines for retempering with air-entraining admixtures:

Measured Air Content (%)	Action
4.0 – 6.0	Addition of water and/or air-entraining admixtures as deemed necessary by the supplier to meet specifications
< 4.0	No re-tempering with air-entraining admixtures or water is permitted; load will be rejected

- .4 When retempering with air-entraining admixtures, the supplier will be given one opportunity to meet the specified air content.
 - .5 If the need for retempering with air-entraining admixtures becomes persistent or continuous, the Engineer or his representative may refuse to accept concrete loads that have been retempered with air-entraining admixtures.
 - .6 The use of de-air-entraining admixtures is not permitted.
 - .7 A load of concrete will be rejected if it is retempered with air-entraining admixtures and the resulting air content exceeds the specified maximum air content.
 - .8 A load of concrete that is rejected at the jobsite may not be retempered at the concrete plant with cement, aggregate, sand or admixtures and subsequently returned to the jobsite.
- .3 The quality assurance technician shall perform an air content and slump test on each load of concrete retempered and shall immediately provide the test results to the Engineer. The next batch of concrete on-site must be also be tested to ensure specifications are met.

1. GENERAL

This Section specifies the requirements for formwork in conjunction with concrete work.

1.1 Measurement Procedures

- .1 No measurement will be made under this Section. Include costs in items of work for which concrete formwork is required.

2. PRODUCTS

2.1 Materials

- .1 Formwork materials: wood and steel formwork materials, as approved by the Engineer.
- .2 Tubular column forms: round, spirally wound laminated fibre forms, internally treated with release material.
- .3 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter and 10 mm deep in concrete surface.
- .4 Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.
- .5 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 and 110 s Saybolt Universal at 40°C, flashpoint minimum 150°C, open cup.

3. EXECUTION

3.1 Erection

- .1 Verify lines, levels, and column centres before proceeding with formwork and ensure dimensions agree with drawings.
- .2 Hand trim sides and bottoms and remove loose earth from forms before placing concrete.
- .3 Construct forms to produce finished concrete conforming to shape, dimensions, locations, and levels indicated within tolerances required by CSA-A23.1.
- .4 Clean formwork in accordance with CSA-A23.1, before placing concrete.
- .5 Remove formwork in accordance with CSA-A23.1.
- .6 Re-use of formwork subject to requirements of CSA-A23.1.

3.2 Isolation Joints

- .1 Contractor shall be required to carefully fit, cut, and mark the sidewalk around all openings, iron covers, manholes, vaults, waterworks stop cock boxes, lamp standards, hydrants, poles, and other surface installations in accordance with Section 32 16 15 and as directed by the Engineer. The joint shall be neatly tooled and marked to the satisfaction of the Engineer.

1. GENERAL

This Section specifies requirements for excavating trenches, and backfilling for installation of pipelines, sewers, conduits, and appurtenances.

.1 Related Work

.1 Division 33 -Utilities

.2 Definitions

.1 Common Excavation: Excavation, placement, and compaction in embankments of all on-site materials whatever nature, which are not included under the definition of topsoil stripping, waste excavation, borrow excavation, or rock excavation; including dense tills, hardpan, frozen materials, and partially cemented materials which can be ripped and excavated with heavy construction equipment.

.2 Rock Excavation: Rock excavation shall be paid for when the material encountered consists of mass or bedrock or a boulder of volume greater than 0.75 cubic meters. Such rock excavation is divided into two categories; (A) and (B), contingent upon its hardness and difficulty experienced in excavation. It shall be the Contractor's responsibility to demonstrate, to the Engineer's satisfaction that the material cannot be removed or that difficulty is being experienced through excavation by conventional means. In doing so, the Contractor may be required by the Engineer to seek and explore planes of weakness or layers that may ease the excavation process. Frozen material is not classified as rock.

.1 Type 'A' Rock

Type 'A' Rock refers to materials, such as fractured sandstone, shale or ledge rock, which can be removed by a backhoe for the depth of trench excavation and size of pipe being installed. For open excavation, it refers to materials, which, in the opinion of the Engineer, result in:

- Substantial delay or decrease in the normal rate of excavation using conventional equipment.
- Significant damage or wear to the excavating equipment.

.2 Type 'B' Rock

Type 'B' Rock requires drilling, blasting, wedging or jackhammering to remove, as determined by the Engineer.

.3 Bedding Material: Materials placed at the bottom of the trench beneath and up to the spring line of the pipe, as specified and approved by the Engineer.

.4 Pipe Foundation: Subgrade material immediately below bedding.

.5 Initial Backfill: Material placed within the trench, above the spring line of the pipe to 300 mm above the crown of the pipe.

.6 Bedding Class: Pipes to be bedded to one of following classes, as specified on drawings and in the Tender Schedule.

Class A

- .1 Concrete Cradle: Pipe is bedded in concrete up to ¼ outside pipe diameter, for a minimum width of pipe diameter plus 200 mm. Above cradle, granular backfill is placed and compacted to 300 mm above pipe.
- .2 Concrete Arch: Pipe is bedded in carefully compacted granular bedding to spring line. Top half of pipe is covered with concrete to minimum depth of ¼ of inside diameter of pipe. Arch width is to be a minimum of pipe outside diameter plus 200 mm.

Class B

- .1 Shaped Subgrade: Bottom of undisturbed excavation is shaped to conform to pipe shape and uniformly support pipe. Pipe is bedded on a 50 mm levelling course of sand. Granular bedding is placed and compacted up to the spring line of the pipe. Pipe is backfilled with imported granular material and compacted to 300 mm above crown of pipe.
- .2 Granular Bedding: Pipe is bedded on compacted granular material placed on flat trench bottom, depth of bedding as follows:

<u>Pipe Diameter (mm)</u>	<u>Bedding Depth (mm)</u>
675 and smaller	75
750 to 1500	100
1650 and larger	150

Granular bedding is placed and compacted up to the spring line of the pipe. Pipe to be backfilled and compacted with imported granular or hand-placed native backfill to 300 mm above crown of pipe.

- .7 Fill Concrete: Controlled density, low strength concrete used as trench backfill material where specified by Engineer.

.3 Materials

- .1 **Native**
Shall consist of material excavated from the trench. It shall contain no frozen soil, roots, rocks, organics or other objectionable material in quantities that might cause pipe damage, excessive settlement or inadequate compaction. The moisture content shall be such as to allow proper placement and compaction.
- .2 **Sand**
Shall consist of soil not excavated from the trench which has an even gradation falling within the following limits:

Screen Size (microns)	Allowable Passing (percent)
5,000	100
2500	70 to 95
315	30 to 65
160	10 to 25
80	2 to 10

- .3 Gravel
Shall consist of soil not excavated from the trench which has an even gradation falling within the following limits and with a 25% fracture count and a plasticity index below 8%:

Screen Size (microns)	Allowable Passing (percent)
20,000	95 to 100
12,500	75 to 95
5,000	40 to 60
2,000	25 to 45
400	10 to 25
80	2 to 10

.4 Protection

.1 Existing Buried Utilities

- .1 Size, depth, and location of existing utilities shown on Drawings are for guidance only; completeness and accuracy are not guaranteed.
- .2 Prior to commencing any excavation work, notify applicable utility authorities, and establish location, and state of use of buried services. Clearly mark such locations to prevent disturbance during work.
- .3 Maintain and protect from damage, water, sewer, gas, electric, or other utilities encountered.
- .4 Obtain written authorization of owner of utility and Engineer before moving or otherwise disturbing utility.

.2 Existing Surface Features

- .1 Protect existing buildings, trees and other plants, lawns, fencing, service poles, wires or paving located within right of way or adjoining properties from damage while work is in progress. Repair to Engineer's satisfaction any damage which may occur.
- .2 Where excavation necessitates root or branch cutting, do so only under direct control of the Engineer.
- .3 Protect existing trees and shrubs in accordance with Section 32 01 90.33.

.3 Shoring and Bracing

- .1 Whenever shoring, sheeting, timbering and bracing of excavations is required, engage services of a professional engineer to design and assume responsibility for adequacy of shoring and bracing. Professional engineer is to be registered in Alberta. Excavation shall be carried out in accordance with the latest edition of the Alberta Occupation Health and Safety Requirements Act. Trench boxes are preferred to sheeting and shoring.
- .2 When requested by the Engineer, submit for review Drawings and calculations signed and stamped by the Professional Engineer responsible for their preparation.
- .3 Close sheeting, when required, to be designed and constructed to prevent adjacent soil or water from entering excavation.

.4 Access

Maintain unobstructed access to fire and police appurtenances, telephone, electric, water, sewer, gas or other public utilities and private properties.

.5 Flooding

Protect open excavation against flooding and damage from surface water run-off.

.5 Safety Requirements

- .1 Adhere to Municipal and Provincial requirements relating to safety of trenching work, including shoring and bracing as required.
- .2 Adhere to all crossing permit (railway, pipeline, telecommunications duct, etc.) requirements.
- .3 Provide signage, barricades, flashers, etc. to adequately denote area of excavation adjacent to roadways.

.6 Measurement Procedures

- .1 Payment for trench excavation, initial backfill, backfill, and compaction will be made at the unit price tendered, within the depth ranges specified or as shown on the drawings, per lineal metre of trench excavated, backfilled, and compacted in

accordance with this Section. Horizontal measurement for each type of installation will be made as follows:

- .1 Sub-drains: From centre to centre of manholes and catch basins, or from centre of manhole/catch basin to designated termination point.
 - .2 Sanitary and Storm Sewer Mains: From centre of manhole to centre of manhole, or from centre of manhole to designated termination point.
 - .3 Corrugated Steel Pipe Culverts: Along invert of pipe from inlet to outlet, included bevelled end section.
 - .4 Catch Basin Leads: From centre of manhole to centre of catch basin.
 - .5 Storm Sewer Service Connections: As specified in Section 33 41 16.02.
 - .6 Concrete Encased and Direct Buried Duct Bank: From designated start point to designated termination point, including length through manholes.
- .2 Trench depth shall be the vertical distance between the ground surface immediately prior to construction start-up and the pipe invert as measured at intervals determined by the Engineer.
 - .3 Payment for supply and placement of sand bedding material according to this Section will be made at the unit price tendered, within the pipe ranges specified, per lineal metre of sand bedding material installed.
 - .4 Payment for supply and placement of washed crushed rock bedding material according to this Section for unsuitable pipe foundation will be made at the unit price tendered per tonne. Unit price to include excavation of unsuitable foundation material and replaced with screened rock.
 - .5 Type "A" rock excavation shall not be measured and shall be considered a subsidiary obligation of the Contractor.
 - .6 Measurement for solid Type "B" rock excavation beneath the trench width multiplied by depth of rock from rock surface to 150 mm below pipe barrel multiplied by length. No overbreak to be measured. Measurement for boulders and rock fragments exceeding 0.75 cubic metres in volume to be determined from three mutually perpendicular dimensions.
 - .7 Measurement for payment of pipeline and utility crossings shall only be applicable to oil and/or high pressure gas pipelines and shall be on a lump sum basis for each crossing made. Measurement for payment shall not be applied to utility crossings unless specifically provided for in the Contract Schedule of Quantities. Notwithstanding the above statements, payment shall not be made where pipeline or utility being crossed falls below pipe being installed or where pipe being crossed was installed under the Contract.
Tendered unit price for each crossing shall include all extra costs, including but not limited to, support of the utility, utility crossing agreements, and utility inspection charges over and above normal excavation costs.

2. PRODUCTS

.1 Bedding and Initial Backfill Materials

- .1 Initial backfill and bedding materials refer to 31 05 16
- .2 Material to be used as specified by Engineer or as shown on Drawings.
- .3 Concrete required for Class A bedding, grades, supports, encasement to be 25 MPa sulphate resistant (Type 50) to Section 03 30 00.
- .4 Native backfill to be approved material selected from trench excavation or other source, unfrozen and free from deleterious material, and with moisture content within +/- 3% of optimum.

.2 Roadway Trench Backfill Material

- .1 To minimize fill settlement under self-weight, excavated soil with a water content exceeding the plastic limit of the soil by more than 10% should not be used as fill unless the moisture content is lowered.
- .2 Wet fill material, should be dried or blended with drier material prior to use as a trench backfill. If this is not practical, the wet material should be wasted or used in landscape areas and berms where bearing capacity is not required.
- .3 Suitable replacement soils would include imported clay with a moisture content within 3% of its optimum moisture content for compaction or imported sand materials suitable for compaction.

.3 Cold Weather Roadway Backfill Material

Between November 1st and March 31st of each year (or as directed by engineer), utility connections within the public road right of way that involve the disturbance of asphalt roads and monolithic curb/ gutter and sidewalk will require the implementation of the following cold weather construction specification:

- .1 Excavations within road ROW to be kept to a minimum, use of trench boxes/ shoring is required,
- .2 Single size passing 16mm retained on 10mm sieve washed crushed rock to be used as pipe bedding/ backfill and extend to a max. 600mm above top of pipe.
- .3 Cold weather, unshrinkable fill or fillcrete shall be placed from top of washed rock to within 100mm of finished road top. Fillcrete specification refer to section 03 05 00.
- .4 Compacted cold mix to match existing asphalt or concrete surfaces until suitable Hot Mix Asphalt can be placed.

The Municipality reserves the right to shorten or lengthen the time period during which these specifications will be implemented, subject to weather conditions.

3. EXECUTION

.1 Site Preparation

- .1 Remove trees, shrubs, vegetation, fences, and other obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Strip top soil from within limits of excavation and stockpile as directed, for respreading after backfilling.

.2 Dewatering

- .1 Keep excavations dry while work is in progress.
- .2 Dispose of water in a manner not detrimental to public health, environment, public and private property, or any portion of work completed or under construction.

.3 Excavation

- .1 Excavate to lines, grades, elevations and dimensions indicated on Drawings. Ground profiles are approximate only. Precise line and grade will be set out by Engineer. Allow Engineer two working days advance notice to set out line and grade.
- .2 Sawcut pavement or sidewalk neatly along limits of proposed excavation.
- .3 Where edge of existing pavement is damaged as a result of trench excavation in shoulder, a minimum 300 mm width to be cut neatly and continuously and reinstated in accordance with Clause 3.9 - Restoration of this Section. Work included under restoration.
- .4 Notify Engineer when soil at proposed elevation of trench bottom appears unsuitable for foundation of installation. Modify trench bottom as directed by Engineer.
- .5 Notify Engineer if new construction conflicts with discovered obstruction. Allow Engineer sufficient time to consider alternative alignment to avoid conflict with obstruction. Modify alignment as directed by Engineer.
- .6 Unless otherwise authorized by Engineer, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m of open trench at end of days operation.
- .7 Stockpile suitable excavated materials required for trench backfill in approved location.
- .8 Dispose of surplus and unsuitable material including rocks in excess of 200mm dimension at a waste site designated by Engineer or a site located by Contractor and approved by Engineer.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Obtain Engineer's approval for method of excavation.
- .11 Excavated rock to a level 150 mm below the barrel of pipe.

.4 Trench Bottom Preparation

- .1 Where required due to removal of unsuitable material or unauthorized over-excavation, bring bottom of excavation to design grade with approved material.

.5 Pipe Bedding and Initial Backfill

.1 Concrete Bedding and Encasement

- .1 Concrete work refer to Section 03 30 20. Place concrete to details indicated or directed.
- .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 hours after placing.

.2 Granular Bedding

- .1 Place granular bedding materials to Class B unless otherwise indicated on drawings.
- .2 Shape bed true to grade to provide continuous uniform bearing surface for pipe exterior. Do not use blocks when bedding pipe.
- .3 Shape transverse depressions in bedding as required to make joints.
- .4 Compact full width of bed to a density of 100% Standard Proctor Density.
- .5 Place layers simultaneously on both sides of installed work to equalize loading.
- .6 Place material by hand under, around, and over pipe until 300 mm of cover is provided. Dumping material directly on pipe will not be permitted.

.6 Backfilling of Shallow and Deep Trenches/Utilities

- .1 Place backfill material in uniform layers not exceeding 300 mm in loose thickness up to subgrade elevation or top of trench. Compact each layer before placing succeeding layer.
- .2 The uniform backfill zone is defined as the upper 1.5m of excavated material. The excavated material, if acceptable to the Engineer, shall be replaced and re-compacted in lifts not exceeding 300 mm loose thickness to 98% S.P.D.
- .3 Below the uniform backfill zone, native backfill materials are to be compacted to a minimum density of 97% Standard Proctor. In lane, utility lot, and park areas, the Engineer may reduce the compaction requirement to 100% of a one-point proctor test if, in his opinion, it is not feasible to achieve the specified density. The one-point proctor density is to be measured at the *in-situ* soil moisture content. In street areas, drying and/or mixing of backfill soil may be necessary to achieve the 97% maximum Standard Proctor density as specified.

- .4 Compact imported granular backfill material to a minimum density of 97% Standard Proctor (>1.5m) and 98% Standard Proctor(<1.5m).
- .5 Compact using approved mechanical tamping devices, or by hand tamping to achieve specified compaction.
- .6 Do not place backfill in freezing weather without written permission of Engineer.
- .7 Shoring, sheeting, and bracing.
 - .1 Unless otherwise indicated, or directed by Engineer, remove sheeting and shoring from trench during backfilling operations.
 - .2 Do not remove bracing until backfilling has reached level of bracing.
 - .3 Pull sheeting in 150 mm increments until clear of installations, simultaneously placing and compacting backfill to fill voids left by pulled sheeting.
 - .4 Pull sheeting thereafter in increments that will ensure backfill is maintained at an elevation at least 450 mm above toe of sheeting.
 - .5 When sheeting is to remain in place, cut off tops at elevations indicated or directed.

.7 Fill Concrete Backfill

- .1 Place bedding and initial backfill material as per Clause 3.6.
- .2 Backfill with fill concrete to level directed by Engineer.
- .3 Vibrate to ensure all voids are filled.
- .4 Allow sufficient curing time prior to working over top of fill concrete.

.8 Restoration

- .1 Replace topsoil as directed by Engineer.
- .2 Restore travelled areas to the pavement or concrete structure shown on the contract drawings.
- .3 Clean and reinstate areas affected by work as directed.

1. GENERAL

Materials and installation of polymeric geogrids used in roadbeds as reinforcement to provide tensile strength to the base.

1.1 Related Sections

.1	Submittal Procedures	Section 01 33 00
.2	Excavating, Trenching and Backfilling	Section 31 23 33.01
.3	Roadway Embankment	Section 31 24 13
.4	Sub-Drainage	Section 33 46 16

1.2 Measurement Procedures

- .1 Measure geogrid in square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
 - .2 ASTM D4101 Standard Specification for Polypropylene Injection and Extrusion Materials.
 - .3 ASTM D4218m Standard Test Method for Determination of the Carbon Black Content in Polyethylene Compounds By Muffle-Furnace Technique.
 - .4 ASTM D5262 Standard Test Method for Evaluating the Unconfined Tension Creep Behaviour of Geosynthetics.
 - .5 ASTM D6637m Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.
 - .6 Drexel University - Geosynthetic Research Institute (GRI).
 - .7 GRI GG2 Geogrid Junction Strength.

1.4 SUBMITTALS

- .1 If requested, submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to the Engineer copies of mill test data and certificate, at least 4 weeks prior to start of Work and in accordance with Section 01 33 00 - Submittal Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 During delivery and storage, protect geogrids from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

2. PRODUCTS

2.1 Material

.1 Geogrid: open grid polymer having biaxial or triaxial orientation, free of striations, roughness, pinholes, blisters, undispersed raw materials or any sign of contamination by foreign matter.

.1 Biaxial

- .1 Roll width: 3.0 m minimum.
- .2 Roll length: 50 m minimum.
- .3 Rib thickness: 1.27 mm minimum.
- .4 Aperture size: 2 mm
- .5 Polymer: polypropylene: to ASTM D4101, high density polyethylene: to ASTM D1248 with inhibitors added to resist deterioration by ultra-violet and heat exposure.
- .6 Peak tensile strength: to ASTM D6637:
 - .1 Machine direction: minimum 19 KN/m.
 - .2 Cross machine direction: minimum 28 KN/m.
- .7 Tensile strength at 2% strain: to ASTM D6637:
 - .1 Machine direction: minimum 6.0 KN/m.
 - .2 Cross machine direction: minimum 9.0 KN/m.
- .8 Rigid geogrid junction stiffness and efficiency:
 - .1 Stiffness: minimum 750,000 mg-cm.
 - .2 Efficiency: minimum 93 %.

.2 Triaxial

- .1 Roll width: 3.0 m minimum.
- .2 Roll length: 50 m minimum.
- .3 Index properties:
 - .1 Rib-pitch: 40 mm.
 - .2 Mid-rib thickness: 1.2 mm minimum.
 - .3 Mid-rib width: 1.1 mm minimum.
 - .4 Nodal thickness: 3.1 mm.
- .4 Structural Integrity:
 - .1 Radial stiffness at low (0.5%) strain: 225 kN/m.
 - .2 Aperture stability: 3.0 kg-cm / deg @ 5.0 kg-cm.
 - .3 Junction efficiency: 93%.

3. EXECUTION

3.1 Installation

- .1 Place geogrid material by unrolling onto graded surface in manner and locations indicated and retain in position in accordance with manufacturer's written recommendations.
- .2 Place geogrid on sloping surfaces in one continuous length from toe of slope to upper extent of geogrid.
- .3 Overlap each successive strip of geogrid 600 mm over previously laid strip.
- .4 Join successive strips of geogrid as recommended by manufacturer.
- .5 Protect geogrid from displacement, damage or deterioration before and during placement of overlay soil layers.
- .6 After installation, cover with overlay layer within 10 days of placement.
- .7 Replace damaged or deteriorated geogrid to approval of the Engineer.
- .8 Place and compact soil layers in accordance with Sections 31 23 33.01 and 31 24 13.

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 geogrid.

1. GENERAL

This Section specifies requirements for removal of pavement markings and cleaning pavement surfaces.

1.1 Related Work

- | | | |
|----|------------------------------------|---------------------|
| .1 | Painted Traffic Lines and Markings | Section 32 17 23.13 |
| .2 | Thermoplastic Pavement Markings | Section 32 17 23.23 |

1.2 Measurement Procedures

- .1 Lines removed to be measured in lineal metres for each type of marking material.
- .2 Symbols and letters removed to be measured in units specified in the unit price schedule.
- .3 Unit price tendered for removal to include tack coat and asphalt repair where required by this Section.
- .4 No additional payment will be made for pavement cleaning or sweeping.

2. PRODUCTS

2.1 Materials

- .1 Abrasives used for removal of painted pavement markings to be products specially designed for sand blasting.
- .2 Class 10 asphaltic concrete pavement to Section 32 12 16.13.
- .3 Tack coat to Section 32 12 13.16.
- .4 System 400 is not an approved removal material.

3. EXECUTION

3.1 Removals

- .1 In areas designated, remove:
 - .1 Removal Processes that are not approved include: painting or blacking out the marking (including System 400) and/or leaving the marking to wear out over time.
 - .2 Thermoplastic in-laid lines by grinding out the marking material and replacing with either a bituminous slurry seal or black pigmented thermoplastic material, which method to be detailed in the Contract Special Provisions.
 - .3 Thermoplastic in-laid symbols by grinding out marking material and replacing with either a bituminous slurry seal or black pigmented thermoplastic material, which method to be detailed in the Contract Special Provisions.
 - .4 Spray type and cold plastic lines and symbols by grinding off marking material. Do not damage underlying asphalt.
 - .5 Paint markings by sand blasting, do not damage underlying asphalt.

- .2 Exercise care to avoid dislodgement of coarse aggregate particles, excessive removal of fines, damage to bituminous binder, or damage to joint and crack sealers.
- .3 Heater milling equipment not to be used.
- .4 All residue from operations to be removed from site and disposed of by Contractor.

3.2 Repair

- .1 No repair is required for removal of painted, spray type and/or cold pavement markings.
- .2 Grooves remaining after removal of thermoplastic inlaid pavement markings are to be filled using Class 10 asphaltic concrete pavement to Section 32 12 16.13. Apply tack coat before placing asphalt mix.

3.3 Pavement Surface Cleaning

- .1 Remove all pavement repair sealing compound to be level with the pavement surface as directed by Engineer.
- .2 Remove the following substances from pavement surface by methods approved by the Engineer. Substances including but not limited to: Dust, dirt, sediment, paint, loose material, oil, grease and animal feces.
- .3 Sweeping and Cleaning: Sweep the existing pavement surface with an approved mechanical sweeper. Remove all residual debris and accumulations of deleterious material.
- .4 Dispose of all deleterious material and debris as directed by the Engineer.

1. GENERAL

This Section specifies requirements for producing and placing hot-mix asphalt concrete including supply of aggregates and bituminous binder.

1.1 Related Work

.1	Aggregate Materials	Section 31 05 16
.2	Asphalt Prime Coat	Section 32 12 13.23
.3	Asphalt Tack Coat	Section 32 12 13.16
.4	Composition of Recycled Asphalt Materials	Section 32 12 16.23
.5	Painted Traffic Lines and Markings	Section 32 17 23.13
.6	Thermoplastic Pavement Markings	Section 32 17 23.23

1.2 Definitions

- .1 Table A, appended to this Section, lists general uses for each type of asphaltic concrete mixtures based on asphaltic concrete aggregate gradation sizes specified under Section 31 05 16.
 - .1 Type 6a – Asphalt Concrete Overlay (ACO): Parking Lots, Lanes, Trails.
 - .2 Type 6b – Asphalt Concrete Residential (ACR): Collector and Local Roads and Overlays
 - .3 Type 6c & 6d – Asphalt Concrete Base (ACB): Base course and top course for Industrial / Commercial, Arterial and Collector Roads.

1.3 Measurement Procedures

- .1 Asphalt concrete paving to be measured in tonne and/or square meters for the specified compacted depth as stipulated in the Unit Price Schedule(s). Unit price bid shall be full compensation for all work involved in supplying asphaltic concrete and installing as described in Clause 3 - Execution of this Section and Section 32 12 50.
- .2 Payment will be subject to the Unit Price Adjustments for density, thickness and asphalt content as defined in Section 2.7, 2.8 and 2.9.

2. PRODUCTS

2.1 Asphalt Cement

- .1 Asphalt cement to have a penetration as shown in Table B appended to this Section.
- .2 Asphalt cement mixing temperature at mixing shall not exceed 155°C.
- .3 Provide approved storage, heating tanks, and pumping facilities for asphalt cement.

2.2 Aggregates

- .1 Asphaltic concrete aggregate shall be crushed gravel. Gradation shall be in accordance with Section 31 05 16, Aggregate Materials, for the Asphaltic Concrete Mix Type specified in the Schedule of Quantities, and as specified herein. Maximum permissible gradation variation as per Table C appended to this Section.
- .2 Sand equivalent: ASTM D2419 (AASHTO T176), minimum 50%. One test per mix design.
- .3 Magnesium Sulphate soundness: ASTM C88 (AASHTO T104) percentage loss by mass, coarse aggregate: 18, fine aggregate 20. One test per aggregate source, or as requested by the Engineer.
- .4 Los Angeles Abrasion: ASTM C131 (AASHTO T96), maximum percentage loss by mass, coarse aggregate: 40. One test per aggregate source, or as requested by the Engineer.
- .5 Absorption: ASTM C127 (AASHTO T85), maximum percentage by mass, coarse aggregate: 1.75. One test per mix design.
- .6 Loss by washing: ASTM C117 (AASHTO T11), maximum percentage passing 80 micron sieve, coarse aggregate: 1.5. One test per mix design.
- .7 Lightweight particles: ASTM C123 (AASHTO T150), maximum percentage by mass less than 1.95 relative density: 1.5. One test per mix design.
- .8 Flat and elongated particles: (with length to thickness ratio greater than 5), maximum percentage by mass, coarse aggregate: 15. One test per mix design.
- .9 Crushed fragments: minimum percentage by mass with minimum of two freshly fractured faces. Retained on 5 mm sieve, Designation 6a: 80%; Designation 6b: 70%.
- .10 Regardless of compliance with specified physical requirements, aggregates may be accepted or rejected on basis of past field performance. One test for each extraction sample.
- .11 Stockpile minimum 50% of total amount of aggregate required before commencing asphalt mixing operation.
- .12 When dryer drum mixing plant is used, stockpile fine aggregate separately from coarse aggregate.
- .13 In addition to the job mix control testing, other tests may be performed in the field periodically for the purpose of determining the quality of the aggregate.
- .14 After the material has proved to be acceptable, a mix design will be undertaken.

2.3 Manufactured Fines

- .1 Manufactured fines to Section 31 05 16.
- .2 Add manufactured fines when necessary to meet job mix aggregate gradation or as directed to improve mix properties.

2.4 Mix Design

- .1 The job mix formula establishes the aggregate proportioning, target aggregate gradation and approved asphalt content to be used for production of asphalt mix and requires the approval of the Engineer on the basis of a mix design.

.1	Marshall Stability	ASTM D 1559
.2	Specific Gravity	ASTM D 2726
.3	Air Voids and VMA	ASTM D 3203
.4	Flow Index	ASTM D 1559, C29
.5	Asphaltic Content Extraction and Sieve Analysis	ASTM D 2172 ASTM C 117 and C 136
.6	Moisture Content (%)	
.7	Film Thickness	

Testing reports to include mix temperature and time of sampling.

This quantity is deemed to be a lot for Quality Assurance and Quality Control purposes.

- .3 Field Density, Asphalt Thickness, and Asphalt Content: After asphaltic concrete has been laid and compacted, one 150mm diameter pavement core from approximately each 1000 sq m of pavement will be obtained at random locations determined by Engineer but at least 500mm from curbs and mat edges. Cross sectional depth of core will be measured to determine asphalt thickness. Density of core will be measured and compared with the Marshall density taken from field samples of the asphalt mix placed in the area of the core. Asphalt content will be determined from the Marshall samples and compared to the recommended asphalt content determined in the asphalt mix design. Field density for the top lift of multi lift ACP layers may be measured using a proprietary electro-magnetic Pavement Quality Indicator (PQI) provided that the Contractor or approved testing facility can prove correlation with actual Marshall laboratory density results.
- .2 If core test results fail to satisfy thickness, density, or asphalt content requirements as specified, Contractor shall immediately modify his construction procedures to produce a uniformly compacted surface which will satisfy density and thickness requirements. Sections with inadequate compaction or thickness shall be subject to a payment reduction as defined under Clauses 2.6, 2.7, and 2.8 in this Section, as directed by Engineer.
- .3 The core test result will be deemed to represent the approximate 1000 m² area from which it was taken depending on location of other cores taken. Boundaries of area represented by the core test results will be determined by the Engineer.
- .4 A thickness deficiency at the completion of the first stage of paving may be accepted by the Municipality provided the deficiency is less than 12mm and the deficient thickness can be included in the subsequent stage of paving.
- .5 Appeal Cores - If initial core is found to be deficient in density, thickness or asphalt content, three additional cores within each deficient area may be taken by an independent qualified testing firm at Contractor's expense, in locations approved by Engineer. In this case, the test results will be averaged using the three appeal cores only to represent area in question.
If the initial core thickness is deficient at the completion of the final lift of paving, that initial thickness is discarded, and 3 new cores will be taken within 10 m of the original core location at a minimum spacing of 2.5 m between cores. The average thickness of the 3 new cores represents that area.

If the Contractor elects to take his own additional cores in the density deficient area the density testing may be carried out in the Contractors Quality Control testing laboratory only if the tests are supervised and witnessed by the Engineers representative or the Independent Testing Laboratory's testing representative. If the area is found to be density deficient the costs for the additional coring and testing will be borne by the Contractor.

- .6 Contractor shall give written notice to Engineer, 48 hours in advance of any paving operations, to make arrangements for testing.
- .7 If test results indicate non-compliance with Specifications, pavement may be rejected by Engineer. Pavement thus rejected shall be removed and replaced at Contractor's expense.
- .8 Cost of additional testing made necessary by Contractor's unsatisfactory workmanship or materials will be charged to Contractor.
- .9 The Contractor shall perform all tests necessary to control the quality of his materials and workmanship, and ensure that his work complies with the Specifications, as specified in Section 01 45 00.
- .10 Upon completion of any test, the testing results shall be provided within five (5) business days to the Municipality, the Engineer, the Supplier and the Contractor.

2.7 Asphalt Concrete Thickness Tolerances

- .1 For areas deficient in total pavement thickness, the contract unit price to be adjusted as follows:
 - .1 No payment for areas deficient in thickness by more than 25%
 - .2 No adjustment in unit price for areas thicker than required.
 - .3 For areas deficient in thickness by more than 10% and less than 25%, of the designed structural thickness, the unit price is to be reduced as per Table E appended to this Section.
 - .4 These pay factors will not apply to asphalt tendered on a per tonne basis.

2.8 Asphalt Density Tolerances

- .1 Each mat of hot-mix asphalt placed shall be compacted to minimum density (percentage of Marshall Density) specified for type of pavement as per Table F appended to this Section.

If asphalt density is found to be deficient according to core tests described under Clause 2.5 of this Section, payment for asphaltic concrete surface course within area represented by core(s) will be reduced. Payment reduction will be equal to unit rate tendered for asphaltic concrete surface course in question, multiplied by payment reduction factor derived from the appropriate payment reduction factor as shown in Table G appended to this Section for the pavement density specified in Table F.

In multi-lift pavements, payment reduction may be applied to individual lifts of pavement; in which case unit price used to calculate payment reduction would be determined by the Engineer based on depth of asphaltic lift in proportion to depth of full asphaltic concrete portion of pavement.

- .4 Hand tools:
 - .1 Lutes or rakes with covered teeth during spreading and finishing operations.
 - .2 Tamping irons having mass not less than 12 kg and a bearing area not exceeding 310 cm² for compacting material along curbs and other areas inaccessible to roller. Mechanical compaction equipment, when approved by Engineer, may be used instead of tamping irons.
 - .3 Straight edge, 3.0 m in length, to test finished surface.

3.4 Preparation

- .1 Written notice of intention to begin paving operations to be given to Engineer 48 hours in advance.
- .2 When paving over existing asphalt surface, clean pavement surface in accordance with Section 32 01 11.01 When levelling course is not required, patch and correct depressions and other irregularities to approval of Engineer before beginning paving operations.
- .3 Apply prime coat or tack coat where directed in accordance with Section 32 12 13.23 or 32 12 13.16 prior to paving.
- .4 Prior to laying mix, clean surfaces of loose and foreign material.
- .5 Paint contact surfaces of existing structures such as manholes, curbs, or gutters with bituminous material prior to placing adjacent pavement.
- .6 Traffic shall not be permitted to travel on tack or prime coat until it has cured. Provide flagmen, if required, to control traffic.

3.5 Transportation of Mix

- .1 Transport mix to job site in vehicles cleaned of foreign material.
- .2 Paint or spray truck beds with light oil, limewater, or detergent solution, at least once a day or as required. Elevate truck bed and thoroughly drain. No excess solution or use of gasoline, kerosene, or similar product will be permitted.
- .3 Schedule delivery of material for placing in daylight, unless Engineer approves artificial light.
- .4 Deliver material to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.
- .5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at a temperature between 125°C and 150°C.

3.6 Placing

- .1 Place asphalt concrete to thickness, grades, and lines indicated on Drawings or directed by Engineer.
- .2 Placing conditions:
 - .1 Place asphalt mixtures only when air temperature is above 5°C.
 - .2 When temperature of surface on which material is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.

- .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
- .3 Place asphalt concrete in compacted lifts of 40 mm minimum depth.
- .4 Spread and strike off mixture with self-propelled mechanical finisher as follows:
 - .1 Construct longitudinal joints and edges parallel to line markings. Lines for paver to follow parallel to centre line of proposed pavement. Position and operate paver to follow established line closely.
 - .2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
 - .3 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
 - .4 Correct irregularities in alignment left by paver by trimming directly behind machine.
 - .5 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot- mix. Do not broadcast material over such areas.
 - .6 Do not throw surplus material on freshly screeded surfaces.
- .5 When hand spreading is used:
 - .1 Wood or steel forms, approved and rigidly supported to assure correct grade and cross section, may be used. Use measuring blocks and intermediate strips to aid in obtaining required cross section.
 - .2 Distribute material uniformly. Do not broadcast material.
 - .3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.
 - .4 Following placing and before rolling, check surface with templates and straightedges and correct irregularities.
 - .5 Provide heating equipment to keep hand tools free from asphalt. Temperature of tools is not to be higher than temperature of mix being placed.

3.7 Compacting

- .1 Roll asphalt continuously to specified density.
- .2 Provide as many rollers as necessary to achieve specified pavement density.
- .3 Start rolling operations as soon as placed mixture can bear weight of roller without undue displacement of material or cracking of surface.
- .4 Operate roller slowly on first pass to avoid displacement of material. For subsequent rolling do not exceed 5 km/h for steel-wheeled rollers and 8 km/h for pneumatic-tired rollers.
- .5 Overlap successive trips of roller by at least one-half width of roller and vary trip lengths.
- .6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.3 Inspections During Construction

- .1 The Engineer will inspect the top lift of ACP. Typically, each days pavement placed would be inspected, as soon as possible after the days production is placed. During the inspection(s) of the top lift, the Engineer will identify and record any areas of slight, moderate and severe segregation and any areas of center-of-paver streak. Any areas requiring repair will be marked by the Engineer. The Engineer will provide the Contractor with a written assessment indicating the location and severity of the segregated areas as soon as practical following each inspection.

.4 Inspections Following Construction

- .1 An inspection following construction will not normally be conducted unless the Municipality has concerns that additional segregation, not identified during construction, may be present. If deemed necessary by the Municipality, this inspection will be conducted up to 1 month after completion of all paving work.

.5 Repairing Pavement Segregation

- .1 Pavement segregation identified in the inspections performed during construction will be repaired by the Contractor at his expense and in accordance with the following:
 - .1 Moderate and Severe segregation in the top lift of pavement and on entrances and intersections shall require repair.
 - .2 Slight segregation on any lift of pavements will not require repair.
 - .3 Moderate segregation on lower lifts of pavement will not require repair.
 - .4 Severe segregation on lower lifts of pavement will only require repair in instances where, in the opinion of the Engineer, the segregated area will affect the long term structural integrity of the pavement structure. Such repair will not be required where the Engineer determines that the paver screed is "dragging" due to distortion of the existing surface.
 - .5 Only moderate and severely segregated center-of paver streaks on the top lift of pavement will require repair.
- .2 The following methods of repair are approved:
 - .1 Moderate segregation: Slurry patch or hot mix patch
 - .2 Severe Segregation: removal and replacement, overlay (if practical) and re-heating with non-contact pavement heater to re-heat the pavement to at least 120°C and addition of hot asphalt cement and fines added and re-compacted.
- .3 Repairs for segregation using removal and replacement shall be for the full lane width or curb to curb only as applicable, depending on the extent of the segregated area. The full depth of the asphalt lift will be removed and replaced with new ACP using an appropriate paver and cold milling equipment. All ACP material used for repair shall have tack coat applied prior to placement.

- .4 The Engineer will mark out the area of repair. The “marked area” shall extend a minimum of 0.5m beyond the segregated area. For center-of-paver streak the “marked area” shall extend a minimum of 100mm laterally and 0.5m longitudinally beyond the streak.
- .5 All repairs shall be regular in shape and finished using good workmanship practices to provide an appearance suitable to the Engineer. Traffic shall be kept off repairs for a sufficient time to ensure that tracking does not occur.
- .6 In the event repairs cover existing lines of pavement markings the Contractor shall reinstate the lines and markings at his expense and to the satisfaction of the Engineer.
- .7 Repairs shall be completed during the construction season except where prevented by inclement weather or seasonal shutdown. In these cases, the Contractor shall complete the repairs prior to June 15 of the following year.

TABLE A - ASPHALT MIX TYPES	
(Refer to Section 31 05 16 - Table A for gradation specifications)	
MIX TYPE	USE
6a / ACO	Lane, Parking Lot, and Trail
6b / ACR/ACO	Bottom and Top Lift for Local and Collector Roadways, and Overlay Paving
6c & 6d / ACB	Bottom(6d) and Top Lift(6c) for Collector, Industrial and Arterial Roadways
Specific areas of use of each class of asphaltic concrete pavement will be defined on drawings and/or unit price table.	

TABLE B - PROPERTIES OF ASPHALT CEMENT FOR ROADS CGSB-16.3			
TEST	ASTM TEST METHOD	TEST RESULT	
		150 – 200A*	200-300A*
1. Absolute Viscosity at 60°C (Pascals per second)	D 2171	Penetration (150) 78 - 155 (200) 50 - 92	Penetration (200) 50 - 92 (300) 26.5 - 45
2. Kinematic Viscosity at 135°C (mm ² per second)	D 2170	Penetration (150) 255 - 360 (200) 205 - 285	Penetration (200) 205 - 285 (300) 150 – 205
3. Penetration at 25°C, 100 gm, 5 second, (dmm)	D5	150 - 200	200 - 300
4. Ductility of residue at 25°C (minimum cm)	D 113	100	---
5. Ductility of residue at 15.6°C (minimum cm)	D 113	---	100
6. Solubility in Trichloroethylene (minimum %)	D 2042	99.5	99.5
7. Flash Point - Cleveland Open Cup (°C)	D 92	205	205
8. Test on residue from thin film oven test (D 1754) ratio of absolute viscosity to original absolute viscosity	D 2171	4.0	4.0

*Note: Performance Graded (PG) Bitumen (PG54-37) may be used on Contract specific applications

TABLE C - AGGREGATE VARIATION LIMITS	
SIEVE DESIGNATION (mm)	MAXIMUM PERMISSIBLE VARIATION * PERCENT BY WEIGHT PASSING
+5.0	±5
5.0	±5
1.25	±3
0.630	±2
0.315	±2
0.160	±1.5
0.080	±1.5

* In any case, the Lot Average Gradation must meet the gradation requirements of Section 31 05 16, Aggregates Materials.

TABLE D - ASPHALTIC CONCRETE PAVEMENT MIX TYPES AND CHARACTERISTICS					
Aggregate Designation, Section 31 05 16 Table A	6a (ACO)	6b(1) (ACR, ACO)	6b(2) (ACR)	6c (ACB)	6d (ACB)
Aggregate Size	10	12.5	12.5	16	20
% Manufactured Fines, -5000 (Minimum) (See Note 1)	50	50	70	75	75
% Fractures, +5000 (2 Faces) (Minimum)	70	70	70	80	80
Asphalt Cement Grade	200 - 300A	200 - 300A	150 - 200A	150- 200A	150 - 200A
Minimum Marshall Stability, N	5300	8000	12000	13500	12000
Number of Blows	50	50	75	75	75
% Air Voids	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5
VMA % (Minimum) by 3% Air Voids	14	13	13	13	12.5
Minimum Theoretical Asphalt Film Thickness, (Microns) (See Note 3)	6.5	6.0	6.0	6.0	6.0
Voids filled with Asphalt, %	65 to 75	65 to 75	65 to 75	65 to 75	65 to
Flow, mm	2 to 4	2 to 4	2 to 4	2 to 4	2 to 4
Minimum Retained Stability, %	70	70	75	75	75
Effect of Moisture on Asphalt Concrete Mixture, ASTM D4867 Minimum Tensile Strength Ratio*Note: will probably require addition of anti-stripping	0.75	0.75	0.80	0.80	0.80

**TABLE D - ASPHALTIC CONCRETE PAVEMENT
MIX TYPES AND CHARACTERISTICS (CONT.)**

- Note 1: The percentage of Manufactured Fines in the -5000 portion of the Combined Aggregate.
 Note 2: All fines manufactured by the process of crushing shall be incorporated into the mix for Asphalt Mix Type 6a.
 Note 3: The minimum theoretical film thickness value shall be established in accordance with TLT-311.

General Requirements for Mix Design:

1. It is recommended that the Design Asphalt Content be determined at 4% air voids, which is the midpoint of the design air voids. The test properties at this asphalt content are then checked to ensure compliance with the respective criteria.
2. A minimum of four specimens shall be prepared at each asphalt content.
3. Theoretical maximum specific gravity shall be determined in duplicate for a least three asphalt contents.
4. Retained stability after 24 hours soaking at 60°C to be run at the recommended Design Asphalt content.

**TABLE E - ASPHALTIC CONCRETE PAVEMENT
UNIT PRICE REDUCTION FOR PAVEMENT THICKNESS**

Thickness Deficiency (%)	Payment Reduction Factor
0 to 10	0%
>10-15	20%
>15-20	50%
>20-25	75%
>25	Remove and Replace

TABLE F - SPECIFIED ASPHALT CONCRETE PAVEMENT DENSITY

Type of Pavement	Minimum Density	Payment Reduction Factor
New construction	98%	A
Staged paving, non-structural final lift paving, levelling course and overlays 50mm and greater, lanes, parking lots, trails, trench repairs	97%	B
Overlays for lanes, parking lots, trails, and 40mm overlays for roads	97%	C

TABLE G - ASPHALTIC CONCRETE PAVEMENT UNIT PRICE ADJUSTMENT FOR DENSITY

A		B		C	
Specific Density = 98%		Specific Density = 97%		Specific Density = 97%	
Field Density	Payment Reduction Factor (%)	Field Density	Payment Reduction Factor (%)	Field Density	Payment Reduction Factor (%)
100.0 to 98.00	0	100.0 to 98.00	0	100.0 to 98.00	0
97.99 to 97.50	2	97.99 to 97.50	0	97.99 to 97.50	0
97.49 to 97.00	5	97.49 to 97.00	0	97.49 to 97.00	0
96.99 to 96.50	10	96.99 to 96.50	2	96.99 to 96.50	2
96.49 to 96.00	20	96.49 to 96.00	5	96.49 to 96.00	3

TABLE G - ASPHALTIC CONCRETE PAVEMENT UNIT PRICE ADJUSTMENT FOR DENSITY (CONT.)					
95.99 to 95.50	30	95.99 to 95.50	10	95.99 to 95.50	6
95.49 to 95.00	40	95.49 to 95.00	20	95.49 to 95.00	12
94.99 to 94.00 <94.00	Remove and Replace	94.99 to 94.50	30	94.99 to 94.50	20
		94.49 to 94.00	40	94.49 to 94.00	35
		93.99 to 93.50	50	93.99 to 93.00	50
		<93.50	Remove and Replace	<93.00	Remove and Replace

**TABLE H - ASPHALTIC CONCRETE PAVEMENT
UNIT PRICE ADJUSTMENT FOR ASPHALT CONTENT**

A. <u>Adjustment for Unit Price Per Tonne</u>				
Deviation of the Actual Asphalt Content from the Approved Design Asphalt Content (%)	Unit Price Adjustment for Asphalt Content (\$ per tonne)			
	Top Lift		Bottom Lift(s)	
	Below	Above	Below	Above
4. FROM 0 TO 0.30	\$0.00	\$0.00	\$0.00	\$0.00
From 0.31 to 0.40	-\$16.00	-\$8.00	-\$16.00	-\$8.00
From 0.41 to 0.50	-\$32.00	-\$24.00	-\$32.00	-\$24.00
From 0.51 to 0.60	-\$48.00	-\$40.00	-\$48.00	-\$40.00
From 0.61 to 0.70			-\$60.00	-\$52.00
B. <u>Adjustment for Unit Price Per Square Metre</u>				
Deviation of the Actual Asphalt Content from the Approved Design Asphalt Content (%)	Unit Price Adjustment for Asphalt Content (%)			
	Top Lift		Bottom Lift(s)	
	Below	Above	Below	Above
5. FROM 0 TO 0.30	0.00%	0.00%	0.00%	0.00%
From 0.31 to 0.40	-10.00%	-3.50%	-10.00%	-5.00%
From 0.41 to 0.50	-20.00%	-7.00%	-20.00%	-15.00%
From 0.51 to 0.60	-30.00%	-15.00%	-30.00%	-25.00%
From 0.61 to 0.70			-40.00%	-35.00%

Notes:

1. For top lift and asphaltic concrete overlay paving deviations of more than 0.60%, the Contractor shall remove and replace the previously laid mix.
2. For bottom lift(s) deviations of more than 0.70%, no payment will be made and the Engineer will determine whether removal and replacement is necessary.

1. GENERAL

This section specifies the occurrences for the replacement, liquidated damages or repair based on affected areas. This shall apply at the time of inspection to all sidewalks, curb and gutter, and related on grade concrete work.

1.1 Definition

- .1 Flag of Sidewalk: The area of sidewalk between the back of curb and back of walk.

2. SURFACE CONDITION DEFICIENCY

- .1 Loss of surface mortar and/or aggregate

Table 2.1: Replacement or Repair Based on the Percent Affected Area by the Surface Condition

Surface Condition	Affected Surface Area (%)	
1. Loss of surface mortar and/or aggregate 2mm-5mm depth	< 15	Repair as per Engineers Direction
	> 15	Replace
2. Los of surface mortar and/or aggregate > 5mm deep	< 5	Repair as per Engineers Direction
	> 5	Replace

3. SIDEWALK, CURB AND GUTTER DEFICIENCIES

Replacement of affected panels shall be required when one or more of the following exist. Concrete inspection deficiencies which exist but do not meet requirements for replacement shall be repaired as per the Engineers direction. Cost of replacement or repairs to be borne by the Contractor. Concrete that is to be removed and replaced shall comply with Section 32 16 15:

3.1 Crack greater than 3mm in width in curb & gutter (see detail 50 0421)

- .1 Excluding joints.
- .2 No vertical displacement.
- .3 No chipping greater than 3 mm.
- .4 Greater than 10% in length of crack with spalling edges.
- .5 Spalling edges maximum total width for both sides is less than 3 mm from outer edge of crack.

3.2 Crack greater than 3mm in width on flag of sidewalk (see detail 50 0421)

- .1 Excluding expansion joint.
- .2 No vertical displacement.
- .3 No chipping greater than 3 mm.
- .4 Greater than 10% in length of crack with spalling edges.
- .5 Spalling edges maximum total width for both sides is less than 3 mm from outer edge of crack.

3.3 Cracks with (see detail 50 04 21)

- .1 Any vertical displacement greater than 3mm.

3.4 Longitudinal Crack (see detail 50 04 21)

- .1 Greater than 3mm width

3.5 Joint vertical displacement (see detail 50 04 22)

- .1 At any joint of greater than 6mm

3.6 Control joint separation (see detail 50 04 22)

- .1 At any control joint greater than 5mm

3.7 Settlement on a road grade (see detail 50 04 22)

- .1 Greater than 30mm over 6m of sidewalk
- .2 Settlement of 10-30mm over 6m of sidewalk warrants slab-jacking (see Section 32 20 00)

3.8 Dished sidewalk or curb & gutter (see detail 50 04 23)

- .1 Greater than 6mm

3.9 Cross Fall (see detail 50 04 23)

- .1 Reverse cross fall
- .2 Less than 0.7 %
- .3 Greater than 3%

3.10 Random cracking (see detail 50 04 23)

- .1 Two or more cracks of any size (including hairline and pencil) in one panel of sidewalk or section of curb and gutter

3.11 Corner Chip (see detail 50 04 23)

- .1 Greater than 75mm
- .2 Saw cutting to remove is unacceptable

3.12 Protect finished work from damage/vandalism (see detail 50 0424)

- .1 Deficiencies considered detrimental to pedestrian safety or appearance of the concrete work, including but not limited to the following:

- .1 Graffiti or writing
- .2 Foot or animal prints
- .3 Chipping greater than 75mm
- .4 Chipping where 2 or more are greater than 50mm
- .5 Significant scarring/paper damage
- .6 Rain damage
- .7 Gouging greater than 10mm deep

3.13 Ponding

- .1 Greater than 6mm in depth

3.14 Curb Alignment

- .1 Applies to F.O.C and L.O.G (Face of Curb and Lip of Gutter)
- .2 Maximum deviation of +/- 12mm in 30m

3.15 Concrete Thickness

- .1 At the Municipality's request, an approved quality assurance laboratory will take one or more sets of 3 cores from suspect concrete work. Sets of cores shall represent not more than 500 square meters of concrete work. If the average core thickness is deficient, that area will be assessed a pay factor according to the Table 3.15.1:

Table 3.15.1: Removal or Liquidated Damages Based on the Affected Area including Payment Adjustment

Thickness Deficiency (mm)	Pay Factor (% Contract Price)
6	100.0
7	97.0
8	93.7
9	90.0
10	85.5
11	80.5
12	75.0
13	68.0
14	60.0
15	50.0
Over 15	Remove and Replace

1. GENERAL

This Section specifies requirements for supply and installation of manholes, catch basins and sewer appurtenances.

1.1 Related Work

.1	Excavating, Trenching and Backfilling	Section 31 23 33.01
.2	Aggregate Materials	Section 31 05 16
.3	Concrete Reinforcement	Section 03 20 00
.4	Cast in Place Concrete	Section 03 30 00

1.2 Measurement Procedures

- .1 Measure excavation and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.
- .2 Measure 1200 mm standard manholes and catch basin manholes as follows:
 - .1 Measure frames and covers for each type installed, grade rings, slab top, manhole barrels, base and pipe connections in vertical metres from the top of the frame and cover to the lowest invert elevation or by each unit installed as specified in the Tender Form Unit Price Schedule.
 - .2 The number of catch basins and manholes installed in any one project shall be recorded.
3. Measure Type 1-S manhole and large diameter manhole vaults as follows:
 - .1 Measure frames and covers for each type installed.
 - .2 Measure grade rings and bricks, slab top and 1200 mm standard manhole barrels installed as part of the Type 1-S and Large Diameter Manholes in vertical metres from the top of the frame and cover to the top of the top of adaptor slab top or top of vault.
 - .3 Measure Type 1-S manhole vaults in units installed.
 - .4 Measure Large Diameter Manhole vaults, including base and adaptor slab top, in units installed.
- .4 Measure other interior and exterior drop manholes as follows:
 - .1 Measure frames and covers for each type installed, grade rings, slab top, manhole barrels, including drop pipe section, (tee, bend, plug, lag bolts and strapping) base and pipe connections in vertical metres from the top of the frame and cover to the lowest invert or by each unit installed as specified in the Tender Form Unit Price Schedule.
- .5 Catch basins to be measured in units installed. Catch basin to include concrete base, concrete barrel, concrete slab top, frame, and cover as required and connection of storm sewer lead.
- .6 Measure outfalls in units installed.
- .7 Measure stormwater inlet/outlet structures in units installed.
- .8 Measure stormwater outlet control structures in units installed.
- .9 Measure stormwater treatment units in units installed.
- .10 Adjustments of rims to final grade will be considered incidental to this Section.
- .11 Connecting to or breaking into manholes, catch basins and mains shall be measured by each unit or on a lump sum basis as specified.

1.3 Submittals

- .1 Submittals in accordance with Section 01 33 00.
- .2 Submit Shop Drawings for Stormwater Treatment Units at least 4 weeks prior to beginning Work.

2. PRODUCTS

2.1 Materials

- .1 Corrugated Steel Pipe (CSP) Manholes and Catch basins shall NOT be used.
- .2 Cast-in-place concrete:
 - .1 In accordance with Section 03 30 00 – Cast in Place Concrete.
 - .2 Portland cement to CAN/CSA-A5, Type 50.
 - .3 Concrete mix design to produce 25 MPa minimum compressive strength at 28 days and containing 25 mm maximum size coarse aggregate, with water/cement ratio to CSA-A23.1.
 - .4 Air entrainment to CSA-A23.1.
 - .5 Additives: Fly ash to CAN/CSA-A23.5.
- .3 Concrete reinforcement: in accordance with Section 03 20 00.
- .4 Precast manhole units: to ASTM C478M, circular. Top sections flat slab top type with opening offset for vertical ladder installation. Minimum 1200 mm inside diameter unless otherwise specified.
- .5 Precast catch basin sections: to ASTM C478M.
- .6 Joints for both catchbasins and manholes as follows:

The joints for precast concrete catchbasins and manholes are to be of the confined O ring type conforming to ASTM C433 or current version thereof. Conical tops, flat tops and grade rings which come without gaskets are to be fully sealed to ensure the manhole will be completely water-tight. The contractor shall use an approved flexible bituminous gasket-type sealant. The sealant shall be placed between all the grade rings and between the frame and the top grade ring. The sealant between the cone and the first grade ring should be 25 mm, in other locations 13mm sealant may be used providing a water-tight seal is formed. The seals are to be installed to the manufacturer's specified procedures.
- .7 Mortar:
 - .1 Aggregate: to CAN3 – A82.56.
 - .2 Masonry Cement: to CAN/CSA-A3000-A8, sulphate resistant, Type 50.Concrete grout and mortar used for patching, filling and repairing holes, cracks and joints in concrete manholes shall be a pre-mixed, non-shrink, cement based patching material consisting of hydraulic cement, graded silica aggregates, special plasticising agent and accelerating agents, which have been formulated for vertical or overhead use. It shall not contain chlorides, gypsum plaster, iron particles, aluminum powder or gas forming agents or promote the corrosion of steel it may come into contact with. Set time shall be less than 30 minutes. One-hour compressive strength shall be a minimum of 13 MPa (200 psi) and the ultimate compressive strength shall be a minimum of 35 MPa (5000 psi). Bond strength shall be a minimum of 11.5 MPA (1700 psi). Steel shims are approved for levelling catch basin frames.

- .8 Ladder rungs: to CAN/CSA-G30.18, No.25M billet steel deformed bars, hot dipped galvanized to CAN/CSA-G164 or 61mm Aluminum. Rungs to be safety pattern drop step type with any sharp edges smoothed off to prevent injury. Manholes are to be orientated so that the safety steps/ladder rungs are aligned with the opening in the conical or flat top. Ladder rungs shall not be installed over the inlet or outlet of the manhole wherever possible. It is preferable that where manholes are located within roadways that the ladder rungs are positioned such that when entering or exiting the manhole they face oncoming traffic. The safety steps shall be installed in all pre-cast manhole sections, including the neck and in the pre-cast section to form a continuous in-line ladder, with rungs equally spaced at a maximum of 410mm apart from within 300mm below the cover to within 600mm of the base or benching. The steps shall be cast firmly in place or secured with a suitable mechanical anchorage to prevent pullout and maintain water tightness.
- .9 Adjusting rings: to ASTM C478M.
Rubber Composite riser rings (one number maximum per manhole) used for the final elevation adjustments of a manhole frame in the manhole neck area shall conform to the following:
- | | |
|-----------------------------------|--|
| Material: | Composite of recycled rubber, nylon fiber and polyurethane prepolymer, natural rubber or combination of the above. |
| Shore Hardness: | 75A +/- 7 Points |
| Tensile Strength: | Minimum 1.0 MPa – ASTM D412 |
| Initial Compression Deformation: | 2.9% Max |
| Compression Set: | 1.5% Max |
| Brittleness at Low Temperature: | Minus 40 ^o C |
| Coefficient of Thermal Expansion: | 12.95 x 10 ⁻⁵ |
| Maximum Thickness of Ring: | 76mm (3 inch) |
- Only to be used with Municipal approval.
- .10 Concrete Brick is not to be used for manhole risers.
- .11 Drop manhole pipe: to be same as sewer pipe.
- .12 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. Assemble and mark unit components before shipment.
 - .2 Gray iron castings: to ASTM A48, Class 20.
 - .3 Ductile iron castings: to ASTM A536, Class 60-40-18.
 - .4 Castings: sand blasted or cleaned and ground to eliminate surface imperfections and coated with two applications of asphalt varnish.
- .13 Safety platform – aluminum grates to be MSO Mississauga Ltd. MSLC48 or approved equal as specified in the Detail Drawings.
- .14 Granular bedding and backfill: in accordance with Section 31 05 16 – Aggregate Materials.
- .15 Concrete mixes and materials: in accordance with Section 03 30 00 – Cast in Place Concrete.

- .16 Insulation for Storm Sewers: Insulation used shall be a minimum of 50mm thick and composed of rigid polyurethane foam which is formed onto the pipe. The insulation shall have a thermal conductivity of $0.161 @ 0.174 \text{ kcal/cm/h/m}^2/^{\circ}\text{C}$ and have a minimum service temperature of -45°C . As an alternative a frost box can be installed using 50mm foam panels as per Standard Detail 50 01 03.

3. EXECUTION

3.1 Excavation and Backfill

- .1 Excavate and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and as indicated.
- .2 Obtain approval of Engineer before installing, manholes, catch basins, outfall structures, storm water inlet/outlet structures, storm water outlet control structures, or storm water treatment units.

3.2 Concrete Work

- .1 Do concrete work in accordance with Section 03 30 00 – Cast in Place Concrete.
- .2 Place concrete reinforcement in accordance with Section 03 20 00 - Concrete Reinforcement.
- .3 Position metal inserts in accordance with dimensions and details as indicated.

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. Maximum of three units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Engineer and remove soft and foreign material before placing concrete base.
- .4 Cast bottom slabs directly on undisturbed ground.
- .5 Set precast concrete base on a minimum of 150 mm granular bedding to depth specified on Drawings, compacted to 95% Standard Proctor Density.
- .6 Precast units:
 - .1 Set bottom section of precast units in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight as follows: The contractor shall use an approved flexible bituminous gasket- type sealant conforming to ASTM C - 990. The sealant shall be placed between all the grade rings and between the frame and the top grade ring. The sealant between the cone and the first grade ring should be 25 mm, in other locations 13 mm sealant may be used providing a water-tight seal is formed. The seals are to be installed to the manufacturer's specified procedures.
 - .2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .3 Plug lifting holes with Type 50 precast concrete plugs set in sulphate resistant hydraulic cement mortar or mastic compound.

- .7 For sewers:
 - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
 - .2 Bench to provide a smooth u-shaped channel. Side height of channel to be 0.5 times full diameter of sewer. Slope adjacent floor at 10:1. Curve channels smoothly. Slope invert to establish sewer grade.
- .8 Compact granular backfill to 100% Standard Proctor Density.
- .9 Place unshrinkable backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfill. If using concrete backfill it should have time to cure before backfilling.
- .10 Installing units in existing systems:
 - 1 Where new unit is to be installed in existing run of pipe, ensure full support of existing pipe during installation. Carefully remove portion of existing pipe to dimensions required and install new unit as specified. The edge formed between the intersection of the pipe and the inside of the manhole wall shall be well rounded and mortared to form a water-tight seal. Where sewer mains pass through or enter manholes, the invert channel shall be smooth and semi-circular in cross section. It may be formed directly in the concrete of the manhole base, or maybe constructed by laying sewer mains continuously through the manhole and then removing the top exposed section of pipe after the surrounding concrete has hardened and neatly trimming the edges.
 - 2 For tee-risers or perched manholes a maximum of one precast concrete manhole riser or barrel section shall be placed on a freshly poured concrete bases and no further work shall be done for a minimum of 12 hours allowing time for the concrete base to set sufficiently.
 - 3 Make joints watertight between new unit and existing pipe.
 - 4 Where deemed expedient to maintain service around existing pipes and when systems constructed under this Project are ready to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
- .11 Set frame and cover to required elevation on no more than three concrete rings and one rubber grade ring to a maximum of 300mm. Steel riser rings are not to be used in either new or the reconstruction of existing manholes. Parge and make smooth and watertight using bituminous gasket.
- .12 Place manhole frame and cover on top section to an elevation 5 - 10 mm below finished surface elevation. If adjustment required use concrete or maximum one rubber ring.
- .13 Place catch basin frame and cover, type indicated on construction drawings, on top section to an elevation 10 mm below finished surface elevation and 10 mm behind the face of curb. The floating frame and cover (F 80 & F 90 Types) is not to bear directly on the riser rings but supported by fully compacted paving material and not by the manhole.

The Contractor shall follow the manufacturer's instructions for installation and raising of the fully floating frames and covers. Instructions can be found at: <http://www.trojanindustries.com> or equivalent.
- .14 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

- .15 Install safety platforms in manholes having depth of 6 m or greater, as indicated.
- .16 The Contractor shall make every effort to keep construction debris from entering the storm system during construction, this may include, at the Contractors expense, the installation of a debris catchment system in the storm catch basin or manhole during construction.

3.4 Adjusting Tops of Existing Units

- .1 Remove existing grates and frames and store for re-use at locations designated by Engineer.
- .2 Sectional units:
 - .1 Raise or lower straight walled sectional units by removing slab top and adding or removing precast sections as required.
 - .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section with slab top.
 - .3 When amount of raise is less than 300 mm use standard manhole grade rings, provided that they do not exceed 450 mm below the frame and cover.
- .3 Monolithic units:
 - .1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation with mortared precast grade rings for 150 mm or less alteration.
 - .2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.
 - .3 When monolithic units with tapered upper section are to be lowered more than 150 mm, remove concrete for entire depth of taper plus as much straight wall as necessary, then rebuild upper section to required elevation with cast-in-place concrete.
 - .4 Install additional manhole ladder rungs in adjusted portion of units as required.
 - .5 Re-use existing gratings and frames.
 - .6 Re-set gratings and frames to required elevation on no more than three concrete rings. Make joints to frame with cement mortar, parge and trowel smooth.
 - .1 Re-set gratings and frames to required elevation on full bed of cement mortar, parge and trowel smooth.

1. GENERAL

This Section identifies the procedures to be followed when connections to existing mains are made within public rights of way with constructed roadways and/or lanes which must be restored to their original cross section following completion of the connections.

1.1 Related Work

1	Excavating, Trenching, and Backfill	Section 31 23 33.01
2	Storm Sewer Mains	Section 33 41 13
3	Storm Sewer Service Connections	Section 33 41 16.02
4	Roadway Embankment	Section 31 24 13
5	Granular Sub-Base	Section 32 11 16.01
6	Granular Base	Section 32 11 16.02
7	Aggregate Materials	Section 31 05 16
8	Plant-Mix Asphalt Paving	Section 32 12 16.13
9	Road-Mix Asphalt Paving	Section 32 12 16.16

1.2 Protection of Public Traffic

- 1 Arrange with the Municipality for temporary closure of public roadway and/or lane 72 hours in advance of anticipated construction activity.
- 2 When working within public rights of way, arrange for traffic accommodation in accordance with an approval plan and Alberta Transportation's Traffic Accommodation in urban work zones latest addition.

1.3 Notices

- .1 Deliver notices to all residents and businesses affected by proposed road/lane closure 72 hours in advance of proposed construction to allow for removal of vehicles prior to access to area being closed. Draft copy of Notice to be submitted to the Engineer for approval.

1.4 Connections to Existing Mains

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with a minimum of disturbance to Work, pedestrian traffic, and vehicular traffic.
- .2 Protect, relocate, or maintain existing active services. When services are encountered, cap off in a manner approved by authority having jurisdiction, stake and record location of capped space service.

1.5 Measurement Procedures

- .1 No payment will be made under this Section, as the Work is incidental to Work in other Sections.

2. PRODUCTS

2.1 General

- .1 Products, materials, and equipment incorporated in the Work to be in accordance with specific Sections.

3. EXECUTION

3.1 Closure of Public Roadways and/or Lanes

- .1 Arrange with the Municipality and Engineer for closure of the Work area a minimum of 72 hours prior to start of construction.
- .2 Establish detours and signage in accordance with an approved plan and Alberta Transportation's Traffic Accommodation in urban work zones latest addition.

3.2 Roadway and/or Lane Surface Restoration

- .1 As indicated or as directed by the Engineer, restore existing public roadways to the cross sections shown on the Drawings:
 - .1 Prepare subgrade and place geotextile as per applicable sections.
 - .2 Place and compact granular subbase in accordance with Section 32 11 16.01.
 - .3 Place and compact granular base in accordance with Section 32 11 16.02.
 - .4 Place and compact asphalt concrete pavement in accordance with Section 32 12 16.13.
 - .5 Construct concrete work in accordance with Section 32 16 15.

3.3 Warranty and Maintenance

- .1 Restored public roadways and/or lanes are to be included in warranty and maintenance periods for new construction.

APPENDIX 'A'



J.R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

EDMONTON – GRANDE PRAIRIE – PEACE RIVER

#4, 7710-102 Avenue
Peace River, Alberta
T8S 1M5

February 17, 2022
File No. PR 4861-17

VELOCITY GROUP
#3, 8909-96 Street
Peace River, Alberta
T8S 1G8

Attention: Mr. Jason Schuler, P. Eng.

Dear Sir:

**Re: Limited Testhole Investigation
Proposed Neighbourhood Infrastructure Renewal
94th and 95th Avenue
Peace River, Alberta**

As requested, J.R. Paine & Associates Ltd. (JRP) has completed a limited testhole investigation on the site of the Neighbourhood Infrastructure Renewal Project in the Town of Peace River, Alberta. As requested by the client, this letter summarizes the testhole investigation and watertable levels only. No detailed geotechnical report or recommendations were requested however, they can be provided upon request. This letter presents the results of the testhole drilling and laboratory results. The project is understood to include upgrades to the watermain, storm lines, sanitary sewer lines, services, roads, and concrete of selected existing roadways within the Town of Peace River. The scope of work that was authorized is as follows:

- 94 Avenue, between 94 Street and 98 Street
- 95 Avenue, between 94 Street and 98 Street

The soils investigation for this project was undertaken on March 17, 2020 utilizing a track mounted drill rig owned and operated by Frontier Enviro-Drilling, of Grande Prairie Alberta. A total of six (6) testholes were advanced to a depth of approximately 6.3 metres below the existing ground surface (BGS). The testhole locations were selected by JRP, based on the information supplied by Velocity Group (Velocity), and were drilled clear of existing utilities and parked

vehicles. Testholes 2020-02 and 2020-05 were drilled out of the roadway in the adjacent boulevard. Testhole 2020-01 was drilled in the roadway approximately one meter from the edge of curb and Testhole 2020-06 was drilled within the South parking lot of the Belle Petroleum Centre. Testholes 2020-03 and 2020-04 were drilled on steep inclines in line with the roadway. The roadways were snow covered at the time of the investigation. No visual investigation of the roadways was included in the scope of this letter. Travel on the roadway was possible for normal wheeled vehicles, however due to the steep nature of Testholes 2020-03 and 2020-04 a track rig was required for access. Testhole locations and elevations were surveyed with GPS by Velocity following drilling and are shown in the attached site plan included in the Appendix.

All disturbed bag samples returned to the laboratory were tested for moisture content. In addition, the plastic and liquid Atterberg Limits and soluble soil sulphate concentrations were determined on selected fine grained samples. Selected cohesionless samples underwent sieve analysis to determine grain size distribution. Lab results are included on the attached testhole logs located in the Appendix. Hydrocarbons were noted in Testhole 2020-01 below 4.5 meters BGS. As requested by Velocity, select samples were sent to ALS laboratory for hydrocarbon analysis. The results and recommendations are considered beyond the scope of this letter and as discussed with the client are to be addressed by others.

A detailed description of the soils encountered is found on the attached testhole logs in the Appendix. In general, the soil conditions on site consisted of surficial gravel fill, underlain by clay fill, underlain by native clay, sand, and clay till.

The groundwater table within the study area was considered low. Three sets of watertable readings were taken, with the results as follows:

**Groundwater Table Readings
Neighbourhood Infrastructure Renewal
Peace River, Alberta
(Metres Below Ground Surface)**

Testhole #	Testhole Elevation (m)	Depth To Watertable				Watertable Elevation (m)
		Mar. 24/20 (7 day)	Apr. 8/20 (22 Day)	Apr. 22/20 (36 day)	May 4/20 (45 day)	
2020-01*	319.36	N/A	N/A	N/A	N/A	N/A
2020-03	322.55	5.97 m	5.80 m	5.76 m	5.74	316.81
2020-05	320.00	5.38 m	5.40 m	5.25 m	5.24	314.76

*Note: Standpipe was installed in 2020-01, however due to frozen conditions no watertable reading was obtained. No standpipe installed in any other testholes.

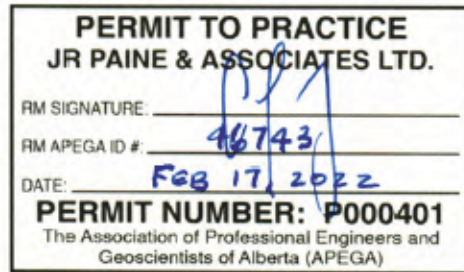
It should be noted that watertable levels may fluctuate on a seasonal or yearly basis with the highest readings obtained in the spring or after periods of heavy rainfall. The noted levels are estimated to be lower than the seasonal average values.

We trust this information is satisfactory. If you should have any further questions, please contact our office.

Respectfully Submitted,
J.R. PAINE & ASSOCIATES LTD.



Scott MacFarlane, P. Eng.
APEGA Member #89667

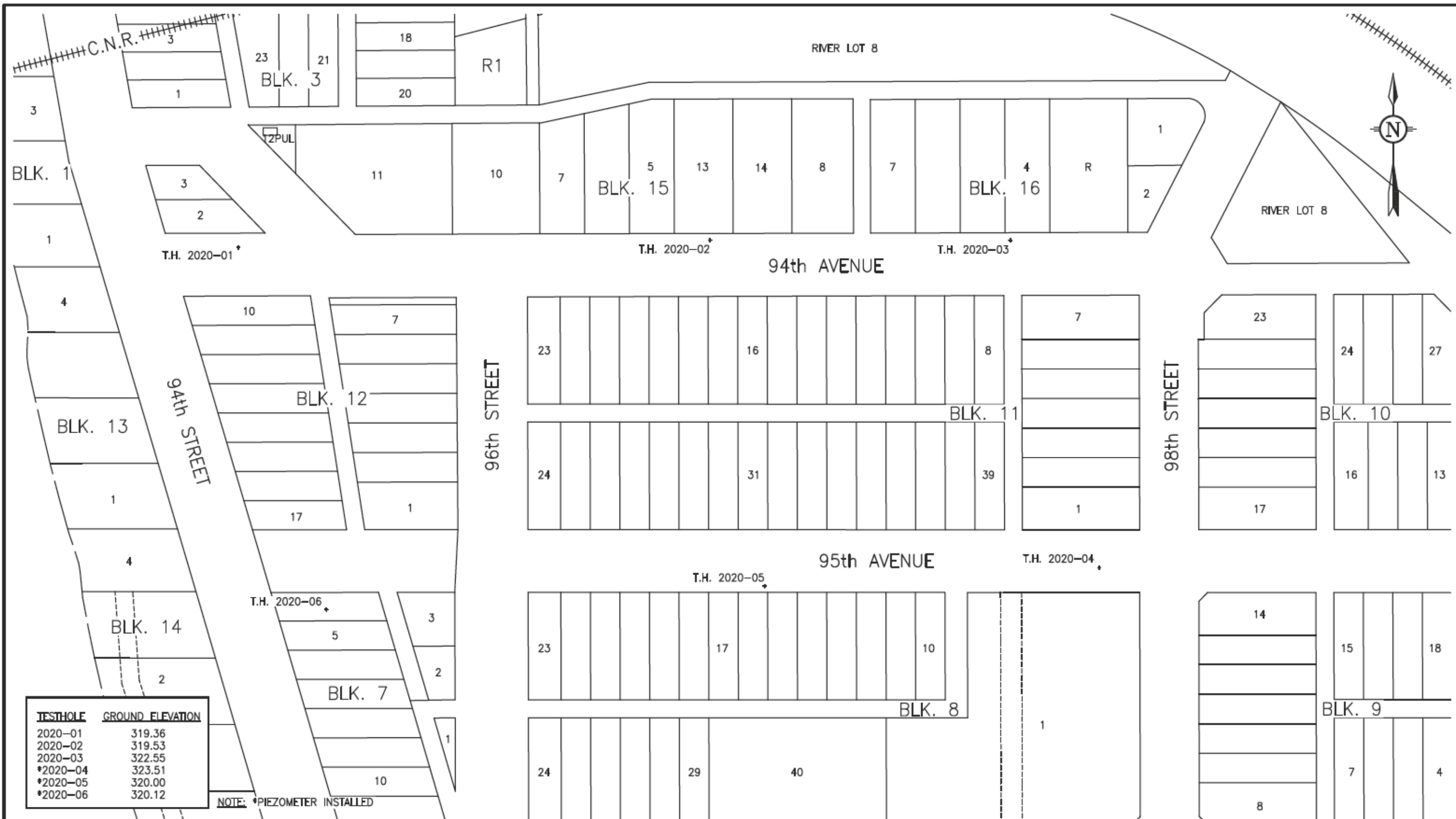


Reviewed by: Al Lang, P.Eng., Engineering Manager

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ATTACHMENTS:

Site Plan (by Velocity), Testhole Logs (TH 2020-01 to TH 2020-06)



TESTHOLE	GROUND ELEVATION
2020-01	319.36
2020-02	319.53
2020-03	322.55
*2020-04	323.51
*2020-05	320.00
*2020-06	320.12

NOTE: *PIEZOMETER INSTALLED

DESIGN:	--
DRAWN:	K.L.K.
DATE:	MARCH 23, 2020
SCALE:	1:1250



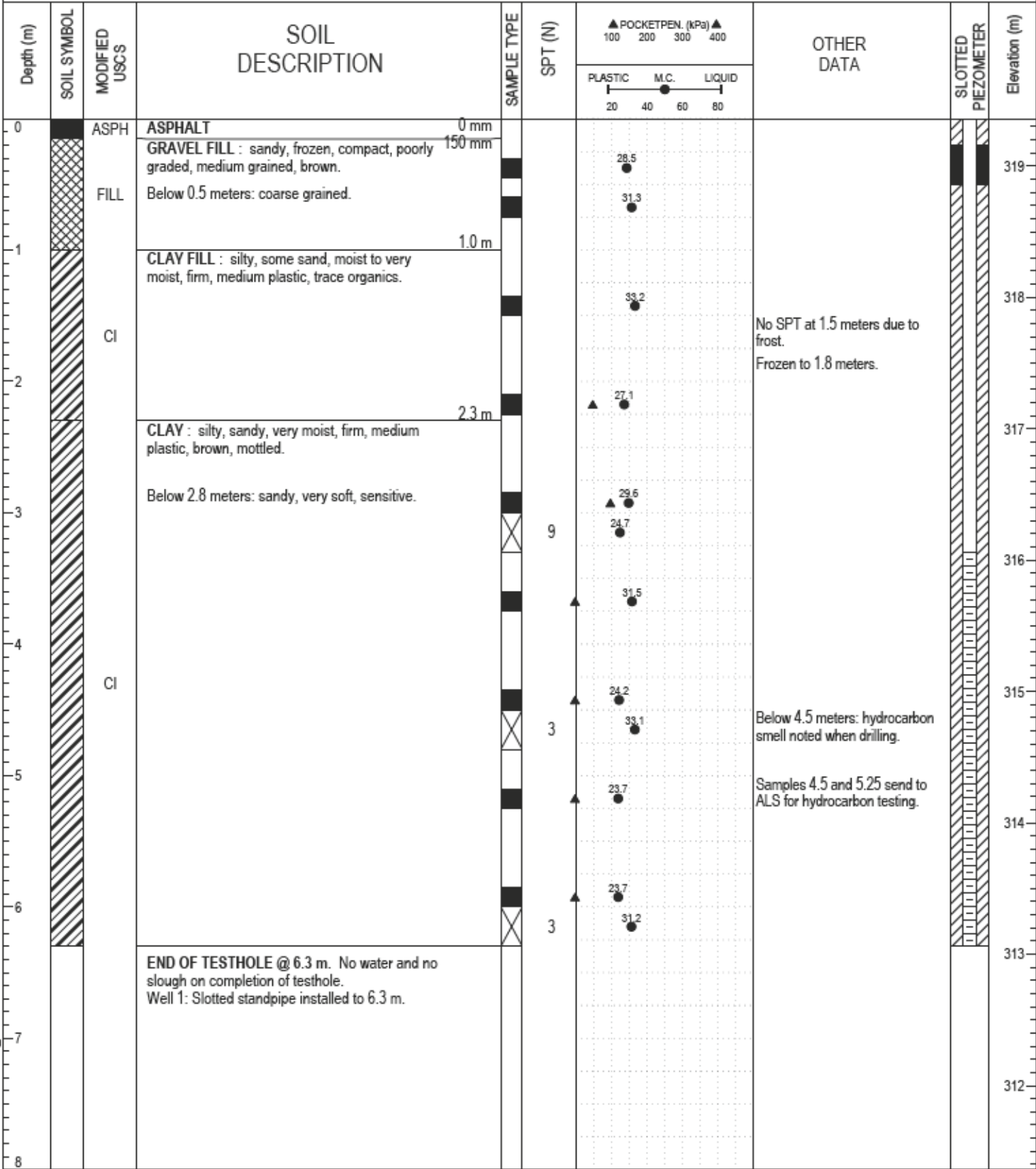
CLIENT: TOWN OF PEACE RIVER

PROJECT: NEIGHBORHOOD INFRASTRUCTURE RENEWAL
 94th & 95th AVENUE; 94th TO 98th STREET
 GEOTECHNICAL TESTHOLE LOCATION PLAN

CLIENT FILE No.	N/A	
VELOCITY FILE No.	170-021	
SHEET	OF	REV.
1	1	01

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PROJECT: Geotechnical Investigation - Neighbourhood Infrastructure Renewal		PROJECT NO: PR 4861-17	BOREHOLE NO: 2020-01
CLIENT: Velocity Group		DRILL METHOD: Solid Stem Auger	ELEVATION: 319.36 m
OWNER:		LOCATION: N 6232734, E 481459	
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> CORE SAMPLE	<input checked="" type="checkbox"/> SPT SAMPLE
	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH
	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND



JRP PR 4831-17 LOGS.GPJ JRPV3_0.GDT 17/02/22

PROJECT: Geotechnical Investigation - Neighbourhood Infrastructure Renewal	PROJECT NO: PR 4861-17	BOREHOLE NO: 2020-02
CLIENT: Velocity Group	DRILL METHOD: Solid Stem Auger	ELEVATION: 319.53 m
OWNER:	LOCATION: N 6232736, E 481618	

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY

Depth (m)	SOIL SYMBOL	MODIFIED USCS	SOIL DESCRIPTION	SAMPLE TYPE	SPT (N)	POCKETPEN. (kPa)		OTHER DATA	Elevation (m)
						PLASTIC	M.C. LIQUID		
0		OR	TOPSOIL : organics, grass, rootlets, black/brown. 0 mm CLAY FILL : very silty, sandy, frozen, friable, medium plastic, light brown, trace organics. 50 mm						
1		Cl	CLAY : silty, moist, stiff, medium plastic, brown. 1.0 m					Frozen to 1.1 meters.	
1.5			Below 1.5 meters: soft, trace white precipitates.		8	24	34.1	At 1.5 meters: limited recovery in SPT.	
2			Below 2.0 meters: very moist.						
3					6		34.5 31.4		
3.4-3.8		Cl	From 3.4-3.8 meters: trace sensitive.						
3.8			Below 3.8 meters: stiff.						
4									
5			Below 5.1 meters: very soft, grey, high plastic in seams, slickensided lenses.		9	27.5 29.8			
5.1								P.L. = 20.8 L.L. = 39.8 M.C. = 32.6 Soluble Sulphates: Negligible	
6			At 6.0 meters: trace water on SPT tool.		8	22.5	33.2		
6.3			END OF TESTHOLE @ 6.3 m. No water and no slough on completion of testhole.						

JRP PR 4831-17 LOGS.GPJ JRPV3_0.GDT 17/02/22



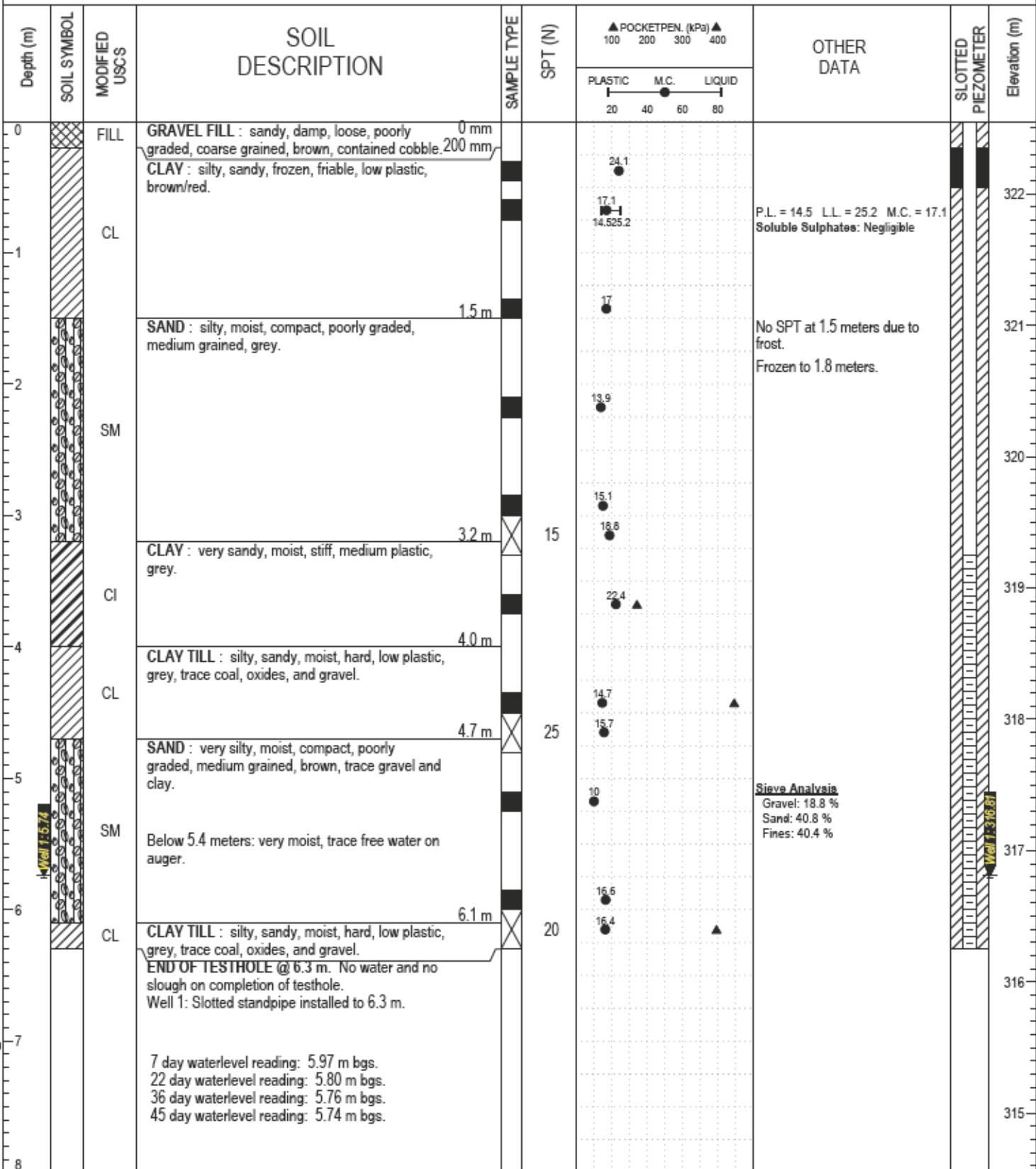
J.R. Faine & Associates Ltd.
CONSULTING & TESTING ENGINEERS
- GEOTECHNICAL - ENVIRONMENTAL - MATERIALS -

17505 - 106 Avenue
Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

LOGGED BY: K. Hominick
REVIEWED BY: S MacFarlane
Fig. No: 3

COMPLETION DEPTH: 6.30 m
COMPLETION DATE: 17/03/20
Page 1 of 1

PROJECT: Geotechnical Investigation - Neighbourhood Infrastructure Renewal		PROJECT NO: PR 4861-17	BOREHOLE NO: 2020-03
CLIENT: Velocity Group		DRILL METHOD: Solid Stem Auger	ELEVATION: 322.55 m
OWNER:		LOCATION: N 6232742, E 481723	
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> CORE SAMPLE	<input checked="" type="checkbox"/> SPT SAMPLE
	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH
	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND



JRP PR 4831-17 LOGS.GPJ JRPV3_0.GDT 17/02/22



J.R. Faine & Associates Ltd.
CONSULTING & TESTING ENGINEERS
- GEOTECHNICAL - ENVIRONMENTAL - MATERIALS -

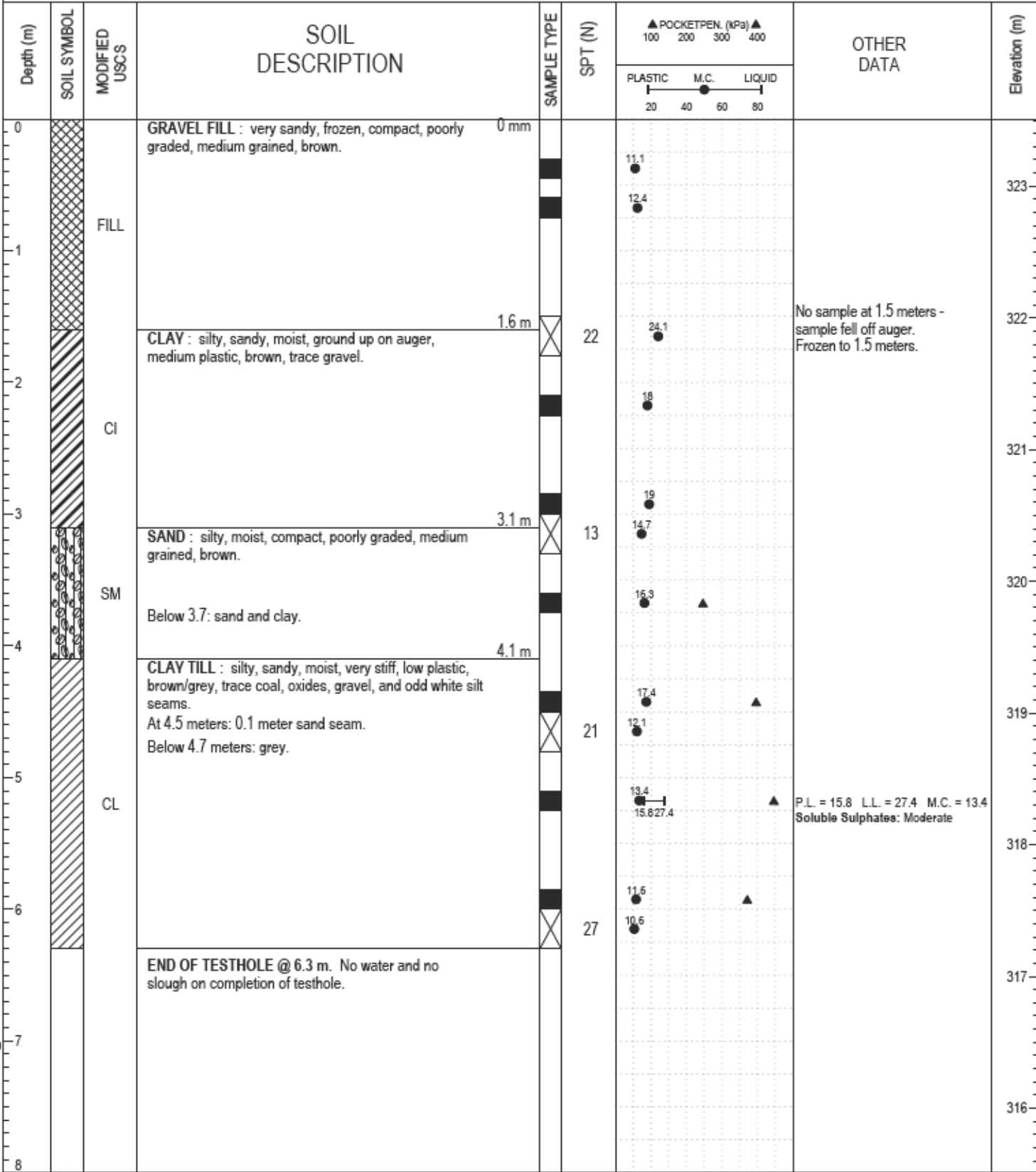
17505 - 106 Avenue
Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

LOGGED BY: K. Hominick
REVIEWED BY: S MacFarlane
Fig. No: 4

COMPLETION DEPTH: 6.30 m
COMPLETION DATE: 17/03/20
Page 1 of 1

PROJECT: Geotechnical Investigation - Neighbourhood Infrastructure Renewal	PROJECT NO: PR 4861-17	BOREHOLE NO: 2020-04
CLIENT: Velocity Group	DRILL METHOD: Solid Stem Auger	ELEVATION: 323.51 m
OWNER:	LOCATION: N 6232614, E 481488	

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY



JRP PR 4831-17 LOGS.GPJ JRPV3_0.GDT 17/02/22



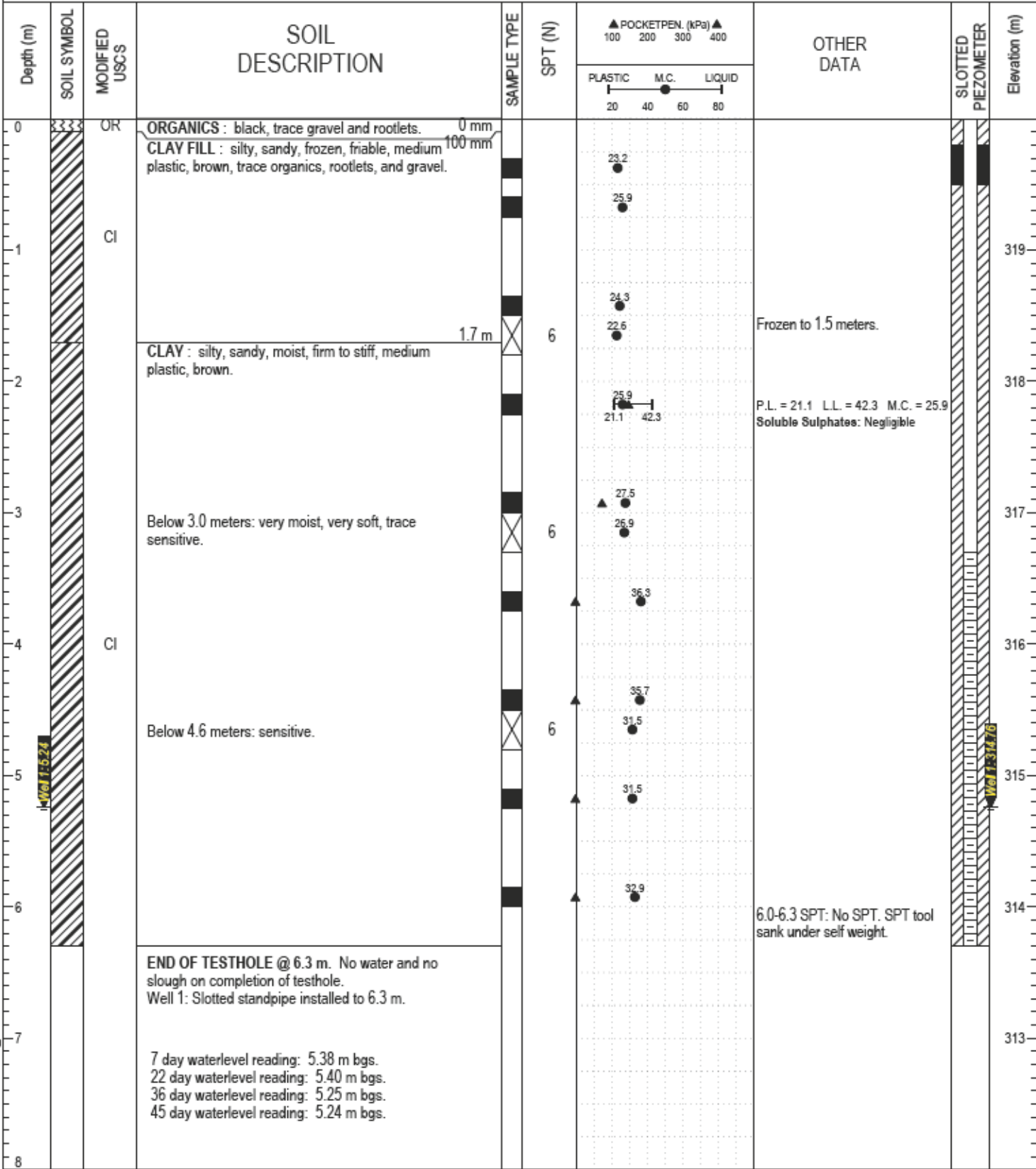
J.R. Faine & Associates Ltd.
CONSULTING & TESTING ENGINEERS
- GEOTECHNICAL - ENVIRONMENTAL - MATERIALS -

17505 - 106 Avenue
Edmonton, AB T5S 1E7
Phone: (780) 489-0700
Fax: (780) 489-0800

LOGGED BY: K. Hominick
REVIEWED BY: S MacFarlane
Fig. No: 5

COMPLETION DEPTH: 6.30 m
COMPLETION DATE: 17/03/20
Page 1 of 1

PROJECT: Geotechnical Investigation - Neighbourhood Infrastructure Renewal		PROJECT NO: PR 4861-17	BOREHOLE NO: 2020-05
CLIENT: Velocity Group		DRILL METHOD: Solid Stem Auger	ELEVATION: 320 m
OWNER:		LOCATION: N 6232628, E 481637	
SAMPLE TYPE	<input checked="" type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> CORE SAMPLE	<input checked="" type="checkbox"/> SPT SAMPLE
	<input type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH
	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND



JRP PR 4831-17 LOGS.GPJ JRPV3_0.GDT 17/02/22

J.R. Faine & Associates Ltd.
 CONSULTING & TESTING ENGINEERS
 - GEOTECHNICAL - ENVIRONMENTAL - MATERIALS -

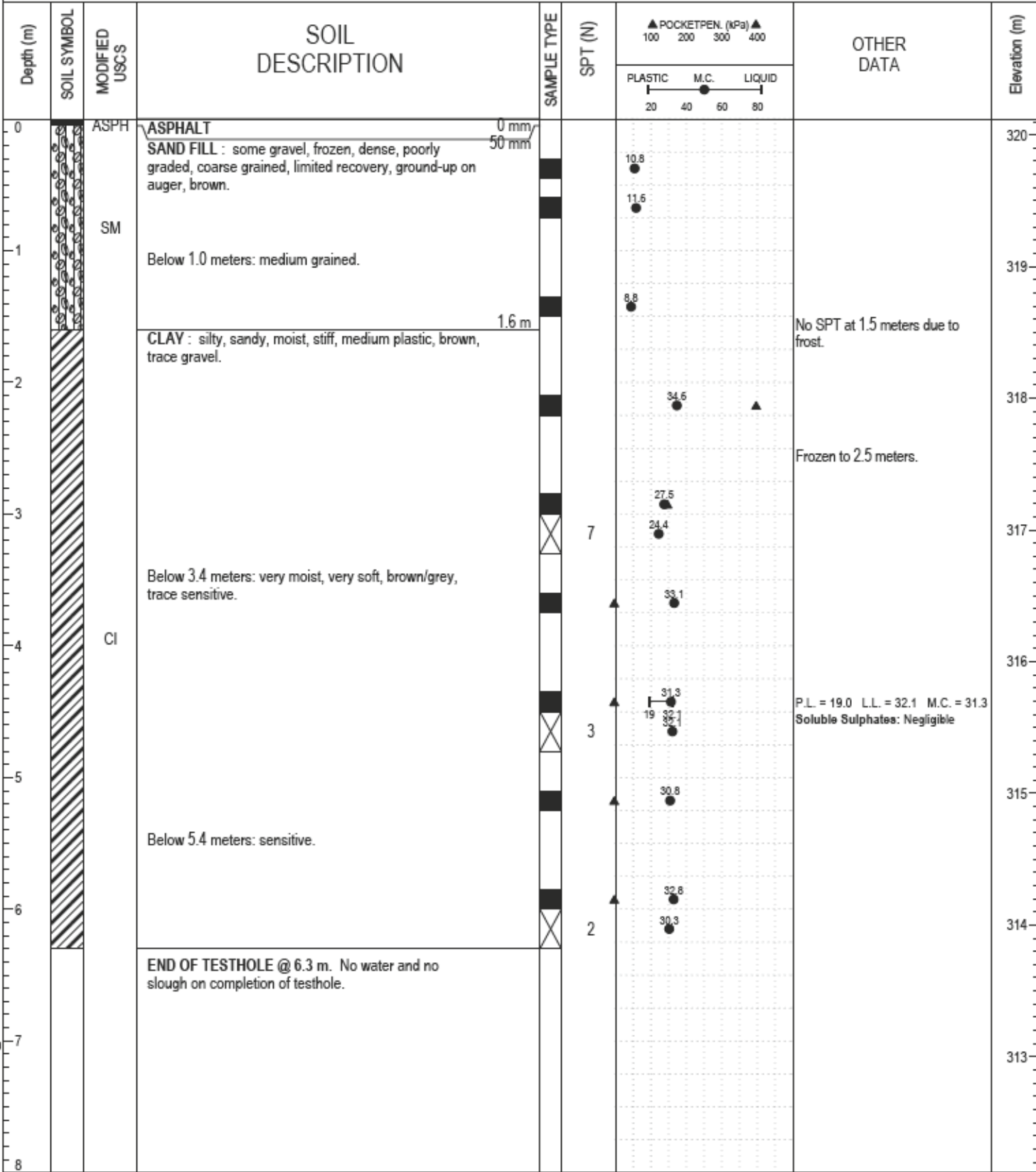
17505 - 106 Avenue
 Edmonton, AB T5S 1E7
 Phone: (780) 489-0700
 Fax: (780) 489-0800

LOGGED BY: K. Hominick
 REVIEWED BY: S MacFarlane
 Fig. No: 6

COMPLETION DEPTH: 6.30 m
 COMPLETION DATE: 17/03/20
 Page 1 of 1

PROJECT: Geotechnical Investigation - Neighbourhood Infrastructure Renewal	PROJECT NO: PR 4861-17	BOREHOLE NO: 2020-06
CLIENT: Velocity Group	DRILL METHOD: Solid Stem Auger	ELEVATION: 320.12 m
OWNER:	LOCATION: N 6232636, E 481746	

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY



JRP PR 4831-17 LOGS.GPJ JRPV3_0.GDT 17/02/22

J.R. Faine & Associates Ltd.
 CONSULTING & TESTING ENGINEERS
 - GEOTECHNICAL - ENVIRONMENTAL - MATERIALS -

17505 - 106 Avenue
 Edmonton, AB T5S 1E7
 Phone: (780) 489-0700
 Fax: (780) 489-0800

LOGGED BY: K. Hominick
 REVIEWED BY: S MacFarlane
 Fig. No: 7

COMPLETION DEPTH: 6.30 m
 COMPLETION DATE: 17/03/20
 Page 1 of 1

APPENDIX 'B'

ATCO GAS



WORK ORDER POINT	WIRE JUNCTION
Completed Work Order	Operating
Current Work Order	
PROPOSED CAPITAL PROJECT	REGULATOR STATION
PROPOSED CAPITAL PROJECT	Operating
SQUEEZE OFF	WELLHEAD
SQUEEZE OFF	Operating
WATER CROSSING	TRANSMISSION PIPES
WATER CROSSING	Abandoned
	Decommissioned
	Operating
	Proposed
COMMUNICATION CABLE	DISTRIBUTION PIPE
COMMUNICATION CABLE	AB
	LP
POWER POLE	MP
POWER POLE	IP
EXCESS FLOW VALVE	IP1
Operating	IP2
	IP3
SERVICE POINT	IP4
Operating	IP5
	IP6
INTERCONNECT	HP
Operating	Unknown
MEASUREMENT POINT	
Operating	
REGULATOR	
Operating	
CONTROLLABLE VALVE	
Operating	
LAMP	
Operating	
STOPPER	
Operating	
RECTIFIER	
Operating	
ANODE	
Operating	
TEST POINT	
Operating	
TEE	
Operating	
REDUCER	
Operating	
COUPLING	
Operating	
END CAP	
Operating	
TRANSITION	
Operating	
WELD	
Operating	
ELECTRO STOP	
Operating	
CONNECTION POINT	
Operating	
INSULATION JUNCTION	
Operating	
	SERVICE PIPE
	AB
	LP
	MP
	IP
	IP1
	IP2
	IP3
	IP4
	IP5
	IP6
	HP
	Unknown
	Proposed, IFC, Not Ready
	STATION PIPE
	STATION PIPE
	DEVELOPER SLEEVE
	DEVELOPER SLEEVE
	INSERTION
	Inserted Main
	Inserted Service

ATCO

Scale: 1:1,500

Current as of 2022-02-02

User ID: up74

GCS: NAD 1983 10TM AEP Resource

Note: All dimensions in meters unless noted otherwise.

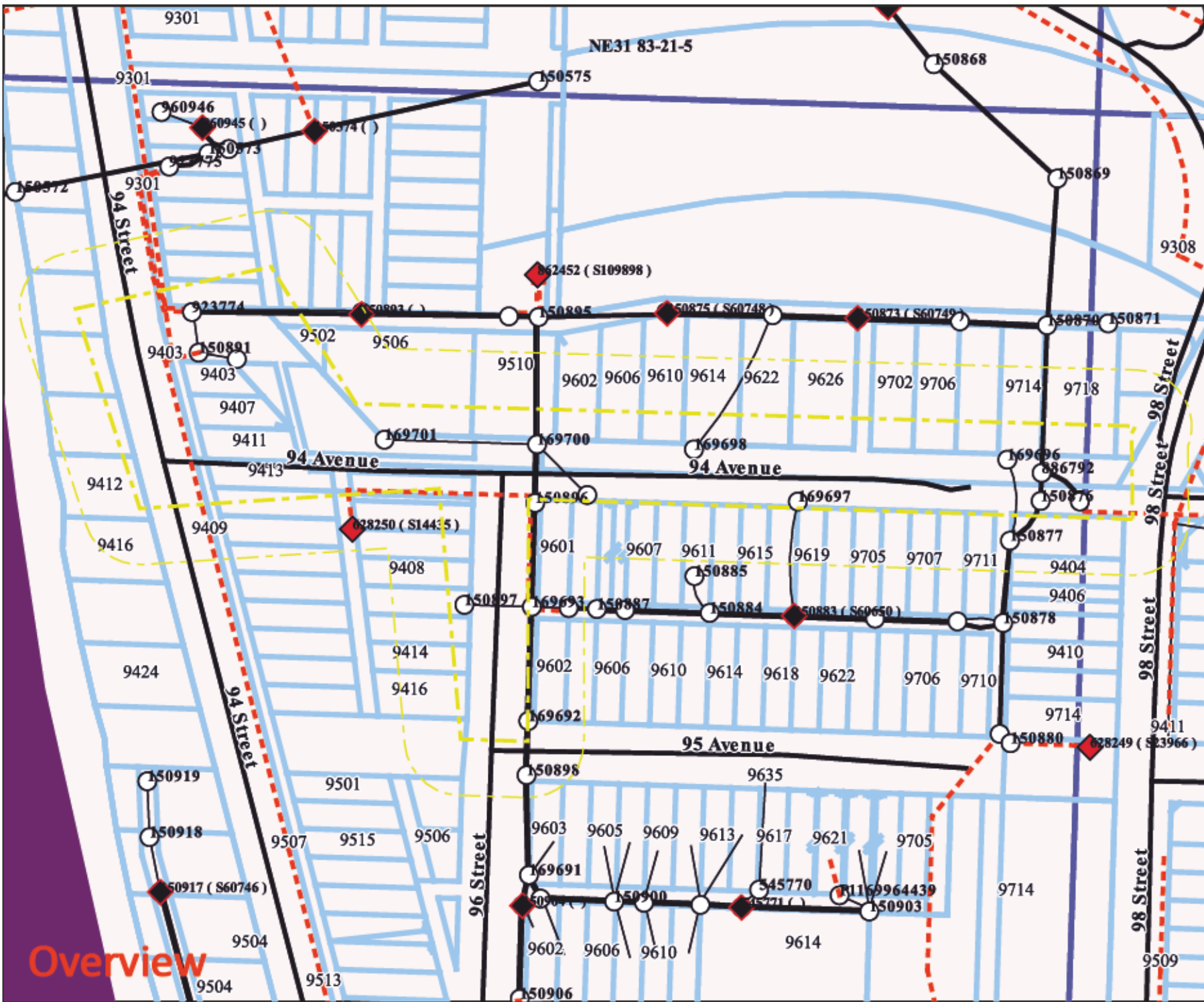
DISCLAIMER

1. While every attempt has been made to maintain this file in an up-to-date condition, revisions and modifications are made from time to time and can occur at any time without notice to the recipient of this information. Furthermore, this file is forwarded under the express understanding that there is no obligation to notify recipients of changes.

2. ATCO provides this information in good faith, to the intended recipient. However, it makes no warranty in regard to the information whatsoever (including but not limited to a warranty as to the accuracy of the information) and ATCO does not accept any liability arising from incomplete, incorrect or misleading information.

3. Not all elements in the legend will be represented in the map.

ATCO ELECTRIC



- OneCallReferral
- AB_One_Call_Registered
- Electric**
 - ATCO_Electric_FiberOpticLines
 - DistributionPoles
 - Transformers**
 - OH
 - UG
 - PrimaryOverheadConductors
 - SecondaryOverheadConductors
 - PrimaryUndergroundConductors
 - SecondaryUndergroundConductor
 - PropertyBoundaries
 - Transmission_Subs
- Cadastral**
 - AddressLabels
 - PropertyBoundaries
- Base**
 - QuarterSections
- Transport**
 - Expressway / Highway
- Waterbody

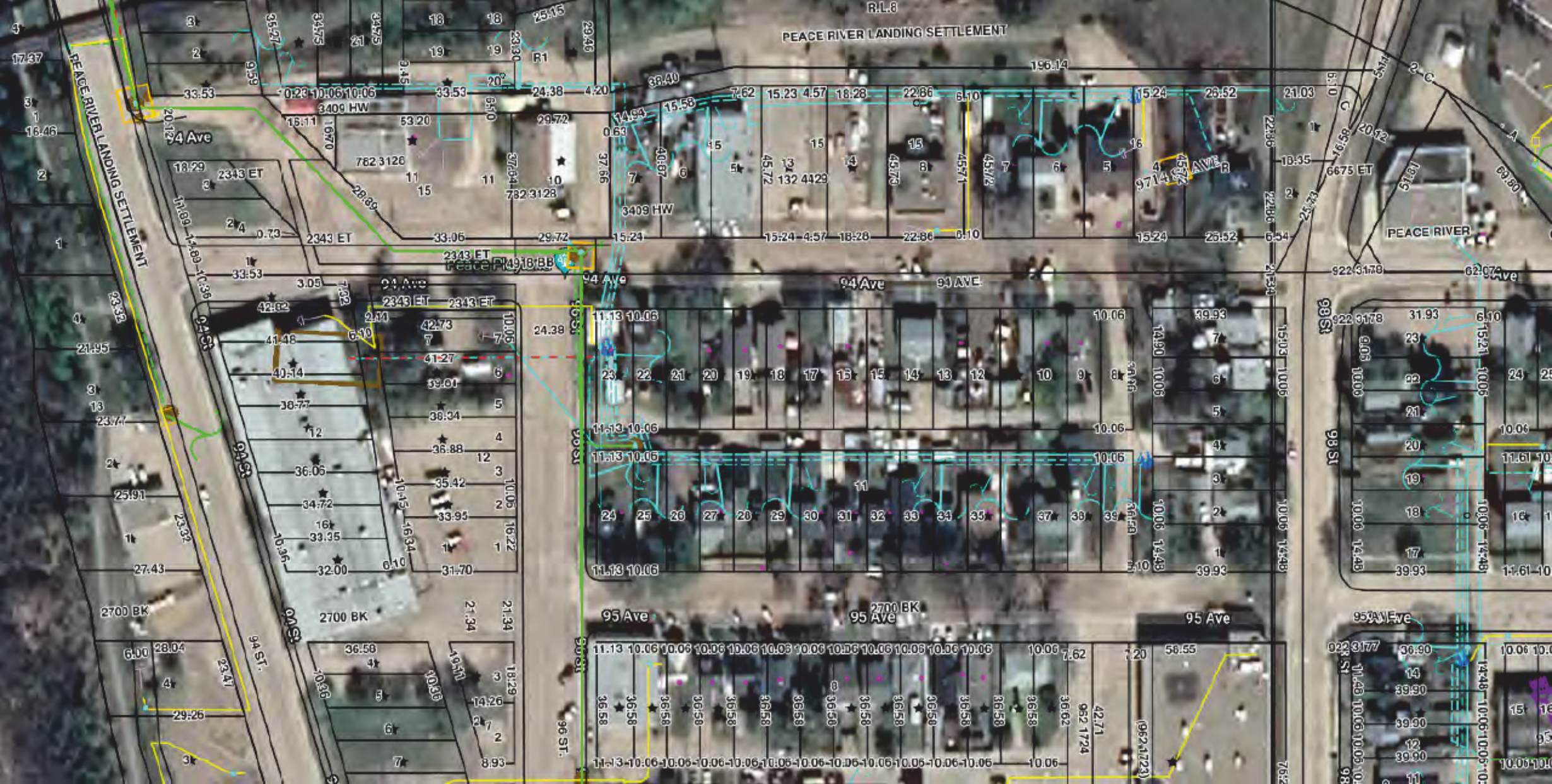
A valid locate request must be submitted before a ground disturbance can begin

Scale: 1:1805
Date: 15/02/2022

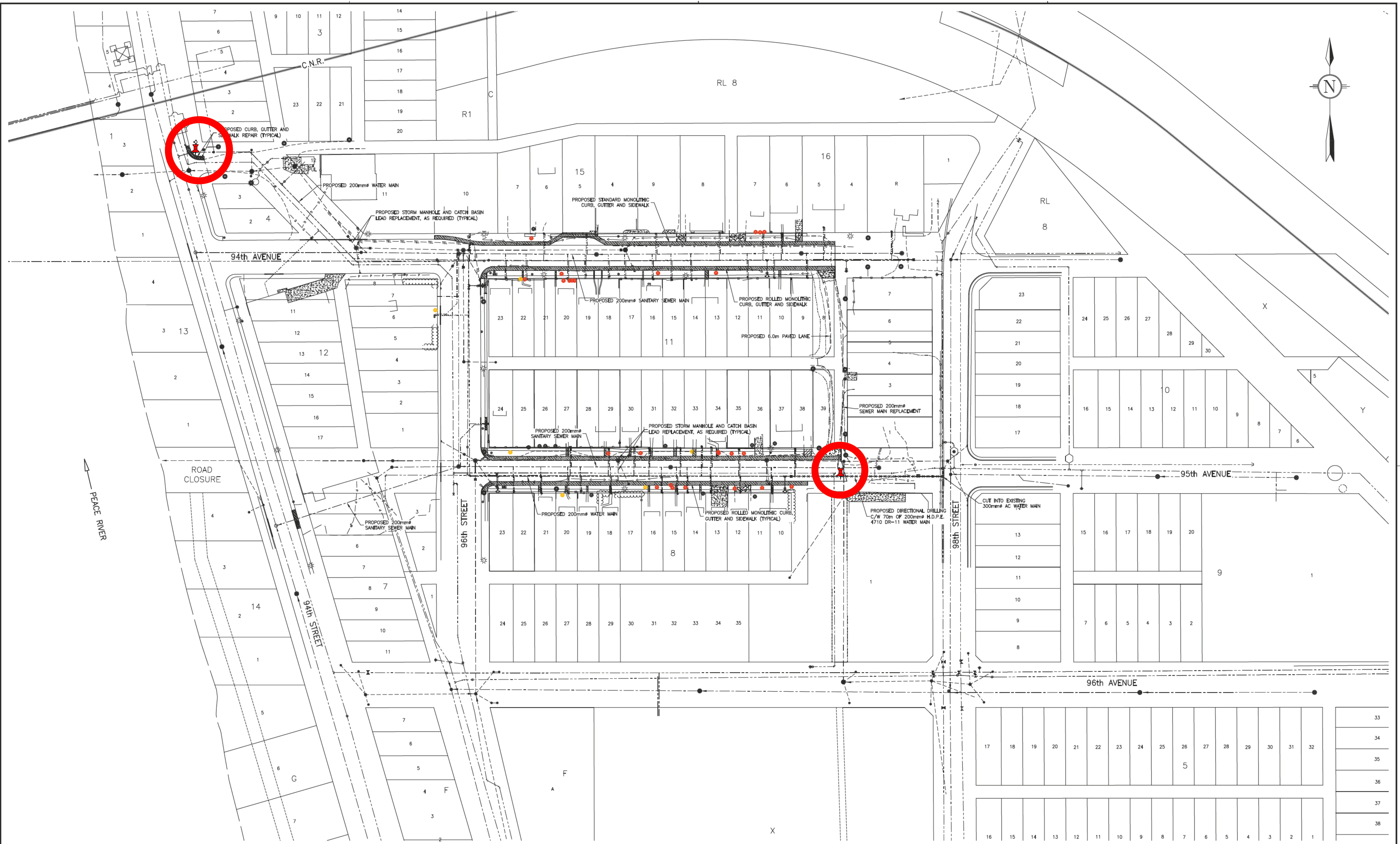
DISCLAIMER: While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither ATCO Electric or PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

Overview

TELUS



EAST LINK



NO.	REVISION	BY	APPD.	DATE
2.	ISSUED FOR PUBLIC INFORMATION SESSION	K.L.K.	J.W.S.	2020-08-06
1.	ISSUED FOR TOWN REVIEW	K.L.K.	J.W.S.	2019-11-29

DESIGN:	J.W.S.
DRAWN:	K.L.K.
CHECKED:	J.W.S.
DATE:	November 29, 2019
BENCHMARK:	
SCALE:	1:750

DESIGN: J.W.S.
 DRAWN: K.L.K.
 CHECKED: J.W.S.
 DATE: November 29, 2019
 BENCHMARK:
 SCALE: 1:750



CLIENT:	TOWN OF PEACE RIVER	CLIENT FILE No.	---
PROJECT:	NEIGHBOURHOOD INFRASTRUCTURE RENEWAL - 2021 94th & 95th AVENUE; 94th TO 98th STREET OVERALL PLAN	VELOCITY FILE No.	170-021
		DRAWING No.	170021-OA
		SHEET	1 OF 6
		LAYOUT No.	01
		REV.	01

D:\2020 Job Files\170-021-01-05 Items\170-021-01-05-01.dwg Printed: 2020 Aug 06 11:54am

SUPERNET



PCRVABJX003

PCRVABMX037

Water Supply

Peace Regional SPCA

Peace Playland

94 Ave

94 Ave

Belle Petroleum Centre

Tapas Room

Buchholz Financial Services

95 Ave

95 Ave

95 Ave



APPENDIX 'C'

Town of Peace River

Neighbourhood Infrastructure Renewal

Water System Notifications & Procedures

- Contractor to provide 48 hours notice to the Water/Wastewater (W/WW) Operations Manager, or Assistant Manager, is required for interruptions, connections, isolation and water system testing operations. Same notice required for Public Works with respect to system operation. Public Works must also obtain Water/Wastewater Operations approval for system operation.
- Devin Braun with Public Works must be contacted for existing system operation. Dana Langer or Randy Dupuis must be contacted for all other matters.
- Notices shall be sent via email so that all parties are informed. Include the Town Engineering, W/WW Operations & Public Works Departments and McIntosh Perry as noted below.

Town of Peace River Engineering

Alisha Mody O: 780-624-2574 M: 780-527-9625 amody@peaceriver.ca

Town of Peace River W/WW Operations

Dana Langer O: 780-624-3311 M: 780-618-6821 dlanger@peaceriver.ca

Randy Dupuis O: 780-624-3311 M: 780-625-5250 rdupuis@peaceriver.ca

Town of Peace River Public Works

Devin Braun O: 780-624-3085 M: 780-618-5523 dbraun@peaceriver.ca

McIntosh Perry Consulting Engineers

Delon Young M: 780-617-4714 d.young@mcintoshperry.com

Maurice Wadman M: 780-625-2351 m.wadman@mcintoshperry.com

Trevor Waterman M: 780-219-5367 t.waterman@mcintoshperry.com

1) Temporary Water Supply & Interruptions

- The Contractor shall supply a plan for temporary water servicing and service interruptions prior to construction. This plan shall be reviewed and approved by the Water Facilities Manager (WFM) prior to construction commencement.
- The WFM shall be notified and approve any operation with respect to this approved plan.
- Minimum 24-hour verbal and written notice to affected residents and properties is required.
- See Item '3' below for temporary water system testing requirement.
- Hydrants used for temporary water must be flushed for 5 minutes and be checked for chlorine residual prior to their use.
- The Town will supply isolation gate valves for the remaining nozzles on hydrants being used for temporary water. These valves will allow for uninterrupted access for the Fire Department if necessary.
- Potable water trucks used for supplying temporary water will require proof of truck certification for potable water (monthly for potable water haulers).
- All temp water piping and fittings must be certified for potable water and either must be new or have been used only for potable water in the past.

2) Water System Isolation & Connections

- Provide a minimum of 48-hour notice for water system isolation and connections. Water Facilities staff and/or Public Works staff on their behalf, shall operate isolation valves.
- The Contractor may operate existing valves under the Municipalities direct supervision, or if otherwise authorized by the Municipality.
- The Municipality must be witness to water main connections and associated disinfection procedures.

3) Water System Testing & Disinfection

- Provide minimum of 48-hour notice to have Town and Engineering representatives available for system testing.
 - The specification requires flushing, pressure testing, 24-hour super chlorination, flushing & de-chlorination, and bacteriological testing. Disinfection procedures referencing AWWA C651 standard and municipal requirements.
 - Coordinate all water system testing with W/WW Operations Manager and McIntosh Perry.
 - The water system testing, and disinfection procedures must be reviewed and approved by the W/WW Operations Managers and be acceptable to Alberta Environment & Parks.
 - The W/WW Operations Managers require separate notification for line flushing to ensure reservoir capacity is not compromised.
 - The Contractor shall coordinate with the W/WW Operations staff to complete bacteriological sampling. The bacteriological samples must be collected by the W/WW Operations, or by the Contractor under the W/WW Operations direct supervision.
 - The bacteriological samples must be sent to the Government of Alberta lab. No other lab is approved. The Town will send samples via courier to the lab for testing. Bacteriological samples must be taken between 2pm and 3pm on Monday through Thursday. Thursday sampling tends to run the risk of samples not being tested on the other end or not receiving results until the following week. Willy's trucking only guarantees timely delivery for Tuesday sampling.
 - All flushing water must be directed to storm drains directly or via overland route unless otherwise approved by the W/WW Operations staff for flushing to the sanitary sewer system. All chlorinated water must be de-chlorinated water must de-chlorinated prior to release to the environment.
- A. The W/WW Operations staff or McIntosh Perry on their behalf must be witness to water pressure leakage tests.
 - B. The W/WW Operations staff or McIntosh Perry on their behalf must verify free chlorine residual once water lines are super chlorinated (minimum 25 mg/L), after 24 hours (minimum 10 mg/L), and post flushing to ensure safe levels for consumption (maximum 2 mg/L).
 - C. The W/WW Operations staff must be party to and agreeable with disinfection and bacteriological sampling procedures.
 - D. The W/WW Operations Managers shall determine the number and location of bacteriological sample points.

APPENDIX 'D'

Date: January 27, 2022

ATCO Pipelines Crossing Number: T22-0266
Your Number

The Town of Peace River
karrie@velocitygroup.ca

Attention: Karrie Kennedy

RE: PROPOSED temporary workspace and temporary access
CROSSING our High Pressure Natural Gas Pipeline(s) Located in:

Legal Description	Pipe Size (mm)
SE-31-83-21-W4M	114 mm

Further to your application dated Jan 27, 2022 ATCO Gas and Pipelines Ltd. (hereinafter called the Grantor), approves The Town of Peace River's (hereinafter called the Grantee) request to conduct Work on or near our Facility or cross our aforementioned high pressure natural gas pipeline(s) subject to the terms and conditions of our attached Facility Crossing Agreement.

Please place a request to activate this agreement by contacting ATCO's Natural Gas Customer Care Centre @ 310-5678 (within Alberta) and 1-888-511-7550 (Outside Alberta). Prompt #3 and refer to Crossing Number T22-0266. Alternatively, you can activate your crossing agreement by texting us at 28261 or chatting with us online at atco.com/naturalgas. The Grantor's Field Representative will contact you within 72 hours to schedule a field meeting to activate the crossing agreement and establish safe ground disturbance procedures.

PLEASE NOTE: THIS AGREEMENT IS VALID FOR ATCO'S LICENSED HIGH PRESSURE NATURAL GAS PIPELINES AND DOES NOT GRANT CONSENT FOR ANY WORK TO BE COMPLETED AROUND ATCO'S INTERMEDIATE OR LOW PRESSURE PIPELINES. A SEPARATE AGREEMENT MUST BE OBTAINED FOR THOSE FACILITIES.

To obtain an agreement for ATCO'S intermediate and low pressure pipelines please send a request to crossings@atcogas.com.

All hydro-vacced holes used to locate the Grantor's facilities must be secured during work activities and never left open unattended. If unattended, the hole must be fenced off at a minimum height of 1.2 meters, visibly marked with orange tape, and covered with 15mm or thicker plywood to prevent accidental entry by pedestrians or animals. Grantee shall, as soon as it is reasonably practical after the completion of Grantee's Work in the Crossing Area, restore the surface of the Crossing Area as closely as is practical to the condition in which it existed immediately prior to the Work being commenced.

Three Working days' notice (minimum 72 hours) must be given to the Grantor's Field Representative

- prior to construction. Please refer to Crossing Number T22-0266 when contacting the Grantor's Field Representative.
- During performance of the Work pursuant to this Agreement, the Grantee shall have a copy of the fully executed (both signatures) Agreement available to the Crossing Area which shall remain on site for the duration of the Work for which this Agreement was granted.
- As per Schedule "C," the rights and obligations of the parties under this Agreement shall terminate **one year** from the date hereof if the Work on the Grantee's Facility has not commenced.

Should you have any questions or require further information, please contact me at (780) 420-5423.

Sincerely,

ATCO Pipelines,
a division of ATCO Gas and Pipelines Ltd.



Gloria Killins
Sr. Land Administrator

Attachments: Facility Crossing Agreement, including:

- 1) Body of the Agreement
- 2) Schedule "A" Standard Terms and Conditions
- 3) Schedule "B" Location Plan and Profile
- 4) Schedule "C" Specific Terms and Conditions

**FACILITY CROSSING AGREEMENT
T22-0266**

THIS AGREEMENT is made and effective as of the **27th day of Jan. 2022**.

BETWEEN ATCO Gas and Pipelines Ltd. ("Grantor")
(hereinafter and in Schedules A, B, & C referred to as the Grantor)

and

The Town of Peace River
(**"Grantee"**)
(hereinafter and in Schedules A, B & C referred to as the Grantee)

Whereas Grantor operates under the jurisdiction of The Alberta Utilities Commission holds one or more rights-of-way (or facilities) in across the said lands, hereinafter referred to as **"Grantor's Facility"**; and

WHEREAS Grantee operates under the jurisdiction of the **Laws of the Province of Alberta** has acquired one or more rights-of-way across the said lands hereinafter referred to as **"Grantee's Facility"**; and

Whereas the rights-of-way and/or Facilities of the respective parties intersect in the Crossing Area; and

Whereas the parties wish to define their respective rights and liabilities with respect to the Crossing Area under certain terms and conditions defined in Schedule 'A'.

NOW THEREFORE THIS AGREEMENT WITNESSES that in consideration of the premises, mutual covenants and agreements herein contained, the parties agree that their respective Work in the Crossing Area shall be governed by this Agreement together with the Schedules as herein described.

1. TERMS AND CONDITIONS

This Agreement including the recitals and the following Schedules, which are attached hereto and made part hereof, shall be the terms and conditions as agreed to by Grantor and Grantee:

Schedule "A" - Mutually Agreed to Terms and Conditions.

Schedule "B" - Location Plan and Profile.

Schedule "C" - Specific Terms and Conditions.

2. LOCATION AND NOTICES T22-0266

(a) Location of Crossing Area (Legal Description):
 SE-31-83-21-W4M

(b) Notices

	<u>Grantor's Office</u>	<u>Grantee's Corporate Office</u>
Name:	ATCO Gas and Pipelines Ltd.	Town of Peace River
Address:	7210-42 Street NW Edmonton, AB T6B 3H1	P.O. Box 6600 Peace River, AB T8S 1S4
Dept.	Land Administration	<u>Director of Engineering and Infrastructure</u>
Contact:	Gloria Killins	<u>Jim McCuaig</u>
Phone:	(780) 420-5423	<u>780-624-2574</u>

(c) Field Representative:

	<u>Grantor's</u>	<u>Grantee's</u>
Name:	ATCO Natural Gas Customer Care Centre @ 310-5678 (within Alberta) or (1-888-511-7550)	_____
Position:		_____
Address:		_____ _____
Phone:		_____ _____

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be duly executed this _____ day of _____, 2022.

ATCO Gas and Pipelines Ltd.

The Town of Peace River

("Grantor")

("Grantee")

Gloria Killins
 Sr. Land Administrative Coordinator

 Title:

Schedule "A"

Mutually Agreed to Terms and Conditions

This Schedule "A" to Form Part of the Facility Crossing Agreement.

Between ATCO Gas and Pipelines Ltd. (Grantor)

and The Town of Peace River (Grantee)

and dated the 27th day of Jan, 2022.

1. Interpretation

1.01 In this Agreement, including the recitals, the words and terms used shall have the following meanings:

- (a) "Crossing Area" means the area of intersection of Grantor's and Grantee's rights-of-way and/or Facilities as outlined in red on Schedule "B";
- (b) "Grantee's Facility" means the facility or facilities to be constructed by Grantee and to be located within, across, along, upon, over or under the Crossing Area;
- (c) "Grantor's Facility" means the facility or facilities of Grantor located within, across, along, upon, over or under the Crossing Area;
- (d) "Facility" means;
 - i) any structure that is constructed or placed on or in the right-of-way within the Crossing Area (concrete slab, concrete conduit, retaining wall, special fences such as chain link, etc.); and
 - ii) any highway, public or private road, railway, irrigation ditch, drain, drainage system, sewer, dike, cable line, telecommunication line, telephone line or line for the transmission of hydrocarbons, power or any other substance that is or is to be carried across, along, upon, over or under the Crossing Area;
- (e) "said lands" means the lands described in Schedule "B";
- (f) "the Body of this Agreement" means the Agreement to which this Schedule is attached and which has been executed by the parties;
- (g) "this Agreement" means the Body of this Agreement and the Schedules attached to it; and

(h) “Work” means, with respect to a Facility, the carrying, laying, installing, constructing, maintaining, operating, repairing, inspecting, replacing, altering, removing, abandoning and such other operations as may be required from time to time.

1.02 Unless a term or provision contained in the Body of this Agreement, if acted upon, would result in violation of any code, statute, law, regulation, permit, license, or government order, the following shall apply:

(a) if any term or provision conflicts with a term or provision contained in any Schedule, the term or provision in the Schedule shall prevail.

(b) If any terms or provision of the Schedules conflict, the following shall apply: Schedule “C”, if present, shall prevail over Schedules “A” and “B”, Schedule “B” shall prevail over Schedule “A”.

2. Consent

Grantor hereby agrees, insofar as it has the right to do so, that the Grantee may perform the Work on Grantee’s Facility in the Crossing Area in accordance with the terms and conditions of this Agreement.

3. Compliance with Statutes and Regulations

Grantee shall at all times comply with any and all applicable codes, statutes, laws, regulations, permits, licenses, orders and directions of any governmental authority from time to time in force. The minimum applicable technical standards therein shall apply to both parties unless more stringent standards are provided for in this Agreement. If compliance with any provision of this Agreement would result in violation of any applicable codes, statutes, laws regulations, permits, licenses, orders and directions of any governmental authority, such code, statute, law regulation, permit, license, order and direction of any governmental authority shall prevail and this Agreement shall be deemed to be amended accordingly.

4. Position of Facility

Unless otherwise indicated in any of the Schedules, or ordered by governmental authority or regulations:

(a) Grantor’s Facility shall be entitled to the upper position in the Crossing Area except for above grade facilities;

(b) a minimum distance of 30 centimetres shall be maintained between the external surfaces of the underground Facilities; and

(c) Grantee’s Facility shall be maintained at the same depth with no side bends for the entire width of the Crossing Area.

5. Conditions

When Grantee performs work on Grantee's Facility in the Crossing Area, the following terms and conditions apply:

- (a) Grantee's Field Representative shall contact Grantor's Field Representative directly, either in person or by telephone, a minimum of 72 hours (excluding Saturdays, Sundays and Statutory Holidays) before commencement of Grantee's Work within 30 metres of the Crossing Area and, if unable to contact that person, Grantee shall serve a minimum of 72 hours written notice pursuant to Clause 8 hereof before commencement of Grantee's Work.
- (b) Grantor has the right to have a representative present to inspect the Work of Grantee in the Crossing Area.
- (c) During installation pursuant to this Agreement, Grantee shall have available at the Crossing Area a copy of this Agreement.
- (d) Before proceeding to excavate within 5 metres of the Crossing Area, Grantee shall fully expose Grantor's Facility by hand digging. Grantee shall not use or permit the use of an excavating machine within 1.5 metres of either side of any existing Grantor's Facility unless otherwise agreed to in Schedule "C".
- (e) Grantee shall, where applicable, install and maintain during performance of the Work suitable markers indicating the location of Grantor's Facility in the Crossing Area.
- (f) Grantee shall lay down and construct its Facility in accordance with the Schedules to this Agreement.
- (g) Grantee shall carry out all Work in the Crossing Area in a proper and diligent manner and in accordance with good engineering and construction practices.
- (h) The party performing the Work shall ensure no damage occurs to existing Facilities while the Work is being performed in the Crossing Area including damage which may result from the use of heavy work equipment outside the Crossing Area while performing the Work in the Crossing Area.
- (i) Where necessary, Grantee shall support Grantor's Facility as required, or as directed by Grantor, while any work is being carried out hereunder.
- (j) In the event that Grantor's Facility suffers contact damage or other damage as a result of Grantee's Work, Grantor shall be notified forthwith and its repair shall be carried out as directed by Grantor at Grantee's cost.

- (k) Where cathodic protection is required by Grantor as a result of Grantee's installation, Grantee at its cost shall, at the time of the construction of its Facility, install and thereafter maintain a cathodic protection testing station for Grantor's Facility at the crossing in accordance with the attached Schedule "C" or as directed by Grantor's representative.
- (l) At least 24 hours (excluding Saturdays, Sundays, and Statutory Holidays) prior to covering Grantor's exposed Facility, Grantee's Field Representative shall contact Grantor's Field Representative directly, either in person or by telephone for inspection.
- (m) Grantee shall, where applicable, install and maintain suitable buried markers indicating the location of Grantee's Facility in the Crossing Area.
- (n) Unless otherwise directed by the Grantor, the Grantee shall cover Grantor's Facility with at least 30 centimetres of select backfill material prior to commencing backfilling operations. Grantee shall, in backfilling the excavation in the Crossing Area, compact the fill material in 15 centimetre layers, or such greater depth specified by Grantor's Field Representative.
- (o) Grantee shall, as soon as it is reasonably practical after the completion of Grantee's Work in the Crossing Area, restore the surface of the Crossing Area as closely as is practical to the condition in which it existed immediately prior to the Work being commenced.
- (p) Grantee shall maintain the Crossing Area in good order and condition and carry out expeditiously all Work hereunder.
- (q) Except as otherwise provided herein, the cost of the Work with respect to each party's Facilities within the Crossing Area undertaken by either party shall be borne by the party requiring such Work.
- (r) The cost associated with the location, identification or supervision shall not be charged to or borne by the other party unless specified in Schedule "C".
- (s) Grantee shall be liable for and shall pay all taxes, rates and assessments of every description whatsoever that may be imposed by any lawful authority by reason of the presence of Grantee's Facility in the Crossing Area, or by reason of this Agreement or of anything done by Grantee pursuant to this Agreement. In addition, Grantee shall indemnify Grantor from and against all such taxes, rates and assessments.

6. Remedy on Default

In case of default by Grantee in carrying out any of the provisions of this Agreement, Grantor may give notice thereof to Grantee. If Grantee fails to commence to remedy such default within 15 days after receipt of such notice and diligently complete such remedy thereafter, Grantor may take such steps as are appropriate to remedy such default and Grantee shall be liable for and shall pay all reasonable costs and expenses incurred by Grantor in remedying the default.

7. Further Work

- (a) If, subsequent to the initial Work undertaken by Grantee for its Facility, either Grantor or Grantee desires to undertake any Work in the Crossing Area in respect of its Facility, this Agreement shall be deemed to grant consent to that party, and the provisions of this Agreement shall apply *mutatis mutandis* to all subsequent Work undertaken by either party under this Clause 7; and, for further certainty, the provision of this Agreement shall be read as if "Grantee" were substituted for "Grantor" and vice versa as the situation requires.
- (b) Notwithstanding the foregoing, installation of any Facility other than those shown on attached Schedule "B" shall require a separate Facility Crossing Agreement.
- (c) Notwithstanding the foregoing, if emergency Work in the Crossing Area is required with respect to a party's Facility, that party shall commence the necessary Work and shall forthwith give the other party's Field Representative verbal notice of the emergency and necessary Work, and shall forthwith give notice pursuant to Clause 8 hereof.

8. Notices

Notices shall be in writing and shall be sent to the parties at the addresses for notice shown in the Body of this Agreement. The following shall govern notices:

- (a) Either party may from time to time change its address for service by giving notice to the other party.
- (b) All notices required to be given hereunder may be delivered by hand, mailed by registered or prepaid mail, or sent by telecommunication. If mailed, the notice shall be deemed to have been received seven days (Saturdays Sundays and Statutory Holidays excluded) after the mailing thereof. If delivered by hand, the notice shall be deemed to have been received on the day on which it was delivered, or if delivered after regular business hours, it shall be deemed to have been received on the following business day. If sent by telecommunication, the notice shall be deemed to have been received on the first business day following the day it was dispatched.
- (c) No notice shall be effective if mailed during any period in which Canadian postal workers are on strike or if a strike of postal workers is imminent and may be anticipated to affect normal delivery thereof.
- (d) Notwithstanding the foregoing, to the extent described in this Agreement, Grantor's and Grantee's Field Representatives or designated alternates shall have the right and authority to make, give, receive any notice, information, direction or Janision required in conducting Work hereunder.

9. Liability and Indemnity

(a) Liability:

- (i) Grantee shall be liable to Grantor for all loss, damages and expenses which Grantor may suffer, sustain, pay or incur by reason of any matter or thing arising out of or attributable to any act or omission of Grantee, its servants, agents, contractors or employees in respect of Grantee's use of the Crossing Area or by reason of this Agreement.
- (ii) Grantor shall be liable to Grantee for all loss, damages, and expenses which Grantee may suffer, sustain, pay or incur by reason of any matter or thing arising out of or attributable to any act or omission by Grantor, its servants, agents, contractors or employees in respect of Grantor's use of the Crossing Area or by reason of this Agreement.

(b) Indemnity:

- (i) Grantee shall indemnify and save harmless the Grantor against all actions, proceedings, claims, demands, and costs which may be brought against or suffered by Grantor or which it may sustain, pay or incur, by reason of any matter or thing arising out of or attributable to any act or omission of Grantee, its servants, agents, contractors or employees in respect of Grantee's use of the Crossing Area or by reason of this Agreement.
- (ii) Grantor shall indemnify and save harmless the Grantee against all actions, proceedings, claims, demands, and costs which may be brought against or suffered by Grantee or which it may sustain, pay or incur, by reason of any matter or thing arising out of or attributable to any act or omission of Grantor, its servants, agents, contractors or employees in respect of Grantor's use of the Crossing Area or by reason of this Agreement.

10. Insurance

- (a) Without in any way limiting the liability of either party under this Agreement, each party shall obtain and keep in force during the term of this Agreement comprehensive general liability insurance covering liability for bodily injury and property damage arising from Work contemplated by this Agreement. The limit of this insurance shall not be less than five million dollars, inclusive, for any one occurrence unless otherwise agreed by the parties in writing. This policy shall provide coverage for liability assumed under this Agreement.
- (b) A party, upon request of the other party, shall furnish written documentation, satisfactory to the requesting party, evidencing the required coverage.

- (c) As an alternative to the five million dollar policy of comprehensive general liability insurance referred to in Subclause 10 (a), if acceptable to the other party, a party may self-insure against the risks normally covered by such a policy.

11. Changes to Agreement

No change, modification or alteration of this Agreement shall be valid unless it is in writing and signed by the parties hereto, and no course of dealing between the parties shall be construed to alter the terms hereof.

12. Assignment

- (a) Neither party to this Agreement shall assign or transfer this Agreement or the right and privileges hereby granted without the written consent of the other party, and such consent shall not be unreasonably withheld. The party intending to assign or transfer this Agreement shall give to the non-assigning party to this Agreement notice of its intent by registered mail.
- (b) The non-assigning party to this Agreement may require the assignor and assignee to execute a novation agreement in a form acceptable to the non-assigning party.

This Agreement shall enure to the benefit of and be binding upon the parties, their successors and assigns.

13. Governing Law

This Agreement and the rights and obligations of the parties herein shall be governed and construed to the laws of the province in which the work is to occur.

14. Term

The rights and obligations of the parties under this Agreement shall terminate:

- (a) two years from the date hereof if construction of Grantee's Facility has not commenced, or
- (b) upon proper abandonment or removal of all of Grantor's or Grantee's Facilities from the Crossing Area and the completion of any reclamation Work required by applicable laws, except for those rights acquired and obligations incurred prior to such events.

15. Miscellaneous

- (a) In this Agreement, words importing the singular include the plural and vice versa; words importing the masculine gender include the feminine and vice versa; and the words importing persons include firms or corporations and vice versa.

- (b) Words such as “hereto”, “thereto”, “hereof”, and “herein”, when used in this Agreement, shall be construed to refer to provisions of this Agreement.
- (c) The headings of all clauses of this Agreement, and the Schedules, are inserted for convenience of reference only and shall not affect the meaning or construction thereof.
- (d) Time is of the essence of this Agreement.
- (e) No waiver of any breach of a covenant or provision of this Agreement shall take effect or be binding upon a party unless it is expressed in writing. A waiver by a party of any breach shall not limit or affect that party’s rights with respect to any other or future breach.

16. Entire Agreement

This Agreement, including the recitals and schedules, sets forth the entire agreement between the parties hereto and shall be deemed to have superseded any and all previous agreements and understandings, whether written or oral, between the parties dealing with the Facilities and the Crossing Area, and all rights and obligations as herein described.

Schedule "B"

Location Plan and Profile

This Schedule "B" to Form Part of the Facility Crossing Agreement.

Between **ATCO Gas and Pipelines Ltd. (Grantor)**

and **The Town of Peace River (Grantee)**

and dated the 27th day of Jan, 2022.

Crossing Agreement-T22-0266

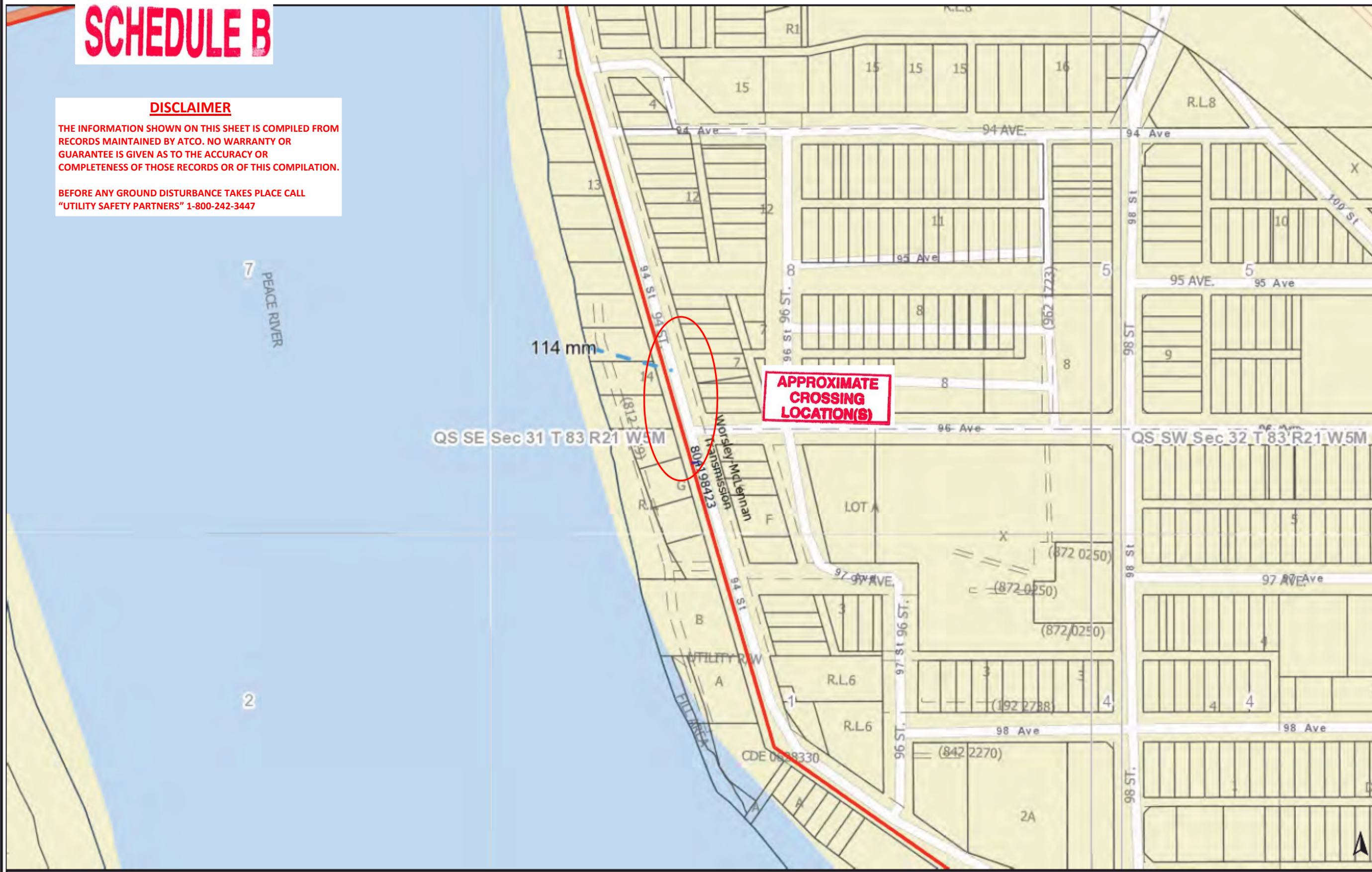
Located in	Legal Description	Pipe Size (mm)
	SE-31-83-21-W4M	114 mm

SCHEDULE B

DISCLAIMER

THE INFORMATION SHOWN ON THIS SHEET IS COMPILED FROM RECORDS MAINTAINED BY ATCO. NO WARRANTY OR GUARANTEE IS GIVEN AS TO THE ACCURACY OR COMPLETENESS OF THOSE RECORDS OR OF THIS COMPILATION.

BEFORE ANY GROUND DISTURBANCE TAKES PLACE CALL "UTILITY SAFETY PARTNERS" 1-800-242-3447



Legend

Distribution

- AB
- LP
- MP
- M1
- M2
- IP
- IP1
- IP2
- IP3
- IP4
- IP5
- IP6
- HP

- Regulator Station
- Rural Tap
- Controllable Valve
- Distribution Capital Project

Transmission

- Abandoned
- Decommissioned
- Operating
- Transmission Station
- Transmission Capital Project

Notes



Schedule "C"

Specific Terms and Conditions

This Schedule "C" to Form Part of the Facility Crossing Agreement.

Between **ATCO Gas and Pipelines Ltd. (Grantor)**

and **The Town of Peace River (Grantee)**

and dated the 27th day of Jan, 2022.

GENERAL CONDITIONS

A. Work Provisions

- a. Grantee shall contact **Utility Safety Partners** at 1-800-242-3447 to identify and mark Grantor's Facilities.
- b. Grantee agrees to survey and stake the location of Grantor's right-of-way, if applicable, and Grantor's Facility within the Crossing Area. Grantee shall not undertake any work until such survey and staking has been completed.
- c. Prior to Grantee undertaking any Work, an on-site, pre-construction meeting is to take place between Grantee's field representative and Grantor's field representative to discuss any site-specific concerns, to accurately locate Grantor's Facilities, and to discuss construction techniques on how to safely work around Grantor's Facility.
- d. The Work of Grantee shall be carried out under the supervision of and to the satisfaction of Grantor's field representative. Grantee shall pay to Grantor all of Grantor's costs and expenses incurred in conducting such inspection outside of the normal business hours of 8:00 a.m. to 4:00 p.m. Monday to Friday (excluding Statutory Holidays).
- e. When performing the Work Grantee shall comply with any additional conditions and protection requirements as directed by Grantor's field representative for the purpose of protecting Grantor's Facilities. Grantor's field representative may suspend the Work if, in their reasonable opinion, they determine that the Work cannot be done safely.
- f. Grantee will use reasonable efforts to ensure that any party proposing to perform Work in proximity to Grantor's Facilities complete an industry approved ground disturbance training program or a training program satisfactory to Grantor.
- g. Under the supervision of Grantor's field representative Grantee shall determine the exact location and depth of Grantor's Facility by an industry approved daylighting procedure.
- h. Under the supervision of the Grantor's field representative, the use of an excavating machine no closer than 1.5 meters of the Grantor's facility is permitted. In the event the

work is required to be closer than the 1.5 meters permitted, approval from the Manager, Field Operations or designate is required in advance of this work taking place.

- i. No heavy equipment shall be moved on, over, across or along Grantor's right-of-way or Grantor's Facilities until it is determined safe to do so by Grantor's field representative. Grantor's field representative may require Grantee to provide, at Grantee's sole cost and expense, an earth berm or rig mat to cover and protect Grantor's Facility. Grantor's field representative shall have the right to specify the fill material to be used.
- j. The storage of materials on Grantor's right-of-way is not permitted except when approved by the Grantor's field representative. During the Work, when so approved, construction material shall only be stored on one side of Grantor's right-of-way and shall not be stored within 2.0 metres of Grantor's Facility. Upon completion of the Work storage of any materials by Grantee shall not be permitted on or within Grantor's right-of-way.
- k. Grantor's field representative may require Grantee to erect temporary fencing before or during the Work to protect Grantor's Facility or for other safety purposes. The requirement to erect such fencing will not relieve Grantee from meeting its other obligations under this Agreement. Any such fencing will be removed once the Work that necessitated the temporary fencing is completed or within a reasonable time after Grantor's request for its removal. All costs and expenses associated with any temporary fencing shall be the responsibility of Grantee.
- l. Grantor may require the operating pressure of Grantor's Facility to be reduced prior to any Work being undertaken in proximity to Grantor's Facility. Operational constraints may dictate the timing of Grantee's Work.
- m. Grantee shall be responsible for its costs and expenses and any costs and expenses of Grantor resulting from depth, clearance or separation conflicts between Grantor's and Grantee's Facilities including any costs and expenses arising from any additional Work necessary to resolve such conflict.
- n. In addition to the notice required by Section 5(l) of Schedule "A", Grantee shall ensure that Grantor's field representative has inspected any exposed Grantor's Facility (including any pipe and coating) prior to Grantee backfilling any excavation. If Grantee fails to obtain such inspection then Grantee will, upon Grantor's request, at Grantee's sole cost and expense, re-expose any such Grantor's Facilities to permit Grantor's inspection and thereafter backfill any such excavation.
- o. Grantor's field representative shall have the right to specify the fill material to be used within Grantor's right-of-way or within the Crossing Area, as required.
- p. The backfill under and over Grantor's Facilities within the Crossing Area shall be compacted to the satisfaction of Grantor's field representative, utilizing compaction methods approved by Grantor's field representative.
- q. Unless approved by Grantor, the depth of cover over Grantor's Facilities shall not be permanently altered.

- r. Grantee shall replace all disturbed or removed signs as soon as practical following the completion of the Work or at Grantor's request.
- s. Grantee shall, if requested by Grantor's field representative, place and maintain marker signs in the vicinity of the Crossing Area.
- t. Grantee shall provide "as-built" drawings of its Facility upon the request of Grantor.
- u. Notwithstanding this Agreement, but subject to the requirement of any applicable laws, Grantee's Facility and any Work undertaken by Grantee will in no way restrict, any of Grantor's operations or rights relating to any of Grantor's Facility or Grantor's use and enjoyment of Grantor's right-of-way. For greater certainty, and without limiting the foregoing, Grantor shall have the right to do any or all of the following: undertake and perform any maintenance, operation, or emergency work in respect of any Grantor's Facilities; and use and enjoy Grantor's right-of-way for any purpose that it is otherwise authorized to do so, whether pursuant to Grantor's right-of-way or by applicable laws.
- v. Grantee, in carrying out any Work shall comply with all applicable laws (including applicable safety, health and environmental laws), and shall implement safety measures necessary to safeguard the Crossing Area in the same manner as a prudent contractor in Alberta carrying on work similar to the Work would do. If, at any time Work is being performed by Grantee within the Crossing Area, there is a period when two or more employers (as defined in the *Occupational Health and Safety Act* ("OH&S Act")), are undertaking activities or Work within the Crossing Area, then throughout such period, or in any case when, pursuant to the OH&S Act, a prime contractor (as defined in the OH&S Act) is required to be appointed, Grantee agrees it is, and shall be deemed to be, the prime contractor in respect of all activities and Work carried on by Grantee or those for whom it is responsible at law throughout such period and throughout the entire Crossing Area.
- w. Grantee shall notify Grantor's field representative immediately following Grantee determining that a relocation, alteration or lowering (or any combination thereof) of Grantor's Facilities is required within any Crossing Area to permit either or both Grantee or Grantor to comply with any applicable laws, (including any applicable code, statutes, regulations, permits, licenses, orders and directions of any governmental authority), or otherwise with this Agreement. Grantee shall, immediately following such determination, ensure no Work is commenced within the Crossing Area, or if the Work is in progress, suspend any further Work until Grantor has: (i) approved the relocation, alteration or lowering (or any combination thereof); (ii) established a construction schedule; and (iii) each of Grantor and Grantee have obtained all necessary permits and approvals that each is required to obtain by any applicable laws. Any such relocation, alteration and lowering shall be carried out by Grantor at the sole costs and expenses of Grantee. Grantee shall pay all amounts that Grantor may incur in connection with any such relocation, alteration and lowering within 30 days of receiving an invoice from Grantor. The amount of such costs and expenses set out in the invoice shall be final and binding on Grantee absent manifest error.

B. GENERAL MATTERS

- a. Grantee covenants, represents and warrants that it has and will retain all necessary rights from the registered owner of the lands comprising the Crossing Area or otherwise obtain and will retain all necessary rights pursuant to applicable laws, necessary in each case to permit Grantee to perform the Work (the "Grantee's Authority"), and that it is not obtaining any such rights from Grantor (notwithstanding anything in this Agreement to the contrary). In addition, nothing in this Agreement or Grantor's execution of this Agreement, shall in any way imply that Grantor has reviewed, consented to, or in any way approved, any subdivision proposed or any interest that Grantee has been granted by the registered owner of the said lands or any other interest otherwise obtained by Grantee pursuant to any applicable laws (including any of Grantee's Authority).
- b. Notwithstanding anything to the contrary contained in this Agreement, none of Grantor's: execution of this Agreement; supervision; approval; or review of Grantee or any of Grantee's Work, including any plans, drawings or documents of Grantee, shall in any way relieve or release Grantee from any of its obligations or responsibilities under this Agreement, or otherwise constitute approval of the foregoing items.
- c. Notwithstanding the definition of Grantee's Facility in Schedule "A", all references to Grantee's Facilities shall mean solely those Facilities specifically set forth in Schedule "B". This Agreement and Grantor's consent and agreement granted by this Agreement relates solely to Grantee's Facilities specifically listed in Schedule "B". If Grantee wishes to deal with any other Facilities including any expansion or relocation of Grantee's Facilities, then Grantee shall be required to enter into a new agreement with Grantor prior to Grantee undertaking any Work or additional activity in respect to any such other Facilities.
- d. Notwithstanding the definition of Grantor's Facilities in Schedule "A", all references to Grantor's Facilities shall include all Facilities of Grantor together with any and all appurtenances thereto.
- e. Grantee hereby acknowledges and agrees that all of Grantee's Work shall be undertaken, performed and carried out at the sole risk, costs and expenses of Grantee and shall in all cases, be done in compliance with Grantee's Authority.
- f. If Grantor or any Grantor's Facilities suffers any damage, including contact damage to Grantor's Facilities, as a result of any of Grantee's Facilities or Grantee's Work, (or any combination thereof), Grantee shall notify Grantor. In any such case, Grantor may carry out any such required repair at the sole cost and expense of Grantee. Grantee shall reimburse Grantor for Grantor's costs and expenses incurred in doing such repairs within thirty (30) days of receiving an invoice from Grantor.
- g. Grantor shall have the right to assign, transfer or convey to any other person, firm, corporation or entity whatsoever, all of Grantor's powers, benefits, privileges, rights, titles and interest arising pursuant to, or conferred by, the Agreement, without consent from, or notice to Grantee. Upon any such assignment, transfer or conveyance by Grantor, Grantee agrees and acknowledges that Grantor shall be released in full from all its liabilities and obligations arising pursuant to this Agreement. Grantor may enter into all agreements, contracts and writings and do all necessary acts and things necessary to give effect to the provisions of this section.

- h. Grantee shall have the right to make any assignment, transfer or conveyance of this Agreement, or the rights and privileges hereby granted, if such assignment, transfer or conveyance is to a party acquiring an interest in Grantee's Facilities to which this Agreement relates. Except as otherwise provided above in this Section, Grantee shall not assign, transfer or convey this Agreement nor the rights and privileges hereby granted without the written consent of Grantor, provided such consent shall not be unreasonably withheld. Together with any request for such consent, Grantee shall provide Grantor with the assignee's written confirmation that the assignee is familiar with this Agreement and agrees to be bound by the terms thereof, subject to receiving Grantor's consent.
- i. Grantee shall be liable for, and indemnify and save harmless Grantor from any and all liabilities, damages, costs, expenses, claims, suits, or actions caused by or resulting from the breach of any applicable law including environmental laws, or the existence of, or the release of, substances on, in or near the said lands which may have an adverse effect on the said lands or the environment, in each case caused by or that result from Grantee or any party for whom Grantee is responsible for at law. Grantee shall be solely responsible for any release of any substance caused by it or any person for whom Grantee is responsible for at law, and shall provide notice of any release of any such substance to Grantor immediately following Grantee learning of same. Grantee shall undertake all requisite remediation of the said lands or any portion thereof as may be required by any applicable laws immediately following the occurrence of any such release.
- j. Notwithstanding anything else herein to the contrary, in no event shall either party be liable to the other party, any person claiming rights derived from the other party's rights or any other third party, for consequential, punitive, indirect or exemplary losses, costs, expenses, injuries or damages of any kind, including lost profits, loss of business, loss of opportunity or other economic damage, howsoever caused, including as a result of breach of this Agreement, negligence or otherwise, regardless of whether the party liable or allegedly liable was advised, had other reason to know, or in fact knew of the possibility of same.
- k. Notwithstanding the termination of this Agreement for any reason, any obligations arising pursuant to this Agreement which by their nature are intended to survive such termination shall continue in full force and effect until discharge of the obligation or until the parties mutually agree in writing to a release of such obligation. Any remedy of Grantor set out in this Agreement is not exclusive of any other remedy whether set out in this Agreement or otherwise available at law.
- l. The reference to "two years" in Section 14(a) of Schedule "A" is hereby reduced to "one year". In addition, where the proposed Work of Grantee is cancelled for any reason, then the rights of Grantee arising hereunder shall terminate. Grantee shall notify Grantor of any such cancellation immediately.

- m. In this Agreement, the word "including" shall mean "including, without limitation" and "includes" shall have a similar meaning. The Term "discretion" means sole, absolute and unfettered discretion. All references to "costs" or "costs and expenses" shall be deemed to mean any and all costs and expenses including any legal costs and disbursements on a solicitor client basis, as applicable.
- n. Except as otherwise specifically provided in this Agreement, whenever any consent, approval, designation, requirement, opinion, judgment or discretion is required of, or any request may be made or any action taken by, Grantor or any of Grantor's field representatives, as the case may be, under the terms of this Agreement, the same shall be granted, determined, required, exercised, made or taken in the discretion of Grantor or the Grantor's field representative, as the case may be.
- o. If any amounts payable by Grantee to Grantor pursuant to this Agreement are not paid within thirty (30) days of Grantor requesting payment, then Grantee shall pay interest thereon at the Bank of Montreal's prime lending rate plus 3% per annum.
- p. Should any provision of this Agreement be finally determined by a court of competent jurisdiction to be illegal, void or otherwise unenforceable, such provision shall be severed from the rest of this Agreement, and the rest of this Agreement shall remain in full force and effect and be binding on the Parties as though the said provision had never been included.

**TEMPORARY ACCESS ACROSS / ALONG GRANTOR'S FACILITY
AND RIGHT-OF-WAY**

- a. The profile of Grantor's right-of-way within the Crossing Area shall not be permanently altered.
- b. Grantor's Facility shall be identified and marked along the entire length of the Crossing Area where the access is required. Markings must remain clearly within the line of sight at all times. All equipment traveling along Grantor's right-of-way shall remain at least 3.0 metres from Grantor's Facility. Any equipment required to cross Grantor's Facility shall do so at a perpendicular angle, at the location(s) approved by Grantor's field representative.
- c. No heavy equipment shall be moved on, over, across or along Grantor's right-of-way or Grantor's Facilities until it is determined safe to do so by Grantor's field representative. Grantor's field representative may require Grantee to provide, at Grantee's sole cost and expense, an earth berm or rig mat to cover and protect Grantor's Facility. Grantor's field representative shall have the right to specify the fill material to be used.
- d. Construction of the temporary access shall not result in reduced clearance between existing ground level and Grantor's Facility in the Crossing Area.
- e. The minimum depth of cover over Grantor's Facility in the Crossing Area shall not be less than 1.2 metres.
- f. Non-vibratory compaction equipment shall be used to achieve compaction over Grantor's Facility in the Crossing Area.

- g. This temporary access is only valid for one year from the date of execution of this agreement. Grantee shall re-apply for additional temporary access or for a permanent road crossing after this date, if required.
- h. Approval of temporary access shall in no way imply that approval for a permanent access will be granted.
- i. Removal of the temporary access shall be done by Grantee, at Grantee's sole cost and expense under the supervision of Grantor's field representative and shall be completed within one year of the date of this agreement.