GREATER SHEDIAC SEWERAGE COMMISSION

DES ÉGOUTS SHEDIAC ET BANLIEUES

STANDARD SPECIFICATIONS

Revised

December 2021

GENERAL INDEX

PLANS AND SPECIFICATIONS
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** WITHIN TOWN OF SHEDIAC LIMITS REFER TO TOWN OF SHEDIAC STANDARD SPECIFICATIONS

LIST OF DRAWINGS

STANDARD CONSTRUCTION CONTRACT

THESE ARTICLES OF AGREEMENT made in duplicate this _____ day of _____ 2015:

BETWEEN:

The Greater Shediac Sewerage Commission

(referred to in the documents forming the contract as the "Owner")

AND:

(referred to in the documents forming the contract as the "Contractor")

WITNESS that the Owner and the Contractor covenant and agree as follows:

ARTICLE I

The Contractor shall in a careful and workmanlike manner execute the following work within the time herein limited:

Project Title
Location

which work is more particularly described in the documents that are attached hereto, entitled "Plans and Specifications" marked "G" (referred to in the documents forming the contract as the "Plans and Specifications") at the place and in the manner therein set out.

ARTICLE II

1 The Owner shall pay to the Contractor as consideration for the execution of the portion of the work to which the fixed price arrangement is applicable the sum of **$**_____ (subject to any additions or deductions provided for in these Articles, the General Conditions, the Terms of Payment or the Labour Conditions, except any addition or deduction which is expressly stated to be applicable only to a unit price arrangement), at the times and in the manner set out or referred to in the document that is attached hereto entitled "Terms of Payment" and marked "A" (referred to in the documents forming the contract as the "Terms of Payment").

2(1) The Owner shall pay to the Contractor as consideration for the execution of the portion of the work to which the unit price arrangement is applicable a sum equal to the number of units of measurement of each class of labour, plant or material actually performed, used or supplied by the Contractor in the execution of the work as measured by the Engineer-Architect and set out in the Engineer-Architect's Final Certificate multiplied by the price for each such unit of measurement as set out in the Unit Price Table as added to or amended in accordance with subsections (2), (3) and (4) (such sum being subject to any additions or deductions provided for in the General Conditions, Terms of Payment, Labour Conditions, except any addition or deduction which is expressly stated to be applicable only to a fixed price arrangement) at the times and in the manner set out or referred to in the document that is attached hereto entitled "Terms of Payment" and marked "A" (referred to in the documents forming the contract as the "Terms of Payment").

2(2) The Engineer-Architect and the Contractor may by agreement in writing add to the Unit Price Table, as set out in the contract documents, classes of labour, plant or material together with units of measurement, prices per unit and estimated quantities therefore where any labour, plant or material which will be included in the Engineer-Architect's Final Certificate is not included in any class of labour, plant or material set out in the Unit Price Table.

2(3) The Engineer-Architect and the Contractor may by agreement in writing amend the price per unit set out in the Unit Price Table for any class of labour, plant or material included therein where an estimated quantity is set out therein for that class of labour, plant or material, if the Engineer-Architect's Final Certificate shows or will show that the total quantity of that class of labour, plant or material performed, used or supplied by the Contractor in executing the work is less than seventy-five percent of that estimated quantity, and the price per unit agreed under this subsection shall apply to the number of units supplied.

2(4) The Engineer-Architect and the Contractor may by agreement in writing amend the price per unit set out in the Unit Price Table for any class of labour, plant or material included therein where an estimated quantity is set out therein for that class of labour, plant or material by establishing a price per unit for units of that class of labour, plant or material performed, used or supplied by the Contractor in executing the work which are in excess of one hundred and twenty five percent of that estimated quantity, and the price per unit agreed to under this subsection shall be applicable only to those units which are in excess of one hundred and twenty-five percent of the estimated quantity.

2(5) For the information and guidance of the Contractor and the persons administering the contract on behalf of the Owner, but not so as to constitute a warranty, representation or undertaking of any nature, either by the Owner to the Contractor or by the Contractor to the Owner, it is estimated that the total amount payable by the Owner to the Contractor for the portion of the work to which the unit price arrangement is applicable is

3 Section 1 is not applicable where the unit price arrangement applies to the whole of the work.

4 Section 2 is not applicable where the fixed price arrangement applies to the whole of the work.

ARTICLE III

1 Subject to sections 2 and 3 of this Article, bound documents (A) and (B) in addition to attached documents (C), (D), (E), (F), (G) and (H) hereto entitled

(A) "Terms of Payment" and marked "A";

(B) "General Conditions" and marked “B”;

(C) "Supplementary General Conditions" and marked "C" (if none, insert not applicable);

(D) "Labour Conditions" and marked "D";

(E) "Insurance Schedule" and marked "E";

(F) "Tender Submission" and marked "F";

(G) "Plans and Specifications" and marked "G"; and

(H) "Post-tender Documents" and marked "H";

all form part of the contract between the Owner and the Contractor.

2 Any provisions of these Articles, the Terms of Payment and the General Conditions which are expressly stated to be applicable only to a unit price arrangement are not applicable to the whole or to the portion of the work to which the fixed price arrangement is applicable.

3 Any provisions of these Articles, the Terms of Payment and the General Conditions which are expressly stated to be applicable only to a fixed price arrangement are not applicable to the whole or to the portion of the work to which the unit price arrangement is applicable.

ARTICLE IV

1 With respect to the execution of the work by the Contractor,

(a) the security deposit having a current market value of $_____ that has been deposited with the Owner by the Contractor for the due fulfillment of the contract shall be dealt with in accordance with the provisions concerning security deposit in the General Conditions, or

(b) a surety company has furnished or has undertaken to furnish a Performance Bond, (insert details - name of company, amount, date, etc.)

and a Labour and Material Payment Bond, (insert details - name of company, amount, date, etc.)

which bond or bonds shall operate according to their tenor.

2 Where bonds are provided under paragraph 1(b), the Contractor shall post on the site of the work a notice that a Labour and Material Payment Bond is in force together with the name and address of the surety company thereunder, a definition of those persons protected thereunder and an outline of the procedure for submitting a claim thereunder.

ARTICLE V

For all purposes of or incidental to the contract, the Contractor's address shall be deemed to be:

ARTICLE VI

The Unit Price Table is the Unit Price Table contained in the Tender.

SIGNED, SEALED AND DELIVERED

In the Presence of:

Witness	"The Owner"
.....	.....
.....	.....
.....	.....

Witness	"The Contractor"
.....	.....
.....	.....
.....	.....

TERMS OF PAYMENT "A"

TOTAL PAYMENT

1 Subject to the provisions of sections 16 and 19 of the General Conditions, the Owner shall pay to the Contractor at the times and in the manner hereinafter set out the amount by which

(a) the aggregate of the amounts described in section 2 exceeds

(b) the aggregate of the amounts described in section 3

and the Contractor shall accept the payment as full consideration for everything furnished and done by him in respect of the work.

DETAIL OF PARAGRAPH 1(a)

2 The amounts referred to in paragraph 1(a) are:

(a) the amount payable to the Contractor pursuant to Article II of the Articles of Agreement;

(b) the amount, if any, payable to the Contractor pursuant to section 12 of the General Conditions relating to soil conditions, neglect or delay;

(c) the amount, if any, payable to the Contractor on account of a suspension of work pursuant to section 18 of the General Conditions;

(d) the amount, if any, payable to the Contractor pursuant to section 36 of the General Conditions relating to work not required to be done under the contract but done by the Contractor under a disputed decision or direction of the Engineer-Architect; and

(e) the amount, if any, payable to the Contractor by reason of an order or change pursuant to section 37 of the General Conditions.

DETAIL OF PARAGRAPH 1(b)

3 The amounts referred to in paragraph l (b) are:

(a) the amount, if any, payable to the Owner pursuant to section 12 of the General Conditions relating to soil conditions;

(b) the amount, if any, which the Contractor is liable to pay to the Owner pursuant to section 14 of the General Conditions relating to damage to the Owner's material, plant and real property;

(c) in the event of a delay in completing the work, the amount payable to the Owner pursuant to section 15 of the General Conditions;

(d) the amount, if any, paid by the Owner in satisfaction of obligations of the Contractor or a subcontractor pursuant to section 20 of the General Conditions or pursuant to the Labour Conditions;

(e) the amount, if any, payable by the Contractor to the Owner pursuant to section 35 of the General Conditions relating to matters done by the Owner which the Contractor refused or failed to do; and

(f) the amount, if any, by which the cost of the work to the Contractor was decreased by reason of dispensations or changes pursuant to section 37 of the General Conditions.

PROGRESS PAYMENTS

4(l) For the purposes of this section, "Payment Period" means an interval of thirty days or such other interval as the Contractor and Engineer-Architect agree upon.

4(2) The Contractor and Engineer-Architect shall, either before or immediately after the signing of the Articles of Agreement, agree on a schedule of provisional unit prices to be used in the preparation of progress claims.

4(3) On or after the end of each Payment Period, a progress claim in writing showing the amount of each class of work performed and materials furnished during such Payment Period, with the value thereof computed in accordance with the schedule of provisional unit prices where applicable or the table of unit prices where applicable, shall be prepared by the Contractor and submitted in triplicate to the Engineer-Architect for approval.

4(4) The Engineer-Architect shall within ten days endorse his approval or amended approval on the copies of the progress claim, after making such alterations therein as he may deem proper, and shall forward one copy to the Owner, return one copy to the Contractor, and retain one copy in his possession and the progress claim so approved shall be the basis of the payment by the Owner under subsection (6).

4(5) In respect of each progress claim, the Contractor shall deliver to the Owner

(a) a Statutory Declaration deposing, or

(b) if required by the Owner, documentary proof verifying,

the fact that all his lawful obligations to subcontractors, workmen and suppliers of material in respect of the work as at a date not greater than forty-five days prior to the date of the progress claim have been fully discharged.

4(6) The Owner shall, within twenty days after receipt of the approved progress claim from the Engineer-Architect and receipt of the statutory declaration or proof of payment required under subsection (5), pay to the Contractor an amount equal

(a) when a Labour and Material Payment Bond was required of and furnished by him, to ninety-five percent of the amount of progress claim, or

(b) when a security deposit was required of and furnished by him, to eighty-five percent of the amount of the progress claim.

4(7) Upon the expiration of sixty days from the date of issuance of an Interim Certificate of Completion under subsection 39(1) of the General Conditions or thirty days after the Contractor has delivered to the Owner an invoice approved by the Engineer-Architect, showing the method by which the amount claimed therein was calculated, whichever is the later date, and if the Contractor has made and delivered to the Owner his Statutory Declaration deposing or proof of payment, if required by the Owner, verifying the fact that all his lawful obligations to subcontractors, workmen and suppliers of material in respect of the work are fully discharged and that all other lawful claims against him in respect of the work including Workers' Compensation assessments have been satisfied or provided for, the amount described in section I as estimated by the Engineer-Architect less the aggregate of

(a) all payments made pursuant to subsection (6),

(b) an amount equal to double the estimated cost to the Owner of completing the items and doing the things described in the Interim Certificate of Substantial Performance which, in the opinion of the Engineer-Architect, are brought about by defects and faults in the work,

(c) an amount equal to double the cost to the Owner of completing the items and doing the things described in the Interim Certificate of Substantial Performance other than items or things to which paragraph (b) applies,

(d) all payments made pursuant to section 9, and

(e) all amounts retained pursuant to a maintenance and guarantee provision, if any, contained in the contract

shall become due and payable by the Owner to the Contractor.

4(8) Upon the expiration of sixty one days from the date of issuance of the Certificate of Substantial Performance under subsection 39(2) of the General Conditions or thirty days after the Contractor has delivered to the Owner an invoice approved by the Engineer-Architect, showing the method by which the amount claimed therein was calculated, whichever is the later date, and if the Contractor has made and delivered to the Owner his Statutory Declaration or proof of payment, if required by the Owner, verifying the fact that all his lawful obligations and lawful claims against him, arising out of the work, have been discharged and satisfied, the amounts described in section 1 less the aggregate of

(a) all payments made pursuant to subsection (6),

(b) all payments made pursuant to subsection (7),

(c) all payments made pursuant to section 9, and

(d) all amounts retained pursuant to a maintenance and guarantee provision, if any, contained in the contract

shall become due and be payable by the Owner to the Contractor. In addition to the Certificate of Substantial Performance, the Engineer/Architect shall issue a form 7 pursuant within the time specified and as required by the Construction Remedies Act., Regulation 2021-81.

4(9) Where the Contractor does not provide the Owner with a Statutory Declaration or proof of payment required by subsection (5), (7) or (8) within the time limited therein, the Owner may withhold payment of the monies which would otherwise have become due until such time as the Statutory Declaration or proof of payment is provided by the Contractor to the Owner and the Owner during this period of time shall not be required to pay interest as provided for in section 6.

CLAIM PAYMENT NOT ACCEPTANCE

5 Neither a Progress Claim nor a payment by the Owner pursuant thereto shall be construed as evidence that the work, material or any part thereof is complete, is satisfactory or is in accordance with the contract.

OWNER'S DELAY IN PAYMENT

6 Delay by the Owner in making a payment when it becomes due and is payable shall, if the delay continues for more than fifteen days, entitle the Contractor to interest on the overdue payment and the Owner shall pay to the Contractor interest thereon from the said fifteenth day until paid at the rate being charged by the Canadian chartered banks in Fredericton on prime commercial accounts as of the date from which such interest was payable.

OWNER'S RIGHT OF SET – OFF

7(l) Without restricting any right of set-off given or implied by law, the Owner may set-off against any amount payable to the Contractor under the contract, any amount payable to the Owner by the Contractor under this contract or under any current contract and, without restricting the generality of the foregoing, the Owner may when making payment pursuant to section 4 deduct from the amount payable any amount which is then payable to the Owner or the Province of New Brunswick by the Contractor under the contract or which, by virtue of the right of set-off, may be retained by the Owner.

7(2) For the purposes of this section "current contract" means

(a) a contract between the Owner and the Contractor under which the Contractor has an undischarged obligation to perform or supply work, labour or materials, or

(b) a contract between the Owner and the Contractor in respect of which the Owner has since the date on which this contract was entered into exercised the right to take the work, the subject of that contract, out of the Contractor's hands.

PAYMENT WHEN CONTRACT TERMINATED

8 In the event that the contract is terminated pursuant to section 19 of the General Conditions, the Owner shall as soon as is practicable under the circumstances pay to the Contractor the amount, if any, payable to the Contractor pursuant to that section.

RELEASE OF HOLDBACK

9(1) Subject to the following paragraphs the Owner shall, upon receipt of the following documents release the Construction Remedies Act Holdback (10% of monies due to the Contractor) sixty-one (61) days after the Certificate of Subtantial Performance of the work has been issued:

(i) Statutory declaration to the effect that:

(1) all expenses incurred by the Contractor in carrying out the contract have been paid except for statutory holdbacks properly retained:

(2) The Construction Remedies Act, Regulation 2021-81, Form 7 is posted at the improvement time frame required by the Construction Remedies Act: and

(3) The Contractor is not aware of any claim or lien made with respect to the Owner’s holdback as contemplated by the Construction remedies Act.

(ii) A Certificate issued to the Owner by a certifier in accordance with the Construction remedies Act; and

(iii) A Clearance certificate from WorkSafe NB.

9(2) The Owner may retain further amounts under the Construction Remedies Act.

9(3) The Owner may retain from the Contract amounts required as Completion Retention and Deficiency Retention. Both are subject to further Construction Remedies Act holdbacks in terms of 10% of monies due to the Contractor for a period of sixty-one (61) days after the Certificate of Final Completion is issued.

9(4) where the Contractor does not provide a Statutory Declaration or does not complete the work as directed or to the satisfaction of the Engineer/Architect the Owner may withhold payment of the monies which would otherwise been due, and during this time, the Owner shall not be required to pay interest.

9(5) The Owner may retain final amounts, under the contract, for any known claims, unpaid amounts due to subcontractors, labourers or suppliers, defective workmanship, equipment, materials, penalties and liquidated damages.

GENERAL CONDITIONS "B"

DEFINITION OF TERMS

(1) In the documents forming the contract, unless the context otherwise requires:

"Engineer-Architect" means the PROJECT ENGINEER ……
……..of ENGLOBE CORP……

and includes a person authorized by him to perform on his behalf any function under the contract;

"herein," "hereby," hereof," "hereunder" and similar expressions refer to the contract as a whole and not to any particular subdivision or part thereof;

"material" includes all materials, commodities, articles and things required to be furnished under the contract for incorporation in the work;

"Owner" means The Greater Shediac Sewerage Commission set forth in the Articles of Agreement as the Owner;

" plant" includes all animals, tools, implements, machinery, vehicles, buildings, structures, equipment, articles and things required for the execution of the work;

"security deposit" means the security given by the Contractor to the Owner in accordance with the contract;

"subcontractor" means a person, firm or corporation having a contract with the Contractor

(a) for the execution of a part or parts of the work included in this contract, or

(b) for the furnishing of material called for in this contract and worked to a special design according to the Plans and Specifications provided such contract is made pursuant to section 4;

"superintendent" means the employee of the Contractor who is designated by the Contractor as being in full charge of the field operations of the Contractor for the purposes of the contract;

"work" includes all labour, material and services required, as shown or described in the contract, supplied and installed or erected complete at the place of building.

1(2) The marginal notes, if any, in the contract documents form no part of the contract but shall be deemed to be inserted for the convenience of reference only.

REFERENCES

1(3) Unless the context otherwise requires, where in a contract document reference is made to a section, subsection or paragraph, the reference is deemed to be a reference

(a) in the case of a section, to a section in the contract document,

(b) in the case of a subsection, to a subsection of the section, and

(c) in the case of a paragraph, to a paragraph in the section or subsection,

in which the reference appears.

INTERPRETING DOCUMENTS

1(4) In interpreting the contract in the event of discrepancies or conflicts between anything in the Plans and Specifications and the General Conditions, the General Conditions shall govern.

1(5) In interpreting the Plans and Specifications:

(a) in the event of discrepancies or conflicts between the Plans and Specifications, the Specifications shall govern;

(b) in the event of discrepancies or conflicts between the Plans, the Plans drawn with the largest scale shall govern; and

(c) in the event of discrepancies or conflicts between figured dimensions and scaled dimensions, the figured dimensions shall govern.

CONTRACT BINDING

2 The contract shall inure to the benefit of and be binding upon the parties hereto and their heirs, executors, administrators, successors, and assigns.

ASSIGNMENT

3 The contract may not be assigned without the written consent of the Owner and until sections 51 and 52 of the *Financial Administration Act*, chapter F-11 of the Revised Statutes of New Brunswick, 1973, have been complied with where applicable.

SUBCONTRACTING

4(l) Except for the subcontracting proposed by the Contractor in his accepted tender, neither the whole nor any part of the work may be subcontracted by the Contractor without the consent of the Engineer-Architect.

4(2) Every subcontract by the Contractor, whether as proposed in the approved tender or as approved by the Engineer-Architect under subsection (1), shall provide that the subcontractor shall comply with all terms and conditions of this contract which can reasonably be applied to his undertaking including, without limiting the generality of the foregoing, the provisions of section 52.

SCOPE OF WORK

5(1) The description of the work and material set out in the contract includes not only the particular kind of work and material mentioned but also all labour, plant and material necessary for the full execution, completion and delivery ready for use of the work and material.

5(2) The Contractor shall provide everything necessary for execution of the work except things in respect of which the contract expressly provides otherwise and except the site of the work if the work when completed is to remain permanently affixed thereon.

NO IMPLIED OBLIGATION

6 No implied obligation of any kind by or on behalf of the Owner shall arise from anything in the contract, and the express covenants and agreements herein contained and made by the Owner are and shall be the only covenants and agreements upon which any rights against the Owner are to be founded, and, without limiting the generality of the foregoing, the contract supersedes all communications, negotiations and agreements, either written or oral, relating to the work and made prior to the date of the contract.

TIME OF THE ESSENCE

7 Time is of the essence of the contract.

INDEMNITY BY CONTRACTOR

8(1) Except as provided in section 9, the Contractor shall indemnify and save harmless the Owner from and against all claims, demands, losses, costs, damage, actions, suits, or proceedings by whomsoever made, brought or prosecuted in any manner based upon, arising out of, related to, occasioned by or attributable to the activities of the Contractor in executing the work under the contract or to an infringement or an alleged infringement by the Contractor of a patent of invention.

8(2) For the purposes of subsection (1), "activities" includes an act improperly carried out, an omission to carry out an act and a delay in carrying out an act.

INDEMNITY BY OWNER

9 The Owner shall indemnify and save harmless the Contractor from and against all claims, demands, losses, costs, damage, actions, suits or proceedings arising out of his activities under the contract which are directly attributable to

(a) a lack of title, a defect in title or an alleged lack of title or defect in title to the site of the work, or

(b) an infringement or an alleged infringement of any patent of invention in executing anything for the purposes of the contract, the model, plan or design of which was supplied by the Owner to the Contractor.

ELECTED MEMBERS

10(1) No member of the Legislative Assembly of the Province of New Brunswick shall be admitted to any share or part of the contract or to any benefit arising therefrom.

10(2) No member of the House of Commons of Canada shall be admitted to any share or part of the contract or to any benefit arising therefrom if Government of Canada funds are involved, whether directly or indirectly, in the payment for or financing of such contract.

SERVING NOTICES

11(1) Notices for the purposes of paragraph 16(l)(a), section 18 and section 19 shall be in writing and shall

(a) be delivered to the Contractor in person, or, if the Contractor is a corporation or partnership, be delivered to the superintendent or to a senior administrative officer of the corporation or partnership, or

(b) be sent by mail to the Contractor or his superintendent addressed to the address mentioned in the contract,

and if any question arises as to when any such notice was given to or received by the Contractor it shall be deemed to have been sufficiently given to and received by him,

(c) if it was delivered pursuant to paragraph (a), on the day it was delivered, or

(d) if it was sent by mail pursuant to paragraph (b), on the day it was received by the Contractor or on the sixth day after it was mailed, whichever is the earlier.

11(2) Any notice, order, direction, decision or communication, other than a notice to which subsection (1) refers, which may be given to the Contractor pursuant to the contract may be given in any manner, but it shall be deemed to have been sufficiently given to the Contractor if it was put in writing and the writing was

(a) delivered to the Contractor in person, or, if the Contractor is a corporation or partnership, was delivered to the superintendent or to a senior administrative officer of the corporation or partnership,

(b) left at the Contractor's office, or, if he has more than one office, at one of them, or

(c) sent by mail to the Contractor or his superintendent addressed to the address mentioned in the contract or to the Contractor's last known place of business or residence.

ADJUSTMENTS DUE TO SOIL CONDITIONS, NEGLECT OR DELAY

12(l) No payment, in addition to the payment expressly promised by the contract, shall be made by the Owner to the Contractor on account of any extra expense, loss or damage incurred or sustained by the Contractor including a misunderstanding on the part of the Contractor as to any fact, whether or not such misunderstanding is attributable directly or indirectly to the Owner or any of the Owner's agents or servants, and whether or not any negligence or fraud on the part of the Owner's agents or servants is involved, unless, in the opinion of the Engineer-Architect the extra expense, loss or damage is directly attributable to

(a) a substantial difference between information relating to soil conditions at the site of the work, or a reasonable assumption of fact based thereon, in the Plans and Specifications or other documents or material communicated by the Owner to the Contractor for his use in preparing his tender and the real soil conditions encountered at the site of the work by the Contractor when executing the work, or

(b) neglect or delay occurring after the date of the contract on the part of the Owner in providing any information or in doing any act which the contract either expressly requires the Owner to do or which would be done by an Owner in accordance with the usage of the trade to enable his Contractor to carry out an undertaking similar to the work being executed under the contract for the Owner,

in which case, if as a condition precedent the Contractor has given to the Engineer-Architect written notice of his claim before the expiration of thirty days from the encountering of the soil conditions giving rise to the claim or from the day on which the neglect occurs or the delay commences, as the case may be, the Owner shall pay to the Contractor, in respect of the additional expense, loss or damage incurred or sustained by reason of that difference, neglect or delay, an amount equal to the cost of the additional plant, labour and material necessarily involved.

12(2) If, in the opinion of the Engineer-Architect, the Contractor has effected a saving of expenditure by reason of the execution of the work by the Contractor being rendered less difficult and less costly because the soil conditions actually encountered by the Contractor at the site of the work when executing the work are substantially different from soil conditions indicated in information, or a reasonable assumption of fact based thereon, in the Plans and Specifications or other documents or material communicated by the Owner to the Contractor for his use in preparing his tender, the amount set out in Article 11 of the Articles of Agreement shall be reduced by an amount equal to the saving effected by the Contractor.

12(3) Paragraph (1)(a) and subsection (2) are applicable only to a fixed price arrangement.

12(14) If information relating to soil conditions at the site of the work appeared in the Plans and Specifications or in other documents or material communicated by the Owner to the Contractor for his use in preparing his tender and if the real soil conditions encountered at the site of the work by the Contractor when executing the work are substantially different from such information, or a reasonable assumption of fact based thereon, so that the cost to the Contractor of executing the work is directly and substantially increased or decreased by reason of such difference, the Engineer-Architect and the Contractor may by agreement in writing amend the price per unit for any class of plant, labour or material involved therein, so that the benefit of a substantial decrease in cost shall accrue to the Owner and the burden of a substantial increase in cost shall not be borne by the Contractor.

12(5) Subsection (4) is applicable only to a unit price arrangement.

12(6) No claim by the Contractor shall be valid in situations where subsection (4) is applicable unless he has given written notice thereof to the Owner within thirty days from the encountering of the soil conditions giving rise to such claim.

OWNER'S TITLE TO PLANT, ETC

13(1) All material and plant and the interest of the Contractor in all real property, licenses, powers and privileges acquired, used or provided by the Contractor for the work shall from the time of being so acquired, used or provided, become and they are the property of the Owner for the purposes of the work and they shall continue to be the property of the Owner

(a) in the case of material, until incorporated in the work or until the Engineer-Architect certifies that he is satisfied that it will not be required for the work, and

(b) in the case of plant, real property, licenses, powers and privileges, until the Engineer-Architect certifies that he is satisfied that the interest vested in the Owner therein is no longer required for the purposes of the work.

13(2) Material or plant that is the property of the Owner by virtue of this section shall not be taken away from the site of the work, or used or disposed of, except for the purposes of the work, without the consent in writing of the Engineer-Architect.

13(3) The Owner is not liable for loss or damage to material or plant that is the property of the Owner by virtue of this section and the Contractor is liable for such loss or damage notwithstanding that the material or plant is the property of the Owner.

CONTRACTOR'S LIABILITY FOR DAMAGE TO OWNER'S PLANT

14(l) The Contractor is liable to the Owner for loss of or damage to material, plant or real property, whether attributable to causes beyond his control or not, supplied or made available by the Owner to the Contractor for use in connection with the work other than loss or damage resulting from and directly attributable to reasonable wear and tear.

14(2) The Contractor shall not use material, plant or real property to which this section applies except for the purpose of carrying out this contract.

14(3) When the Contractor has failed to make good any loss or damage for which he is liable under this section within a reasonable time after being required by the Engineer-Architect to do so, the Engineer-Architect may cause the loss of damage to be made good, and the Contractor shall thereupon be liable to the Owner for the cost thereof.and shall on demand pay to the Owner an amount equal to such cost.

14(4) The Contractor shall keep such records of material, plant and real property to which this section applies as the Engineer-Architect from time to time requires and shall, from time to time as the Engineer-Architect requires,

satisfy the Engineer-Architect that such material, plant and real property are at the place and in the condition that they ought to be.

EXTENSION OF TIME AND PENALTY FOR DELAY IN COMPLETION

15(1) The Engineer-Architect may, on the application of the Contractor if made in accordance with the time limits in subsection 33(2) and made before the day fixed by Article I of the Articles of Agreement for completion of the work or any specified portion thereof or before any new date for completion previously fixed under this subsection, if in his opinion it is in the public interest, extend the time for completion of the work or any specified portion or portions thereof by fixing a new day for such completion.

15(2) Where the Contractor does not complete the work or any specified portion thereof by the day fixed by Article I of the Articles of Agreement for such completion or by such subsequent day, if any, to which the time for completion has been extended under subsection (1), but does complete the work or portion thereafter, the Contractor shall pay to the Owner

(a) where no statutory penalty is provided by subsection (3),

(i) an amount equal to all salaries, wages and traveling expenses paid by the Owner to persons superintending the work during the period of delay, which would not otherwise have been payable,

(ii) an amount equal to the value to the Owner of the use of the completed work for the period of delay, and

(iii) an amount equal to all other expenses and damages incurred or sustained by the Owner as a result of the work or specified portion thereof not being completed during the period of delay, or

(b) where a statutory penalty is provided for by subsection (3), the amount prescribed therein for each day the work or specified portion therefor was not complete during the period of delay.

15(3) (a) The Contractor shall pay to the Owner

(i) for each day of the period of delay during which the work in its entirety is not complete, the sum of ……., and

(ii) for each day of the period of delay during which the following specified portions of the work are not complete, the sum stated for such portion

(A)……

(B)…….

(C)…….

(b) Where no penalty is stipulated in paragraph (a), the Contractor is not bound by this subsection.

15(4) For the purposes of this section,

(a) the work is deemed to be completed on the day specified by the Engineer-Architect in his Interim Certificate of Completion, and

(b) “period of delay" means the period commencing on the day fixed by Article I of the Articles of Agreement for completion of the work or any portion thereof or such subsequent day, if any, to which the time for completion has been extended under subsection (1) and ending on the day immediately preceding the day on which the work or portion thereof is completed.

15(5) The Engineer-Architect may waive the right of the Owner to the whole or any part of a payment payable pursuant to subsection (2).

DEFAULT OR REMOVAL OF WORK FROM CONTRACTOR

16(l) In any of the following cases, namely,

(a) where the Contractor has made default or delayed in commencing or in diligently executing the work or any portion thereof to the satisfaction of the Engineer-Architect and the Engineer-Architect has given notice thereof to the Contractor and has by such notice required the Contractor to put an end to such default or delay and such default or delay continues for six days after such notice was given,

(b) where the Contractor has made default in the completion of the work, or any portion thereof, within the time limited for such completion by the contract,

(c) where the Contractor has become insolvent,

(d) where the Contractor has committed an act of bankruptcy,

(e) where the Contractor has abandoned the work,

(f) where the Contractor has made an assignment of the contract without the required consent, or

(g) where the Contractor has otherwise failed to observe or perform any of the provisions of the contract,

the Owner may, without any other authorization, take all or any portion of the work out of the Contractor's hands and may employ such means as he may see fit to complete the work.

16(2) Where the work or any portion thereof has been taken out of the Contractor's hands under subsection (1), the Contractor shall not, except as provided in subsection (3), be entitled to any further payment in respect of the work so affected including payments then due and payable but not paid, and the obligation of the Owner to make payments in respect thereof as provided for in the Terms of Payment shall be at an end with respect to that portion of the work taken out of his hands, and the Contractor shall be liable to and upon demand therefore shall pay to the Owner an amount equal to all loss and damage suffered by the Owner by reason of the non-completion of the work by the Contractor.

16(3) Where the work or any portion thereof has been taken out of the Contractor's hands under subsection (1) and is subsequently completed by the Owner, the Engineer-Architect shall thereafter determine the amount, if any, of holdback and progress claims of the Contractor in respect thereof unpaid at the time of taking the work out of the Contractor's hands that in his opinion are required by the Owner for the purposes of the contract and the Engineer-Architect shall, if he is of the opinion that no financial prejudice to the Owner will result, authorize payment of the amount to the Contractor.

CONTRACTOR'S CONTINUING OBLIGATION

17(l) The taking of the work, or any portion thereof, out of the Contractor's hands pursuant to section 16 does not relieve or discharge the Contractor from any obligation under the contract or imposed upon him by law except the obligation under the contract to complete the physical execution of that portion of the work so taken out of his hands.

17(2) If the work or any portion thereof is taken out of the Contractor's hands pursuant to section 16, all material and plant and the interest of the Contractor in all real property, licenses, powers and privileges acquired, used or provided by the Contractor for the purposes of work shall, notwithstanding subsection 13(l), be the property of the Owner without compensation to the Contractor.

17(3) If the Engineer-Architect certifies that any property interest of the Owner by virtue of subsection (2) is no longer required for the purposes of the work and that it is not in the interests of the Owner to retain the interest, it shall revert to the Contractor subject to the provisions of subsection 13(3).

SUSPENSION OF WORK

18(1) The Engineer-Architect may require the Contractor to suspend execution of the work either for a specified or unspecified period by giving notice to that effect to the Contractor.

18(2) The Contractor upon receiving notice of the Owner's requirement pursuant to Subsection (1) shall suspend all operations except those which, in the Engineer-Architect's opinion, are necessary for the care and preservation of the work, material and plant.

18(3) During the period of suspension the Contractor shall not remove from the site any part of the work, any material or any plant without the consent of the Engineer-Architect.

18(4) If the period of suspension is thirty days or less, the Contractor, upon the expiration of the period of suspension, shall resume the execution of the work and except where the suspension order was due to the Contractor not diligently prosecuting the work or failing to prosecute the work in a good and workmanlike manner he is entitled to be paid the cost of any plant, labour and material necessarily involved in complying with the suspension.

18(5) If the period of suspension is more than thirty days and if, upon the expiration of the period of suspension, the Engineer-Architect and the Contractor agree that the execution of the work be completed by the Contractor, the Contractor shall resume operations and complete the execution of the work in accordance with any terms and conditions agreed upon by the Engineer-Architect and the Contractor.

18(6) If upon the expiration of a period of suspension of more than thirty days, the Engineer-Architect and the Contractor do not agree that the work will be completed by the Contractor or they are unable to agree upon the terms and conditions under which the Contractor will complete the work, the notice of suspension shall be deemed to be a notice of termination pursuant to section 19.

TERMINATION OF CONTRACT

19(1) The Owner may at any time by giving notice to that effect terminate the contract.

19(2) The Contractor shall upon receipt of a notice pursuant to subsection (1) cease all operations forthwith.

19(3) If the contract is terminated pursuant to subsection (1), the Owner shall pay to the Contractor an amount equal to the lesser of

> (a) the value as agreed upon by the Contractor and the Engineer-Architect of all work performed by the Contractor as of the date of termination or, if the Contractor and the Engineer-Architect cannot agree, as calculated in accordance with the formula set out in section 45, less all amounts already paid to the Contractor by the Owner and less all amounts which the Contractor is liable to pay to the Owner, and

(b) the amount calculated in accordance with the terms of payment which would have been payable to the Contractor had he completed the work.

19(4) If the contract is terminated pursuant to subsection (1), the Owner shall pay to the Contractor an amount equal to the value as agreed upon by the Contractor and the Engineer-Architect of all work performed by the Contractor as of the date of termination or, if the Contractor and the Engineer-Architect cannot agree, as calculated in accordance with the formula set out in section 45, less all amounts already paid to the Contractor by the Owner and less all amounts which the Contractor is liable to pay to the Owner.

19(5) Subsection (3) is applicable only to a fixed price arrangement and subsection (4) is applicable only to a unit price arrangement.

PAYMENT BY OWNER OF CONTRACTING OBLIGATIONS

20(1) The Owner may, in order to discharge lawful obligations of and satisfy lawful claims against the Contractor or a subcontractor arising out of the execution of the work, pay an amount which is due and payable to the Contractor, under any provision of the contract, directly to the obligees of and the claimants against the Contractor or the subcontractor.

20(2) A payment made pursuant to subsection (1) is to the extent of the payment a discharge of the Owner's liability under the contract to the Contractor.

20(3) The Contractor shall discharge all his lawful obligations and shall satisfy all lawful claims against him arising out of the execution of the work as the same become due.

20(4) The Contractor shall, whenever so requested by the Engineer-Architect, make a statutory declaration deposing to the existence and condition of the obligations and claims referred to in subsection (3).

ACCESS TO WORK BY OWNER

21 The Contractor shall permit the Engineer-Architect to have access to the work and to all areas where portions of the work are being fabricated or manufactured at all times during the execution of the work, shall provide the Engineer-Architect with full information concerning what is being done to execute the work and shall give the Engineer-Architect every possible assistance in respect of the performance of his duty to see that the work is executed in accordance with the contract and also in respect of the performance and exercise of the duties and powers specially imposed or conferred on him by the contract.

CLEAN UP

22 The Contractor shall upon completion of the work clear and clean the work and its site to the satisfaction of and in accordance with any directions of the Engineer-Architect.

CONTRACTOR'S SUPERINTENDENT

23(l) The Contractor shall, during working hours, until the work has been completed, keep on the site of the work a competent superintendent who has authority to receive on behalf of the Contractor any order, direction or other communication that may be given under the contract.

23(2) The Contractor shall, upon the request of the Engineer-Architect, remove any superintendent who, in the opinion of the Engineer-Architect, is incompetent or has been conducting himself improperly and shall replace a superintendent so removed with another superintendent as described in subsection (1).

REMOVAL OF CONTRACTOR'S EMPLOYEES

24 The Contractor shall, at the request of the Engineer-Architect, remove from the work any person employed on the work who, in the opinion of the Engineer-Architect, is incompetent or has been conducting himself improperly and the Contractor shall not permit a person so removed to remain on the site of the work.

ESCALATION - LABOUR - MATERIAL

25(l) Except where the Labour Conditions contain an escalation clause, the amount payable to the Contractor under the contract shall not be increased or decreased by reason of any increase or decrease in the cost of the work brought about by an increase or decrease pursuant to the Labour Conditions.

25(2) Notwithstanding section 12 and subsection (1) of this section, the amount set out in Article II of the Articles of Agreement shall be adjusted, in the manner provided in subsection (3), in the event of any change in any tax imposed under the *Social Services and Education Tax Act*, chapter S-10 of the Revised Statutes of New Brunswick, 1973, or the *Excise Tax Act*, chapter E-13 of the Revised Statutes of Canada, 1970,

(a) after the date of the submission by the Contractor of the tender for the contract, and

(b) that applies to the material incorporated or to be incorporated in the work and that affects the cost to the Contractor of such material.

25(3) In the event of any change after the date of submission of the tender for the contract by the Contractor in any tax described in subsection (2) that applies to the material incorporated or to be incorporated in the work and that affects the cost to the Contractor of such material, the amount set out in Article II of the Articles of Agreement shall

(a) be increased where the cost to the Contractor of any material has been increased by virtue of the change, or

(b) be decreased where the cost to the Contractor of any material has been decreased by virtue of the change,

by an amount equal to such amount as it is established upon examination of the relevant records of the Contractor referred to in section 47, represents the increase or decrease, as the case may be, in the cost to the Contractor of the material involved that is directly attributable to the change in the tax levied on or in respect of such material.

25(4) For the purpose of determining the adjustment in the amount set out in Article II of the Articles of Agreement by virtue of any change in any tax described in subsection (2), where such tax is changed after the date of submission of the tender by the Contractor but public notice of such change has been given by the Minister of Finance of the Province or the Federal Government, as the case may be, before the date of submission of the tender, the change of such tax shall, for the purposes of this section, be deemed to have occurred before the date of submission of the tender.

25(5) The Contractor is not entitled to any part of a rebate of taxes obtained by the Owner.

USE OF LOCAL LABOUR AND MATERIAL

26(l) The Contractor shall use Canadian labour and material in carrying out the work, to the full extent to which they are procurable, consistent with proper economy and the expeditious carrying out of the work,

26(2) Subject to subsection (1), the Contractor shall employ labour and obtain material from the locality where the work is being executed to the extent to which it is available and shall use the offices of the Canada Employment Centre in the recruitment of workmen wherever practicable.

26(3) Subject to subsections (1) and (2), the Contractor shall employ a reasonable proportion of persons who have served on active service with the armed forces of Canada and have been honourably discharged therefrom.

SAFETY

27(l) If, in the opinion of the Engineer-Architect, the Contractor is not conducting construction of the work with proper safety precautions for workmen as prescribed by the *Occupational Health and Safety Regulation - Occupational Health and Safety Act,* the Engineer-Architect may, by giving notice in writing to the Contractor, stop the work.

27(2) Where under subsection (1) the Engineer-Architect has stopped the work, the Contractor shall immediately cease his operations until the provisions of the *Occupational Health and Safety, Regulation - Occupational Health, and Safety Act* have been complied with to the satisfaction of the Engineer-Architect.

27(3) No extension of time or monetary allowances shall be made to the Contractor for loss or delay arising from any stoppages in work under this section.

PROTECTION OF WORK

28 The Contractor shall guard or otherwise protect the work and shall protect the specifications, plans, drawings, information, material, plant and real property provided by the Owner to the Contractor against loss or damage from any cause.

PUBLIC CEREMONIES

29(l) The Contractor shall not allow or permit any public ceremony in connection with the work without the permission of the Owner.

29(2) The Contractor shall not erect or permit the erection of any sign or advertising on the work without the approval of the Engineer-Architect.

INSURANCE

30(l) The Contractor shall at his own expense maintain such insurance policies, if any, as are required under this contract in a form and with companies approved by the Owner and of the nature, in the amounts, for the periods and containing the terms and conditions, if any, set out in the Insurance Schedule.

30(2) All insurance policies covering the work and maintained by the Contractor pursuant to subsection (1) shall provide that the proceeds thereof are payable to the Owner, except where the Insurance Schedule otherwise provides.

30(3) The Contractor shall deposit with the Engineer-Architect the originals of all policies of insurance maintained by the Contractor pursuant to subsection (1) and the Contractor shall, when required by the Engineer-Architect, submit to him proof that such policies are in force.

30(4) Upon application by the Contractor, the Engineer-Architect may waive compliance with subsections (2) and (3).

FIRE LOSS

31(l) If the work or any portion thereof is lost or destroyed, and monies are paid to the Owner in respect of the loss or damage under a policy of insurance maintained by the contractor pursuant to section 30, the monies shall be held by the Owner for the purposes of the contract.

31(2) The Owner may elect to retain absolutely the monies held under subsection (1) and, in such event, the monies belong absolutely to the Owner and

(a) the Contractor is liable to the Owner in an amount equal to the amount by which the insurance monies payable is less than the loss and damages suffered and sustained by the Owner, including costs associated with clearing and cleaning the site of the work, and

(b) there shall be a financial accounting between the Owner and the Contractor in respect of the portion of the work which was lost or damaged and in respect of which monies have been retained absolutely by the Owner and there shall be included in the financial accounting all amounts paid or payable by the Owner under the contract to the Contractor, together with all amounts paid or payable by the Contractor under the contract to the Owner and the Owner shall pay to the Contractor any balance.

31(3) Upon payment as required by subsection. (2) by the Owner or the Contractor as the case may be, the Owner and the Contractor are discharged from all rights and obligations under the Contract in respect of the portion of the work which was lost or damaged and in respect of which monies have been retained absolutely by the Owner as though such portion of the work had been fully completed and executed by the Contractor in accordance with the contract.

31(4) If an election is not made under subsection (2), the Contractor shall restore and replace the portion of the work lost or damaged and the insurance monies shall be disbursed by the Owner to the Contractor in the manner and subject to the terms and conditions governing monies payable under the contract to the Contractor by the Owner, except that for the purpose of this subsection "one hundred percent" shall be substituted in subsection 4(6) of the Terms of Payment for "ninety-five percent" and "eighty-five percent".

CONTRACTOR'S RESPONSIBILITIES

32(l) The Contractor shall at his own expense do whatever is necessary to ensure that

(a) no person, property, right, easement or privilege is injured, damaged or infringed by reason of the Contractor's activities under this contract,

(b) pedestrian and other traffic on any public or private road or waterway is not unduly impeded, interrupted or endangered by the execution or existence of the work and plant,

(c) fire hazards are eliminated and in the case of a fire in or about the work that it is promptly extinguished,

(d) the health of all persons employed on the work is not endangered,

(e) adequate medical supervision of all persons employed on the work is maintained,

(f) adequate sanitation measures in respect of the work are taken, and

(g) all stakes, buoys, lines, levels and marks placed on or about the works by or under the authority of the Engineer-Architect are protected and are not removed, defaced or altered.

32(2) The Engineer-Architect may direct the Contractor to do such things and to construct such works which the Engineer-Architect considers reasonable and necessary to ensure compliance with or to remedy a breach of subsection (1).

32(3) The Contractor shall at his own expense comply with a direction of the Engineer-Architect made pursuant to subsection (2).

INTERPRETATIONS OF CONTRACT DOCUMENTS - CLAIMS ARISING

33(l) If at any time before the work has been completed and the Engineer-Architect has issued his Final Certificate of Completion, any question arises as to whether anything has been done as required by the contract or as to what the Contractor is required by the contract to do, and in particular, and without limiting the generality of the foregoing, as to

(a) the meaning of anything in the Plans and Specifications,

(b) the meaning to be given to the Plans and Specifications in case of any error therein, an omission therefrom, or an obscurity or discrepancy in the wording or intention thereof,

(c) whether the quality or quantity of any material or workmanship meets the requirements of the contract,

(d) whether the plant, material or workmen provided by the Contractor for executing the work and carrying out the contract are adequate to ensure that the work will be executed in accordance with the contract and that the contract will be carried out in accordance with its terms,

(e) what quantity of any kind of work has been completed by the Contractor, or

(f) the timing and scheduling of the various phases of the execution of the work,

the question shall be decided by the Engineer-Architect whose decision is final and binding.

33(2) In matters arising other than under section 12, the Contractor shall, where he intends to submit a claim for additional time or money arising out of the construction of the work, give written notice of his intention to claim

(a) in the case of changes or alterations of the work ordered by the Engineer-Architect, within fourteen days of receipt of the notice of change, and

(b) in the case of a dispute arising out of interpretation of the contract, within thirty days of the first occurrence of the circumstances giving rise to the dispute.

33(3) In matters arising other than under section 12, the Contractor may submit a claim for additional time or money only on those matters covered by the notice of intention to claim given under subsection (2) and such claim if not submitted within thirty days of the occurrence of the portion of the work out of which the claim arises shall be barred.

33(4) The Engineer-Architect shall within thirty days of receipt of a notice of claim under this section render his decision in writing to the Contractor.

33(5) The Contractor shall construct the work in accordance with the decisions and directions of the Engineer-Architect given under this section and in accordance with any consequential decisions and directions given by the Engineer-Architect.

DEFECTS AND OMISSIONS

34(1) Without restricting any warranty or guarantee implied or stipulated by law, the Contractor shall at his own expense rectify and make good any defect or fault or omission that appears in the work within twelve months or within such additional period of time stipulated in the Specifications concerning particular portions of the work from the date of the Engineer-Architect's Final Certificate of Completion, or where an Interim Certificate of Completion has been issued under section 39, from the date of such Interim Certificate.

34(2) If any defect, fault or omission appears in the work and the Engineer-Architect is of the opinion that it is one which the Contractor, either under subsection (1) or under a warranty or guarantee implied or stipulated by law, is obliged to remedy and make good, the Engineer-Architect may direct the Contractor to remedy and make good the defect, fault or omission by, giving notice to the Contractor of the existence of the defect, fault or omission and the notice shall specify the time within which the defect, fault, or omission is to be rectified and made good.

34(3) The Contractor shall rectify and make good the defect, fault or omission described in a notice given pursuant to subsection (2) within the time specified in the notice.

OWNER'S RIGHT TO COMPLETE WORK

35(l) Where the Contractor has failed to comply with any decision or direction given by the Engineer-Architect under section 22, 32, 33, or 34, the Engineer-Architect may employ such methods as he may deem expedient to do that which the Contractor failed to do.

35(2) The Contractor shall on demand pay to the Owner all costs, expenses and damages incurred or sustained by the Owner by reason of the Contractor's non-compliance with any decision or direction given by the Engineer-Architect under section 22, 32, 33, or 34 and by the action taken by the Engineer-Architect pursuant to subsection (1).

CONTRACTOR'S RIGHTS ON DISPUTED DECISION

36 If the Contractor has, within ten days of communication to him by the Engineer-Architect of any decision or direction of the Engineer-Architect under section 22, 32, 33, or 34, given notice to the Engineer-Architect in writing disputing such decision or direction and stating the ground or grounds which form the basis of such dispute, the Owner shall pay to the Contractor the cost of the additional labour, material and plant necessarily involved in carrying out the decision or direction beyond what the Contract, correctly understood and interpreted, would have required the Contractor to do.

CHANGES IN THE WORK

37(l) The Engineer-Architect may at any time before he issues his Final Certificate of Completion, in writing,

(a) order work or material in addition to that provided for in the Plans and Specifications, and

(b) delete work or change the dimensions, nature, character, quantity, quality, description, location or position of the whole or any part of the work or material provided for in the Plans and Specifications or as ordered pursuant to paragraph (a),

and the Contractor shall execute the work in accordance with such orders, deletions, and changes as if the same had appeared in and been part of the Plans and Specifications.

37(2) The Engineer-Architect shall determine whether anything done or not done by the Contractor pursuant to an order, deletion or change made by the Engineer-Architect pursuant to subsection (1) increased or decreased the cost of the work to the Contractor.

37(3) If the Engineer-Architect determines under subsection (2) that the cost has been increased, the Owner shall pay to the Contractor the cost of the additional labour, material and plant necessarily involved.

37(4) If the Engineer-Architect determines under subsection (2), that the cost has been decreased, the Owner may reduce the amount payable to the Contractor under the contract by the amount equal to the reduction in cost of the labour, material and plant involved.

37(5) Where provision for the calculation of increased and decreased cost under subsections (3) and (4) is contained in the Contract Documents, such cost shall be calculated in accordance therewith.

RELATIONS WITH OTHER CONTRACTORS

38(l) Wherever work being done by the Owner's forces or by other contractors is contiguous to work covered by this contract, the respective rights of the various interests involved shall be established by the Engineer-Architect to secure the completion of the various portions of the work in general harmony.

38(2) The Owner reserves the right to let other contracts in connection with this project and the Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their material and the execution of their work and shall properly connect and co-ordinate his work with theirs.

38(3) If any part of the Contractor's work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer-Architect any defects in such work that render it unsuitable for such proper execution or results and his failure so to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his work except as to defects which may develop in the other contractor's work after the execution of this work.

38(4) To insure the proper execution of his subsequent work, the Contractor shall measure work already in place and shall at once report to the Engineer-Architect any discrepancy between the executed work and the drawings.

CERTIFICATE OF SUBSTANTIAL COMPLETION

39(l) If the Engineer-Architect is satisfied that the work is substantially performed and is acceptable for use by the Owner, he may at any time before issuance of a Final Certificate of Completion issue to the Contractor a Certificate of Substantial Performance, and shall describe therein the portions of the work not completed to his satisfaction, state those quantities which require additional measurements and all things which must be done by the Contractor before a Final Certificate of Completion can be issued.

39(2) As soon as reasonably possible after

(a) the work has been completed, and

(b) the Contractor has complied with the contract and all orders and directions made pursuant thereto,

to the satisfaction of the Engineer-Architect, he shall issue to the Contractor a Final Certificate of Completion.

39(3) The Engineer-Architect before issuing a Final Certificate of Completion, may, in addition to the matter described in the Interim Certificate of Completion, require the Contractor to rectify any other portions of the work not completed to the satisfaction of the Engineer-Architect and to do any other things necessary for the completion of the work.

39(4) The Engineer-Architect shall measure and keep records of his measurements of the quantities of labour, material and plant performed, used and supplied by the Contractor in executing the work and shall, at the request of the Contractor, inform him of his measurements and the Contractor shall assist and co-operate with the Engineer-Architect in such measuring and is entitled to inspect the records of measurements kept by the Engineer-Architect.

39(5) On the day that the Engineer-Architect issues his Final Certificate of Completion under subsection (2), he shall issue a Final Certificate of Measurement showing the quantity of labour, plant and material performed, used and supplied by the Contractor in executing the work and all measurements included therein shall be binding upon the Owner and the Contractor and are conclusive between them as to the quantity of any labour, plant or material performed, used or supplied by the Contractor in executing the work.

39(6) Subsections (4) and (5) are applicable only to a unit price arrangement.

CONVERSION OF SECURITY DEPOSIT

40(l) If the work is taken out of the Contractor's hands pursuant to section 16 or if the contract is terminated pursuant to section 19 or if the Contractor is in breach of or in default under the contract, the Owner may negotiate the security deposit, in the case of bonds, or convert the security deposit to the Owner's own use, in the case of money, and the amount realized by the Owner shall be deemed to be a debt by the Owner to the Contractor and the Owner shall have the right of set-off and may set-off against the debt any sum or amount which the Contractor may be liable to pay to the Owner and the balance of the debt, if any, after the right of set-off has been exercised, shall if such balance, in the opinion of the Engineer-Architect, is not required for the purpose of the contract and subject always to the provisions of section 20 be paid by the Owner to the Contractor.

40(2) The Owner may retain for the purpose of the contract any balance of moneys, otherwise payable to the Contractor under subsection (1).

RETURN OF SECURITY DEPOSIT

41(l) Upon the Engineer-Architect's Interim Certificate of Completion being issued, the Owner shall, if the Contractor is not in breach of or in default under the contract, return to the Contractor that part of the security deposit covering performance of the work which, in the opinion of the Engineer-Architect, is not required for the purposes of the contract.

41(2) Where the security deposit was converted to cash, the Owner shall pay to the Contractor the interest accrued thereon to the date of payment to the Contractor, but in no case shall the interest payable by the Owner exceed the amount paid to the owner thereon as a result of the Owner complying with subsection 20(2) of the *General Regulation - Crown Construction Contracts Act* and in no case shall interest be paid by the Owner to the Contractor on that portion of the security deposit taken or used by the Owner in accordance with the provisions of this Agreement.

PERMITS AND LICENCES

42(1) The Owner shall furnish all surveys unless otherwise specified.

42(2) Permits and licenses of a temporary nature normally required for the prosecution of the work shall be secured and paid for by the Contractor.

42(3) Easements or other authorizations for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner unless otherwise specified.

42(4) No extension of time for completion of the work shall be allowed due to delay for any cause in the obtaining by the Contractor of the licenses and permits described in subsection (1), (2) or (3) except where such delay is the direct result of actions of the Owner.

DETERMINATION OF COST UNIT PRICE

43 Whenever it is necessary for the purposes of sections 12, 18, 36 and 37 to determine the cost of labour, plant or material, the Unit Price Table shall be used, that is, the cost shall be equal to the product of the agreed quantity of such labour, plant or material expressed in the appropriate unit of measurement multiplied by the price in respect of such unit.

DETERMINATION OF COST – AGREEMENT

44 If the method of determination in section 43 cannot be used because the labour, plant or material involved is not included in the Unit Price Table, the cost of the labour, plant or material for the purposes of sections 12, 18, 36 and 37 shall be the amount agreed upon from time to time by the Contractor and the Engineer-Architect.

DETERMINATION OF COST - COST PLUS

45(l) Where the method of determination provided for in section 43 cannot be used and the Engineer-Architect and Contractor do not agree as provided in section 44, the Owner and the Contractor may, by an agreement in writing, agree to determine the cost of labour, plant or material for the purposes of sections 12, 18, 36 and 37 to be equal to the aggregate of

(a) all reasonable and proper amounts actually expended by or legally payable by the Contractor in respect of the labour, plant or material which fall within any of the classes of expenditure described in subsection (2) (being costs which are directly attributable to the execution of the work and are not costs in respect of which the allowance in paragraph (b) is made), and

(b) fifteen percent of the total of the expenditures of the Contractor that meet the test in paragraph (a), as an allowance for all other expenditures by the Contractor and for profit, and without limiting the generality of the foregoing, being also an allowance for payments and charges relating to overhead, head office expenses and general administration costs of the Contractor, including finance and interest charges, or, five percent of such expenditures where the Contractor has the work done by a subcontractor: provided that such allowance shall not be applied to any portion of the expenditures identified under paragraph (2)(h) in which the *Machine Rental Regulation - Crown Construction Contracts Act* is used to calculate such expenditure; but where the cost determination arises solely out of a change order issued pursuant to section 37 and the value of that change order, as estimated by the Engineer - Architect at the time of its issue, is $2,500 or less, then twenty percent of the total of the expenditures of the Contractor that meet the test in paragraph (a), as an allowance for all other expenditures by the Contractor and for profit, and without limiting the generality of the foregoing, being also an allowance for payments and charges relating to overhead, head office expenses and. general administration costs of the Contractor, including finance and interest charges, or, ten percent of such expenditures where the Contractor has the work done by a subcontractor: provided that such allowance shall not be applied to any portion of the expenditures identified under paragraph (2)(h) in which the *Machine Rental Regulation Crown Construction Contracts Act* is used to calculate such expenditure.

45(2) Classes of expenditure that are allowable are:

(a) payments to subcontractors, agreed to by the Owner;

(b) wages, salaries and traveling expenses of employees of the Contractor while they are actually and properly engaged on the work, other than wages, salaries, bonuses, living and traveling expenses of personnel of the Contractor generally employed at the head office or at a general office of the Contractor unless such personnel is engaged at the site of the work with the approval of the Engineer-Architect;

(c) payments for material necessary for and incorporated in the work, or necessary for and consumed in the execution of the work;

(d) payments for consumable tools, other than tools customarily provided by tradesmen, necessary for and used in the execution of the work;

(e) payments for preparation, inspection, delivery, installation and removal of material necessary for the execution of the work;

(f) payments for renting, erecting, maintaining, and removing temporary offices, sheds and similar structures necessary for and used by the Contractor in executing the work;

(g) assessments in respect to the work payable under any statutory requirement or other agreements relating to payroll burdens;

(h) payments for renting plant and allowances for plant owned by the Contractor necessary for the execution of the work providing that such payments or allowances are reasonable and do not exceed the equipment rental rate set out in the *Machine Rental Regulation - Crown Construction Contacts Act;*

(i) payments for inspection, delivery, installation and removal of plant necessary for the execution of the work; and

(j) other payments made with the approval of the Engineer-Architect that are necessary for the execution of the work.

DEFINITION OR DETERMINATION OF COST

46(l) For the purposes of sections 44 and 45 and except as in those sections specifically provided, plant does not include tools.

46(2) For the purposes of sections 43, 44 and 45, "Unit Price Table" means the table referred to in Article VI of the Articles of Agreement.

MAINTAIN RECORDS BY CONTRACTOR

47(l) The Contractor and each subcontractor shall maintain

(a) the detail of the compilation of his estimate showing labour, material, plant, overhead and all other elements entering into his unit or lump sum prices as prepared for the purpose of tender, and

(b) full records of the actual cost to him of the work together with all proper tender calls, quotations, contracts, correspondence, invoices, receipts and vouchers relating thereto,

and shall make them available to audit and inspection by the Owner, the Comptroller of the Province of New Brunswick, or by persons acting on their behalf, shall allow them to make copies thereof and to take extracts therefrom, and shall furnish them with any information which they may require from time to time in connection with such records.

47(2) The records maintained by the Contractor and each subcontractor pursuant to this section shall be kept intact until the expiration of two years from the date of issuance of the Final Certificate of Completion under subsection 39(2) or until the expiration of such other period as the Owner may direct.

47(3) The Contractor shall require all subcontractors and all firms, corporations and persons directly or indirectly controlled by or affiliated with the Contractor and all firms, corporations and persons directly or indirectly having control of the Contractor to comply with subsections (1) and (2) as if they were the Contractor.

WORK SCHEDULE

48(l) Except as otherwise provided in the Contract Documents, the Contractor shall submit to the Engineer-Architect within thirty days of the formal notice of award of contract a work schedule satisfactory to the Engineer Architect showing therein the time, rate, and order of construction he proposes for the various portions of the work.

48(2) No progress claims shall be paid by the Owner during the time while the Contractor is in default under subsection (1).

COST BREAKDOWN OF LUMP SUM WORK

49 The Contractor shall, on contracts which are wholly lump sum or partly lump sum and partly unit price, submit a schedule to the Owner showing the cost breakdown of the lump sum work to assist the Engineer-Architect in assessing progress claims.

CONTRACTOR'S JOB OFFICE

50(1) The Contractor shall provide a temporary weather tight job office, located in an area approved by the Engineer-Architect, for his own use complete with facilities for filing drawings, specifications, correspondence, purchase orders and such other appurtenances as are necessary for the proper conduct of the work and shall remove same upon completion of the work.

50(2) The Contractor shall provide a telephone in the job office described in subsection (1) where practicable.

50(3) The Contractor shall at all times during construction of the work maintain in the job office required by subsection (1) a complete and current set of plans, specifications and change orders for this contract.

RECORD OF IMPORTED PLANT

51 The Contractor shall deliver to the Engineer-Architect each time a Progress Claim is submitted a statement, signed by a responsible person on behalf of the Contractor, setting forth an accurate record of the serial number, type and date of arrival in the Province of all construction equipment brought into the Province and used during the immediately preceding Payment Period in performance of the work, the arrival of which had not been previously reported, together with the date of departure from the Province of any such equipment which had been so used.

COPY PURCHASE ORDERS

52(l) Where the accepted tender for the construction of the work exceeds fifty thousand dollars, the Contractor shall maintain on the construction site one copy of every purchase order used in acquiring services and material for incorporation into the work of this contract and allow the Engineer-Architect or his authorized representative access thereto.

52(2) A copy of each purchase order shall be made available to the Engineer-Architect at the job site prior to incorporation of the material purchased thereby into the work.

ARBITRATION

53(1) Any claim or dispute involving the Owner and the Contractor may, by mutual agreement of the parties, be submitted to arbitration.

53(2) Should the Owner in accordance with this section agree to enter into an Agreement to Arbitrate, the Agreement shall be limited to matters contained in the claim submitted by the Contractor and shall stipulate that the arbitration is not binding on either party.

This document is the document referred to as "Insurance Schedule" and marked "E" in the Articles of Agreement entered into on the _____day of _____, 20 ____ between the Owner and the Contractor.

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Owner

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Contractor

INSURANCE SCHEDULE

The Contractor shall at his own cost and expense, provide and maintain insurance that will protect the Contractor from claims for bodily injury, including death, and from claims for property damage which may arise from the performance of this contract. The comprehensive general liability insurance required shall be for an inclusive limit of not less than Two Million Dollars ($2,000,000.00) for each occurrence. The Contractor shall, at the request of the Owner, file with the Owner a policy, one certified copy of such insurance which shall be for an amount and on a form acceptable to the Owner.

The Owner further reserves the right to require the Contractor to ensure his plant and equipment, and file with the Owner evidence that such insurance is in force and for such amount or amounts as the Owner may deem to be adequate.

The Contractor shall pay for and maintain Builders All Risks Insurance during the term of the contract. Such insurance shall incorporate at least, the following features:

- The Owner, the Contractor, all sub-contractors and the Consultant as named assured, and incorporating the insurer's Waiver of Subrogation against any of such named assureds.
- Coverage for the full value of the project.
- A debris removal clause.
- Coverage may exclude cost of making good faulty workmanship, construction or design, but this exclusion shall not apply to damage resulting from such faulty workmanship, construction or design.
- Fire Insurance to a total of no less than one hundred percent (100%) of the total value of the work done and material delivered to the site, payable to the Owner and Contractor as their respective interests may appear.
- Automatic reinstatement clause.
- A deductible of no more than $1,000.00. The cost of this deductible shall be borne by the Contractor.

- Loss payable shall be made to the Owner and the Contractor as their interests may appear.

This insurance shall be negotiated for, procured from, and the premium paid to a resident agent of an Insurance Company licensed to do business in the Province of New Brunswick.

All insurance shall remain in effect until issuance of the "Certificate of Final Acceptance".

A separate policy endorsement shall be provided if any blasting is to be carried out under the contract.

TENDER FORM

This document is the document referred to as "Tender Submission" and identified as Section "F" in the Articles of Agreement entered into on the _____day of _____ 20____ between the Owner and the Contractor.

Blue Copy for Tender Submission
White Copy Retained by Contractor

(
(
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(_____
Owner

Signed (
(
(
(_____
Contractor

TENDER SUBMISSION
Project Title - Location, N.B.

Tender Submitted By:_____

TO: The Greater Shediac Sewerage Commission
25, ch. Cap-Brulé Rd.
Boudreau-Ouest, NB E4P 6H8

Attention: Mr. Joey Frenette, B.Sc., P.Tech. – General Manager

We, the undersigned, hereby offer and agree to furnish all and every kind of labour, tools, implements, machinery, plant, service and materials that may be required to execute and complete, in a workmanlike manner all the work embraced in the construction of the above mentioned work and in accordance with the plans and specifications exhibited to us, and such revisions, further details and special plans as may be furnished, from time to time, during the progress of the work.

We have examined the plans, specifications and site and have ascertained all necessary particulars with regard to the work and upon acceptance of this tender are prepared to enter into a contract, in the form exhibited with the said plans and specifications, at and for the prices set opposite the different items.

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

Tenderers must bid on each item listed below.

ITEM Unit bid to be either type-written, printed or written in ink in words.	**MEASURE -MENT**	**APPROX. QUANTITY**	**UNIT BID PRICE** (in figures)	**TOTAL** (in figures)
1. a) ....dollars and .....cents per			$ _____	$ _____
b) ....dollars and .....cents per			$ _____	$ _____
c) ....dollars and .....cents per			$ _____	$ _____
2. a) ....dollars and .....cents per			$ _____	$ _____

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

Tenderers must bid on each item listed below.

ITEM Unit bid to be either type-written, printed or written in ink in words.	**MEASURE -MENT**	**APPROX. QUANTITY**	**UNIT BID PRICE** (in figures)	**TOTAL** (in figures)
3. a) ....dollars and .....cents per			$ _____	$ _____
4. Contingency Allowance (As Authorized)				$_____

SUB-TOTAL FOR CONTRACT: $_____

HST @ 15%: $_____

TOTAL FOR CONTRACT: $_____

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

In addition to the unit bid items, the following allowances shall be used in adding up the total for the bid, as noted in the Tender Form:

ELECTRICAL ALLOWANCE

This is a provisional sum and will be used to pay for the electrical service extension to the site by NB Power. Any work to be paid for from this allowance must be authorized in writing by the Engineer. This provisional sum as shown in the Schedule of Prices must be used in adding up the total for the bid. The Contractor will be reimbursed for costs in this category upon submission of a paid invoice from NB Power identifying the work done and the dates carried out.

CONTINGENCY ALLOWANCE

This is a provisional sum and will be used to pay for any extra work that may be deemed as necessary by the Engineer. Any work to be paid for from this allowance must be authorized in writing by the Engineer. This is a provisional sum as shown in the Schedule of Prices and must be used in adding up the total for the bid.

GENERAL

The prices tendered in the Schedule of Prices will cover full payment for the work involved in the noted items and which are more particularly described in the Measurement of Work that is contained in the Particular Specifications.

It is to be noted that the quantities shown in the Schedule of Prices are approximate and the Owner reserves the right to increase or decrease these quantities at the same unit price tendered.

It is distinctly understood that no departure from the work covered by the drawings and specifications, or the tender prices stated herein, will be made except upon the written approval of the Engineer or his authorized representative.

The tenderer must submit herewith a security deposit in the form and amount described in the Instructions to Tenderers.

The Owner reserves the right to reject any or all tenders and the lowest or any tender need not necessarily be accepted. Tenderers may be evaluated on the following criteria:

- Price;
- Ability to meet the project schedule;
- Past experience of similar projects by the Contractor, the proposed subcontractors and the individuals proposed for the work;
- Quality;
- Safety, based on the Contractor's safety record, the Contractor's attention to safety on past projects and the Contractor's Safety Manual and safety procedures.

The following sections must be completed and submitted with the tender.

SIMILAR PROJECTS – [minimum of 3 to be listed]

The following is a list of projects **(to be 3 different owners)** of a similar size and type completed by the tenderer. The Owner and/or Engineer reserve the right to contact the Project Engineer or Owners provided (including listed and all other projects completed by the Tenderer) for reference purposes.

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

Owner #1:
Owner/Project Name: _____

Brief Description: _____

_____

Year: _____ Value: _____

Project Engineer: _____ Contact Number: _____

Owner Representative: _____ Contact Number: _____

Owner #2:
Owner/Project Name: _____

Brief Description: _____

_____

Year: _____ Value: _____

Project Engineer: _____ Contact Number: _____

Owner Representative: _____ Contact Number: _____

Owner #3:
Owner/Project Name: _____

Brief Description: _____

_____

Year: _____ Value: _____

Project Engineer: _____ Contact Number: _____

Owner Representative: _____ Contact Number: _____

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

EQUIPMENT

The following is a list of equipment that the tenderer agrees to provide, as requested by the Engineer, to complete the work in an efficient manner and within the time allowed.

MAKE AND DESCRIPTION	YEAR	CAPACITY	CONDITION

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

INDIVIDUALS PROPOSED FOR PROJECT

The following is the Work Teams that the tenderer proposes to use. Any changes to the proposed teams shall to be approved in writing by the Engineer.

POSITION	**NAME**	**QUALIFICATION & EXPERIENCE**
Project Manager		

Team/Crew #1

Foreman		
Excavator Operator		
Pipe Layer		
Other		

Team/Crew #2 (if applicable)

Foreman		
Excavator Operator		
Pipe Layer		
Other		

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

PROPOSED SUB-CONTRACTORS

The following is a list of sub-contractors and we will sub-contract the following parts of the work to the sub-contractors listed for each part and we agree not to make changes in the following list without the prior written approval of the Owner and Engineer. In our opinion the sub-contractors named hereunder are reliable and competent to perform that part of the work for which each is listed. Work not assigned to sub-contractors will be done by our own forces.

PART OF THE WORK	SUB-CONTRACTOR	ADDRESS
Others (Specify)		

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

MATERIAL ORIGIN FORM

This form must be completed and submitted with the tender.

The following is a list of material Manufacturers and/or Suppliers that we will utilize for this project. We agree not to make any revisions to this list without prior written approval of the Owner and Engineer.

MATERIAL	**MANUFACTURER/SUPPLIER/SOURCE**
Others (Specify)	

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

SAFETY

The following shall provide information on the Tenderer's Safety Program and procedures. The Owner and/or Engineer reserve the right to request a copy of the Tenderer's safety manual and policies for review before the tender is awarded.

1. Do you have a Registered Safety Program in place (Yes or No):

2. Since when:

3. Number of Incidents Reported to WorkSafe NB in the past five (5) years:

4. Name of Safety Officer:

5. Registration with NBCSA (Yes or No):

6. Description:

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

This offer is irrevocable for thirty (30) days from the date on which the tenders are opened and if accepted within said thirty (30) days, I (we) undertake to enter into a contract, in the attached standard form for the execution of the work and to complete the work within the time allowed.

DATED AT _____

THIS _____ DAY OF _____, 20_____.

NAME OF FIRM _____

ADDRESS _____

_____

TELEPHONE _____ FAX _____

_____ _____
Signature of Witness Authorized Signature

_____
Name (Printed)

_____
Title (Printed)

_____ _____
Signature of Witness Authorized Signature

_____
Name (Printed)

_____
Title (Printed)

NOTE: If the Contractor is an Incorporated Company, the tender will be signed by the President or other officer or officers duly authorized to sign, and the seal affixed.

I, HEREBY, CONFIRM THAT I HAVE READ AND UNDERSTOOD THE ABOVE_____
(Initials)

SECTION No. 1 – INSTRUCTION TO TENDERERS

1.1 INSTRUCTIONS TO TENDERERS

1.2 TENDER DOCUMENTS

Only those tenders submitted by persons or firms who have been listed either individually or jointly as having received tender documents will be considered.

Addenda to the tender documents will be issued only to those persons having received tender documents.

It is the responsibility of all Tenderers to ensure that they are listed as having received tender documents. The Owner or his Representative assumes no responsibility for the accuracy of the List of Bidders.

Tender documents may only be obtained from the location named in the public notice of tender.

All requests for additional information, clarifications or instructions concerning the Tender must be sent IN WRITING (facsimile, e-mail or letter) and received by the Engineer no later than four (4) working days prior to the public Tender opening. Requests shall be submitted to the individuals designated on the Tender Data Sheet. Oral information provided by any staff other than designated will not be binding.

All relevant questions deemed by the Engineer to be appropriate for general interest to all potential Bidders and the Engineer's response to each question shall be issued to all Bidders in the form of an Addendum or a Clarification.

1.3 TENDER SUBMISSION

Sealed tenders will be received at the time, date and location as stated in the Tender Advertisement. The Bid Security Deposit will be in the form and amount as stated in the Tender Advertisement.

The tender envelope will have on the face of it, the name of the Tenderer submitting the tender and will be identified as:

Project Title
Location

and will be addressed as follows:

The Greater Shediac Sewerage Commission
25, ch. Cap-Brulé Rd.
Boudreau-Ouest, NB E4P 6H8

henceforth to be referred to as the Owner.

Tenders are to be submitted, and will be evaluated, in accordance with Regulation 82-109 under the Crown Construction Contracts Act (0.C. 82 - 506), filed June 17, 1982. It shall be the responsibility of the Tenderer to be familiar with this regulation and to carefully follow the instructions outlined therein.

1.4 TENDER DEPOSIT

It will be a condition of all Tenderers that there be deposited with each tender the following:

A Bid Bond for an amount equal to **$ Insert Amount**

OR

A bid bond in the amount of 10% of the total bid minimum OR a certified cheque in the amount of 15% of the total bid minimum made payable to the Greater Shediac Sewerage Commission must accompany each tender

Such deposits will be returned to other than the three low Tenderers on completion of tender review. The deposit of the successful Tenderer will be returned to him after he has furnished the Owner with a security hereinafter referred to in Clause 1.5. The deposit of the low Tenderers will also be returned at this time.

1.5 CONTRACT SECURITY – PERFORMANCE BOND AND LABOUR & MATERIAL BOND OR CERTIFIED CHEQUES

It is a condition of the acceptance of the contract whether so expressed in the acceptance or not that the Tenderer will, within eight [8] calendar days from notification of acceptance, and as a guarantee of the due fulfillment of all provisions of the contract, furnish the Owner with the following:

A Performance Bond and a Labour and Material Payment Bond, each of an amount equal to 50% of the tender price (Including HST), with a satisfactory guarantee Security Company. The performance bond and labour materials bond shall comply with the Construction Remedies Act and related regulations. Where permitted by the Construction Remedies Act, the Owner may allow alternative forms of security such as a certified cheque.

If a certified cheque is used as a tender deposit. The cheque(s) will be cashed and the money retained by the Owner as Contract Security. It will be returned to the Contractor not less than sixty (60) days following the date of Final Acceptance as determined by the Engineer, provided there are no outstanding deficiencies. In the case of default, this money will be used to complete the work and through the right of set-off to pay suppliers and subcontractors. Any interest earned by this security while held by the owner shall remain the property of the owner and not be paid to the

Contractor.

All bonds shall be procured from, and the premiums paid to, a resident agent of an insurance company or to a general insurance broker, licensed to do business in New Brunswick. Such bonds shall also be satisfactory to the Owner as to form and issuer.

The labour and material payment bond and performance bond or Certified Cheque shall remain in force and effect for the duration of the contract and maintenance period and until issuance of the Certificate of Final Acceptance.

1.6 TENDER VALID FOR

The Owner shall, within thirty (60) working days of the public tender opening for the contract, notify the successful Tenderer that they are the successful Tenderer and call on them to enter into a formal contract for construction of the work.

The successful Tenderer shall, within ten (10) working days of notification:

- where required, provide a performance bond and labour & material bond in the amount stipulated;
- provide proof of insurance coverage of the type and in the amount stipulated in the General Conditions;
- execute the formal document.

1.7 HARMONIZED SALES TAX

The New Brunswick Harmonized Sales Tax [HST] is not to be included in the tendered unit prices. A single line entry is provided in the Tender Form indicating the total HST applied to the overall bid price.

1.8 HOLDBACK FUNDS

Subject to the following paragraphs the Owner shall, upon receipt of the following documents release the Construction Remedies Act Holdback (10% of monies due to the Contractor) sixty-one (61) days after the Certificate of Substantial Performance of the work has been issued: Statutory declaration to the effect that; all expenses incurred by the Contractor in carrying out contract have been paid except for statutory holdbacks properly retained; The Construction Remedies Act, Regulation 2021-81, Form 7 is posted at the improvement time frame required by the Construction Remedies Act; and the Contractor is not aware of any claim or lien made with respect to the Owner's holdback as contemplated by the Construction remedies Act. A certificate issued to the Owner by a certifier in accordance with the Construction remedies Act; and a Clearance certificate from WorkSafe NB. The Owner may retain further amounts under the Construction Remedies Act. The Owner may retain from the Contract amounts required as Completion Retention and Deficiency Retention. Both are subject to further Construction Remedies Act holdbacks in terms of 10% of monies due to the Contractor for a period of sixty-one (61) days after the Certificate of Final

Completion is issued. Where the Contractor does not provide a Statutory Declaration or does not complete the work as directed or to the satisfaction of the Engineer/Architect the Owner may withhold payment of the monies which would otherwise been due, and during this time, the Owner shall not be required to pay interest. The Owner may retain final amounts, under the contract, for any known claims, unpaid amounts due to subcontractors, laborer's or suppliers, defective workmanship, equipment, materials penalties, and liquidated damages.

1.9 ESTIMATED QUANTITIES

The quantities shown on the tender form are approximate and are subject to change. The Owner reserves the right to decrease or increase these quantities at the tendered prices. The work will be measured up monthly and the Tenderer will prepare his claim based on these measurements. **Any decrease or increase in quantities will be at the unit prices quoted in the tender and no extra compensation will be allowed.**

The Owner reserves the right to delete any items or groups of items entirely, without penalty. There shall be no payment for "anticipated profit" on any items where the quantity is adjusted or the item deleted.

1.10 QUALIFICATIONS OF BIDDERS

Persons or firms submitting tenders shall be actually and actively engaged in the lines of work required by the specification and shall be able to refer to work of similar character performed by them. The Bidders shall be capable of demonstrating that they have the corporate and employee experience as well as the equipment required to complete this project as required by the drawings and specifications including all the schedule and safety requirements. This will be evaluated using the information included in the tender form as well as information gathered through contacts and references during the tender review stage.

1.11 EXAMINATION OF DRAWINGS, SPECIFICATIONS AND SITE

Each Tenderer, before submitting his tender, will carefully examine the contract documents and will visit the site to determine the existing conditions and limitations, including labour conditions and fair wage provisions wherever such are imposed by the Statutes of the Province of New Brunswick and will not claim at any time after the submission of the tender, or the subsequent execution of a contract, that there was any misunderstanding with regard to the conditions imposed by the contract.

1.12 DRAWINGS FOR USE DURING CONSTRUCTION

Before starting the work, the Contractor must obtain from the Engineer drawings that are stamped "FOR CONSTRUCTION" and dated with a "DATE" stamp. Only drawings that are stamped in this manner are to be used for construction purposes.

The Contractor will be provided with up to six (6) sets of drawings and specifications

at no cost; additional sets will be charged at $100.00 each.

1.13 LOCATION OF SITE

Consultant to add location of site in the supplementary specifications.

1.14 OPENING OF TENDERS

The public opening of tenders will be held immediately following the tender closing. All Bidders are invited to be present. The lowest or any tender will not necessarily be accepted. **The award of the tender, if any, will not be made at the tender opening.**

1.15 CONDITIONS OF TENDER

The Tenderer acknowledges that the Owner shall have the right to reject any, or all, Tenders for any reason, or to accept any Tender which the Owner in its sole unfettered discretion deems most advantageous to itself. The lowest, or any Tender will not necessarily be accepted and the Owner shall have unfettered right to:

a) Accept a Tender which is not the lowest Tender;
b) Reject a Tender that is the only Tender received.

In evaluating the Tenders, the Owner may consider any information deemed relevant in determining what is most advantageous, which may include:

- Price;
- Safety, based on the Tenderer's safety record, the Tenderer's attention to safety on past projects, the Tenderer's Safety Manual and safety procedures followed, information gathered from the references during the bid review process and/or past work for the Owner;
- Ability to meet the project schedule, based on past projects listed in the tender form, information gathered from the references during the bid review process and/or past work for the Owner;
- Past experience of similar work by the Tenderer, the proposed subcontractors and the individuals proposed for the work;
- Quality, based on past projects listed in the tender form, information gathered from the references during the bid review process and/or past work for the Owner.

By submitting a Tender, the Tenderer acknowledges the Owner's rights under this Tender and absolutely waives any right, or cause of action against the Owner, its officers, directors, employees or consultants by reason of the Owner's failure to accept the Tender submitted by the Tenderer, whether such right or cause of action arises in contract, negligence, bad faith or otherwise.

The evaluation will be based on the information provided by the Tenderer in the Tender Form, as well as the information through contacts of references and/or through previous work for the Owner. This may include information received from the Owners listed in the tender form on projects by the Tenderer other than those listed.

1.16 DISCREPANCIES

Tenderers finding discrepancies or omissions in the specifications, drawings, or other contract documents, or having any doubt as to the meaning or intent of any part thereof, will notify the Engineer immediately who will send written instructions or explanations to all Tenderers. Neither the Owner nor the Engineer will be responsible for oral instructions. Addenda, bulletins, or corrections issued during the time of bidding will be covered in the tender and will become a part of the contract documents.

1.17 PROVIDE REQUIRED INFORMATION

The Tenderer must provide all the information required in the Tender Form. This includes the list of sub-contractors, the list of similar jobs, the list of equipment, the name of job superintendent, the material and labour origin form and the information on sub-Tenderers. Failing to supply the above information may result in a rejection of the tender by the Owner.

1.18 MATERIAL AND LABOUR ORIGIN

Canadian materials and labour shall be used to the full extent they are procurable and consistent with proper economy and the expeditious performance of the project.

1.19 EQUIPMENT AND MATERIAL DEVIATIONS

Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawing, which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or civil layout, all such redesign, and all new drawings and detailing required thereof, shall be prepared by the Contractor at his own expense and approved by the Engineer.

1.20 PRIOR APPROVAL OF PRODUCTS AND EQUIPEMENT AND MATERIAL DEVIATIONS

Where the Specifications or Drawings stipulate a particular product, equipment or material and a Tenderer would like to propose an alternate, written requests for approvals of alternates will be considered by the Engineer up to five (5) working days before receipt of Tenders. Such requests shall be accompanied by complete descriptive and technical information so that a proper evaluation can be made.

When a request for approval of an alternate product, equipment or material is made, the Engineer may grant approval and will issue a notification to this affect to bidders listed at that time. If an item is approved, bidders may use that item in place of the specified item. If in the sole opinion of the Engineer any information required for the proper and complete evaluation of such alternate product(s) is not included with this submission, the request for approval will be denied. Neither the Owner nor the Engineer will be responsible for requesting any additional information deemed to be required for this evaluation.

In submission of bids incorporating approved equals to products specified, bidders shall

include in their bid any changes required in the work to accommodate such approvals. A later claim by the bidder for an addition to the Contract price because of changes in work necessitated by use of approved equals will not be considered. If an item is not approved the Tenderer making the request will be notified by the Engineer prior to the time of Tender closing.

Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawing, which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or civil layout, all such redesign, and all new drawings and detailing required thereof, shall be prepared by the Contractor at his own expense and approved by the Engineer.

If no alternate product, equipment, or material is approved prior to the close of tenders, the successful Tenderer shall be required to use the product, equipment or material as stipulated by the Specifications or the Drawings. The term "…or approved equal…" shall apply only to approval of equals *prior to the close of Tenders*.

1.21 HIRING PRACTICES

All hiring wherever practicable shall be done through the Human Resource Centre of Canada. The Contractor will not discriminate against any person because of race, national origin, colour, religion, political affiliation, sex, age, or marital status.

1.22 CONSULTANT'S RELATIONSHIP

Nothing in this contract shall create nor be implied to create any contractual arrangement between the Engineer and the Contractor.

1.23 PAYMENT FOR MATERIAL ON SITE

There will be no payment for material on site for this project, unless approved otherwise by the Owner.

1.24 ELECTED MEMBERS

No member of the Legislative Assembly of the Province of New Brunswick shall be admitted to any share or part of the contract or to any benefit arising there from unless such member of the Legislative Assembly falls within Clause (d) of subsection (3) of Section 49 of the Elections Act, Chapter 9, Acts of New Brunswick, 1967.
No member of the House of Commons or Senate of Canada shall be admitted to any share or part of the contract or to any benefit arising there from if Government of Canada funds are involved, whether directly or indirectly, in the payment for or financing of such contract.

1.25 LAW OF THE CONTRACT

For any contracts entered into subsequent to tendering, the law that shall apply shall be the law of the Province of New Brunswick.

1.26 JOB MEETINGS

The Contractor and/or his representatives shall be required to attend periodic job meetings at the site at the discretion of the Engineer.

1.27 CONSTRUCTION OFFICES AND WORKING HOURS

It will be the responsibility of the Contractor to supply their own construction offices. Supply of offices will not be measured for payment, but is considered incidental to the contract.

1.28 TEMPORARY FACILITIES

The Contractor shall provide temporary enclosures for the protection of materials subject to damage by weather exposure. He shall provide temporary toilet facilities for his personnel and temporary heat as required for proper protection and drying out of the work up to the date of completion. He shall also supply any temporary power that he requires and proper sanitation facilities for employees.

1.29 PROTECTION OF THE WORK

The Contractor shall protect the work from all damage from the elements and all other effects in such a manner as the Engineer may direct. The Contractor, however, shall not be relieved of the responsibility for any injury or damage through the Contractor failing to protect the work, even though the Engineer did not specifically request such protection to be provided.

The Contractor shall comply with all Local Ordinances regarding the obstruction of streets, the opening of drains and sewers, and the protection of pedestrians. He shall properly protect all adjoining shrubbery, lawns, fences, buildings, signage, mail boxes etc., from injury during the progress of the work.

1.30 COOPERATION

It is to be noted that other work may be in progress under various contracts within the working area of this contract. The Contractor will, to the satisfaction of the Engineer, allow the other Contractors reasonable access to the work and will co-operate with them in the carrying out of their duties and obligations.

No claim will be entertained for any inconveniences or any slowdown in work due to these Contracts.

The work of this contract is subject to the restrictions and requirements of a "Certificate of Approval to Construct" as issued by the NB Department of Environment. Work shall not commence until this has been received by the Owner and a copy provided to the Contractor.

1.31 UTILITY INSTALLATIONS

Excavation and Construction Near Natural Gas Pipelines

Prior to start of any of the following construction activities anywhere within the area, the Contractor shall contact Enbridge Gas New Brunswick and obtain a field gas pipeline locate. This will be in the form of a completed Line Locate Request Form from the gas pipeline company, singed by both the Contractor and the gas pipeline company. A copy of the signed Line Locate Request Form must be given to the Engineer by the Contractor prior to start of any construction activities. The Contractor's copy of the signed Line Locate Request Form must be available for review at the construction site for the duration of the project.

The construction activities include but are not limited to:

- all excavation work
- ploughing below 300 mm
- ground leveling
- installing draining systems
- augering
- fencing
- blasting

Construction activities near Enbridge Gas New Brunswick pipelines are governed by NB Board of Commissioners of Public Utilities. The Contractor shall adhere to the regulations of the appropriate authority when carrying out construction activities near gas pipelines.

Enbridge Gas New Brunswick

All construction activities near the Enbridge Gas pipelines shall be carried out in strict accordance with the latest edition of the NB Board of Commissioners of Public Utilities – Guidelines for Excavation in the Vicinity of Gas Lines and Enbridge Gas New Brunswick – Support of Gas Pipelines in the Vicinity of Excavations documents. A copy of these documents can be obtained from Enbridge Gas New Brunswick.

1.32 INQUIRIES

Consultant to add complete address and technical personnel responsible for each specific project, including name and email.

SECTION No.2 – GENERAL REQUIREMENTS

2.1 GENERAL REQUIREMENTS

The General Requirements contained in the Greater Shediac Sewerage Commission Standard Specifications [dated April 2017] shall be used for this project.

If work is within the Town of Shediac limits and is not related to sewer work please refer to the Town of Shediac Specification.

If work is within the Greater Shediac Sewerage Commission limits but outside of the Town of Shediac limits please refer to the Greater Shediac Sewerage Commission.

2.2 SCOPE OF WORK

The work to be done under this contract will consist of the supplying of all materials, labour, supervision, construction plant, equipment, etc., necessary for the completion of the work as shown on the drawings and as described in these specifications.

The foregoing will not be construed as limiting, restricting, or modifying any general or specific requirements as set forth in any part of the Contract documents. The work includes all work subsidiary and incidental thereto required for a complete and functional installation.

Details concerning the Scope of Work shall be as stated in the supplementary General Conditions.

2.3 SITES AND SITE RESTRICTIONS

The work will be performed within the Greater Shediac Sewerage Commission boundaries. The site is shown on the drawings and is accessible from existing roads in the area.

The work is on or immediately adjacent to public rights-of-way, and work must be limited to within identified limits including easements. Any damage or disturbance caused by the Contractor outside these limits shall be reinstated at his cost and to the satisfaction of the Engineer.

The Contractor shall execute this work with as little damage to existing properties and existing municipal infrastructures as is possible. Existing culvert, fences, shrubs, trees, water wells, utilities, etc. shall be protected by the Contractor. Any repairs or reconstruction required shall be incidental to the work and acceptable to the Engineer.

The site shall be kept secure by the Contractor throughout the course of the work. When the Contractor is not on site, the site fencing shall be securely closed or site security provided to protect the safety of the public.

It is the Contractor's responsibility to examine the site and determine any other restrictions which may affect the work, as no claim will be entertained for any additional costs caused by site conditions or restrictions.

Access to the work area, including the construction and maintenance of an access road if required, shall be the responsibility of the Contractor. Contractor shall acquire permission of owners to operate on or use all private property outside easements. Furthermore, at no time will the Contractor be allowed to use any private roads unless a written confirmation from the Owner of such roads has been provided to the Engineer clearly stating that the Owner and their Engineer are in no way responsible for the upkeep of this road during or after construction. This will be the full and complete responsibility of the Contractor.

Verbal permissions for access of private lands will not be acceptable.

All structures, roadways, ditching, trees, piping systems, etc. which are to remain shall be protected through the course of the work, and the Contractor shall be responsible for the acceptable and timely repair of any damages. This includes existing driveway culverts, cross culverts, headwalls, manholes, valves, catch basins, etc., which will be required to be protected during the course of the work. The contractor will be responsible for repairing or replacing damaged during construction, incidental to the work.

2.4 EXAMINATION OF DRAWINGS, SPECIFICATIONS AND SITE

Each tenderer, before submitting his tender, will carefully examine the contract documents and will visit the site to determine the existing conditions and limitations, including labour conditions and fair wage provisions wherever such are imposed by the Statutes of the Province of New Brunswick and will not claim at any time after the submission of the tender, or the subsequent execution of a contract, that there was any misunderstanding with regard to the conditions imposed by the contract.

2.5 TECHNICAL SITE VISIT

All bidders are invited to attend a technical site visit to be held at the (location on day and date at time to be added by Consultant in the Supplementary Specifications.)

This site visit is non-mandatory; however, all bidders are strongly encouraged to attend. No claims will be entertained for bidders' misunderstanding of the site conditions or work requirements resulting from their absence at this meeting. Verbal directives or answers provided at the site visit will not become part of the tender requirements. Any changes or clarifications required will be made formally by addendum following the site visit.

2.6 UTILITIES

Certain underground and above ground utilities may be located along the construction route and it will be the responsibility of the Contractor to ensure that there is no damage to these facilities, including ensuring that all hydro poles are supported during the work. It is also the responsibility of the Contractor to arrange for and pay any costs associated with the locating of buried electrical and gas mains, incidental to the work.

This includes but is not limited to, all water, sewer, gas, culverts, etc., and all telephone, electric power lines, poles, etc. The contractor is responsible for coordinating with the utilities to locate these lines prior to the start of the work and if necessary, for "daylighting" any lines to verify their location. Any repairs required due to the pipe work will be considered incidental to the work.

If main power supply is to be supplied to the site, this will be done by NB Power. All components of this supply shall be protected by the Contractor as he shall be responsible for any damages thereto. The coordination of NB Power will be included in this contract.

No claim will be entertained for any damage or any slowdown of work due to the aforementioned utilities. Further, the Contractor will be fully responsible for the costs of repairs required to any of these utilities, including incidental damages resulting from the work.

In no case shall the existing sanitary sewer and lift stations be removed from service during the course of the work. The Contractor shall provide all required temporary pumping or vacuum trucks should a facility have to be temporarily shut down for connection to the existing system.

Excavation and Construction near Natural Gas Pipelines

Prior to start of any of the following construction activities anywhere within the area, the Contractor shall contact Enbridge Gas New Brunswick and Maritime and Northeast Pipelines and obtain field gas pipelines locates. This will be in the form of a completed Line Locate Request Form from the gas pipeline company, signed by both the Contractor and the gas pipeline company. A copy of the signed Line Locate Request Form must be given to the Engineer by the Contractor prior to start of any construction activities. The Contractor's copy of the signed Line Locate Request Form must be available for review at the construction site for the duration of the project.

Construction activities near Enbridge Gas New Brunswick pipelines are governed by NB Board of Commissioners of Public Utilities. Construction activities near the Maritimes and Northeast Pipelines system are governed by the National Energy Board (NEB) under the DPR – Damage Prevention Regulation. The Contractor shall adhere to the regulations of the appropriate authority when carrying out construction activities near

gas pipelines.

Enbridge Gas New Brunswick
All construction activities near the Enbridge Gas pipelines shall be carried out in strict accordance with the latest edition of the NB Board of Commissioners of Public Utilities – Guidelines for Excavation in the Vicinity of Gas Lines and Enbridge Gas New Brunswick – Support of Gas Pipelines in the Vicinity of Excavations documents. A copy of these documents can be obtained from Enbridge Gas New Brunswick.

2.7 SOIL CONDITIONS

Refer to supplementary conditions and drawings for complete soil report.

Additional soils information may be obtained by the Contractor during the tendering stage at his own discretion and expense. The Contractor shall obtain approval from the Owner prior to conducting test pits on site. NBDTI approval shall be obtained for test pits on NBDTI Right-of-Ways.

The soils information contained herein is for general use only and the Owner and Engineer accept no responsibility for its accuracy and/or its completeness.

The Contractor shall obtain approval from the Owner prior to conducting test pits on site.

2.8 DATUM

All elevations shown on the drawings or mentioned in the Specification are referred to the Bench Mark as shown on the drawings.

2.9 PERMITS

The Contractor shall obtain and pay for all licenses and permits, which may be required to comply fully with laws, ordinances and regulations of the proper public authorities, in connection with the performance of this work.

The Contractor shall be responsible for all damages and shall indemnify and save the Owner harmless from and against all damages and liability, which may arise out of the failure of the Contractor to obtain and pay for such licenses and permits and to comply fully with any and all applicable laws, ordinances and regulations.

Proof of Contractor's or Subcontractor's license or qualifications, i.e. electrical, plumbing and refrigeration shall be provided upon demand by any authorized person or agency.

The Engineer will provide the Contractor with a copy of the Certificate of Approval for Construction, if applicable, by the Department of Environment and Local Government, under Regulation 82 – 126, Water Quality Regulation of the Clean Environment Act. A

copy of this Approval must be available on the job site (in the Ownership of the Project Superintendent) for the duration of the project.

2.10 SAFETY

Before starting the work, the Contractor *will inform the Workplace Health Safety and Compensation Commission* of his intentions to begin the job. All work will be done in compliance with the Occupational Safety Act, Regulations 91-191 and 88-221.
All work will be performed in a safe and efficient manner to the completion satisfaction of both the Engineer and the Safety Inspector.

The Contractor shall create a site specific safety plan for this project which shall as a minimum incorporate the following items:

- Identify responsible persons;
- Provide emergency contact names and numbers;
- Include a copy of the contractor's safety manual if available;
- Site specific safe work procedures;
- Site specific safety orientation program;
- Weekly safety meetings;
- Environmental response plan.

Upon any breach of the safety procedures contained in the site specific safety plan (including the failure to wear proper personal protective equipment (PPE), improper signage or unsafe trenches), the following disciplinary actions will be administered in the case of Contractor's personnel's actions on the construction site:

1st Instance:	Verbal Warning by Inspector or Project Engineer.
2nd Instance:	Written Warning Violation Report by Project Engineer.
3rd Instance:	Removal of Contractor's employee and/or foreman from site by the Project Engineer in writing.

All notices shall be explained to the Foreman and Contractor Employee by the Inspector/Project Engineer regarding violation. Copies shall be distributed to the Foreman. **Verbal Warning will be documented.**

The removal from the site of the Contractor's employees and/or Forman for safety violations shall not justify schedule adjustments. The Contractor shall be required to immediately replace this individual with an individual of equal or more experience or qualifications, to be approved by the Engineer.

2.11 ITEMS TO BE SUPPLIED BY THE OWNER

The Owner shall supply only the site as it exists at time of tendering. The Owner shall supply only the site as it exists at time of tendering and as will be reconstructed by others under separate contracts or phase.

2.12 ITEMS TO BE SUPPLIED BY THE CONTRACTOR

The Contractor shall supply everything necessary to complete the work shown on the drawings and detailed in these specifications. This includes minor details, work, equipment, labour or services not specifically mentioned on the drawings or in the specifications but obviously necessary for the proper completion of the work.

2.13 CONTRACTOR'S REPRESENTATIVE

A competent representative of the Contractor shall be available at all times during the construction period, to make repairs and respond to emergencies which may arise from the construction.

The Contractor must have a designated full-time foreman on site to oversee and coordinate all construction activities. **The foreman shall not be permitted to operate heavy equipment during the works but shall be dedicated to the management and coordination of the on-site construction process and will be available for communication by local cellular telephone during project work hours, incidental to the work.**

2.14 SCHEDULE OF WORK

The Contractor will provide within seven (7) calendar days of the date of the contract award, a schedule in a bar chart format, acceptable to the Engineer, showing the program and timing for construction of the various portions of the project and estimated dates for completion of each portion.

He will submit a progress report to the Engineer once each month, which will show a comparison of work completed and work as scheduled and will revise this schedule as necessary during the course of the work. **No progress payments will be made until the schedule and progress reports are received in a form acceptable to the Engineer.**

2.15 LAYOUT OF THE WORK

Survey stakes to indicate line and grade for the project shall be provided **once**.

Two (2) working days notice shall be given by the Contractor to the Engineer before the stakes will be placed. Preservation and replacement of stakes will be the responsibility of the Contractor. Costs will be deducted from any holdback monies owed to the Contractor for any request to have the stakes replaced.

The Contractor will provide all forms, stakes and lines, and render such assistance to the Engineer as may be necessary to establish the initial alignment and measurements of work. The checking, by the Engineer, of any layout or of any line or level, shall not in any way relieve the Contractor of his responsibility for the accuracy thereof.

2.16 CUSTODY OF PLANS, SPECIFICATIONS AND DRAWINGS FOR USE DURING CONSTRUCTION

The original plans and specifications shall remain in the sole custody of the Engineer. Six (6) copies of the construction drawings shall be given to the Contractor before commencement of construction or ordering of materials. It is the responsibility of the Contractor to ensure that they are in possession of drawings that are stamped "For Construction", dated with a "Date" stamp and a copy of the latest edition of the Greater Shediac Sewerage Commission Specifications before commencement of any work. Only drawings that are stamped in this manner are to be used for construction purposes. Additional copies of the plans or specifications or any working plans will be provided at the contractor's expense (minimum of $100.00 each).

The Engineer may furnish additional drawings to assist with the proper execution of the work. These drawings will be issued for clarification purposes only. Such drawings shall have the same meaning and intent as if they were included with the plans referred to in the contract.

2.17 INTERPRETATION

In case of any actual or alleged disagreement or discrepancy between the Contract and these specifications and/or the plans of the work on file in the office of the Engineer, as to the true intent and meaning thereof, the same shall be referred to the Engineer, whose decision shall be final.

Where the Contractor and Engineer fail to agree, the Contractor is required to notify the Engineer in writing before proceeding with the disputed work.

2.18 START OF WORK

The successful Tenderer shall start the work within one (1) week of notification by the Engineer to proceed.

Material and equipment must be ordered immediately upon award of contract to ensure timely arrival on site. Copies of the Contractor's purchase orders shall be sent to the Engineer at the same time they are sent to suppliers to verify ordering dates.

2.19 CONSTRUCTION SEQUENCE

The Contractor will be required to provide a construction sequence and identify the major milestones in their Schedule of Work. To be in accordance with the supplementary General Conditions.

2.20 COMPLETION DATES

The project is to start within one (1) week after the award of tender and must be completed in its entirety by the date stated in the Supplementary General Conditions.

The whole of the works shall be completed within the time stated in the Tender or as calculated from the date of award of tender by the Owner, using the number of working days as originally provided for.

The Contractor is to provide and schedule sufficient crews, plant, etc. to ensure these completion requirements are met. If the Contractor's original schedule is affected by weather or other factors, he shall be required to provide additional personnel and/or equipment as necessary to ensure this completion date is met, and this is to be done at no additional cost to the Owner.

The Contractor shall, in the event that he fails to complete the Work on the day fixed in the Contract for completion, or on the day to which the time for completion may be extended by the Engineer, forfeit and pay to the Owner the sum on one thousand dollars ($1,000) for each day of delay as liquidated damages and not as a penalty. The payment recognizes both, the extra cost to the Owner of the continued observation of the Works by the Engineer, and/or the loss of revenue or additional cost incurred by the Owner by virtue of the delay. The Owner may deduct the amount of such Liquidated Damages from any monies payable to the Contractor under the Contract.

2.21 WORKING HOURS AND WORKING DAYS

The work day shall not commence before 7:00am or end after 7:00pm, unless otherwise approved by the Engineer. This includes backfilling and clean-up of the site prior to the deadline of 7:00pm.

Working days shall typically be Monday to Friday, unless there is a statutory holiday.

2.22 NIGHT, SATURDAY, SUNDAY AND HOLIDAY WORK

The Engineer may order or the Contractor may request work to proceed in whole or in part at night, on Saturdays, Sundays or holidays if it is deemed necessary or expedient in order to preserve and maintain traffic over or on any street or road or to complete any works that are of an urgent nature.

No Sunday work will be permitted, except in the case of emergency and then only with the written permission of the Engineer and to such extent as may be necessary.

The Contractor shall, as far as possible, refrain from work on Saturdays and statutory holidays in the Province of New Brunswick. If work must be carried out on such a Saturday or holiday, written notification must be submitted to the Engineer at least four (4) days in advance stating those places where work will be conducted and what

Engineering assistance may be required. If the Contractor fails to give such notice in advance of any Saturday or holiday, such failure shall be considered as an indication that no work requiring the presence of an Engineer or Inspector is to be done by the Contractor on that Saturday or holiday.

2.23 DELAYS

The Contractor shall neither be entitled to any claim nor bring any action or suit against the Owner for any damage which may be sustained by reason of any delay in the progress of the work, apart from the provisions specifically addressed in these General Requirements.

2.24 CERTIFICATE OF SUBSTANTIAL PERFORMANCE

The intent of this certificate is to facilitate the release of holdback where major works are substantially completed; such as, the installation of trunk sewer or water lines, but final clean-up activities, which may extend over several months or into a new construction season are still outstanding.

As soon as the works have been substantially completed and have satisfactorily passed any final tests required under the Contract; the Engineer may issue the Certificate of Substantial Performance of the works.

2.25 CERTIFICATE OF FINAL ACCEPTANCE

Eleven (11) months after the date declared in the Certificate of Substantial Performance and the Completion of all deficiencies, the Contractor shall advise in writing that the works are fully completed and are ready for final inspection. Within ten (10) working days following receipt of this letter the Engineer shall make arrangements for this final inspection of the work with appropriate Commission staff and the Contractor. If any work was held over to the following construction season (as per General Condition No. 18), the Certificate of Final Acceptance shall be held until the twelve (12) month warranty period is completed on that section of the works that was held over.

The Contractor shall promptly correct all defects, deficiencies, etc. which are identified during the final inspection.
When this work has been completed, the Engineer shall then prepare the "Certificate of Final Acceptance". The Contractor shall sign the certificate, affixing the corporate seal thereto declaring that the Contractor has no further claims against the Owner whatsoever with respect to the contract.

2.26 WARRANTY AND MAINTENANCE PERIOD

The Warranty and Maintenance Period shall commence on the date stated in the Certificate of Substantial Performance and the date of Completion of all deficiencies and remain in effect for a minimum of twelve (12) months and until issuance of the "Certificate of Final Acceptance". The Contractor, at his own cost, shall be responsible

to inspect, audit and maintain the works and remedy any defects or deficiencies discovered or appearing in the works from the first day of construction, and the Contractor further agrees to correct or pay for any damages to other work resulting from the said defects or the correction thereof.

However, a number of supplied items may be subject to an extended warranty (as noted in the supplementary specifications). Suppliers shall refer to each individual Section for warranty requirements and be included during the submission for approval.

Laterals for new developments shall have a Warranty for 12 months. If sewer lateral is still not connected or in use by the end of 12 months the lateral will remain under warranty to a maximum of 5 years or 3 months after connection has been made to new home.

Furthermore, warranty documents are to be submitted to the Engineer for review within two (2) weeks after start-up and commissioning. Warranty documents are to be addressed to the Owner.

Deficiencies of a non-emergency nature must be repaired within one (1) week of observation or after receipt of instructions in writing to do so.

Deficiencies of an urgent or emergency nature must be repaired immediately upon observation or upon receipt of notification from the Engineer or an Official of the Commission. Every effort possible must be made by the Contractor to repair such deficiencies immediately.

A Failure to make necessary repairs or corrections due to lack of equipment, material, labour or any reasons whatsoever will result in the Owner causing the works to be done at the expense of the Contractor.

All costs and expenses incurred in correcting any defects which appear prior to and during the warranty and maintenance period, whether performed by the Contractor, his representative, or the Owner or his representative shall be borne by the Contractor. The Contractor shall, in addition, be liable to the Owner for all expenses, losses, or damage incurred by the Owner as a result of any faulty materials and defective workmanship, or as a result of the Contractor's failure to correct any defects as observed or as notified, including but not restricted to all extra engineering costs, inspection and testing of the work.

The Contractor's failure to resolve the defects or deficiencies shall permit access to the Contractors performance bond by the Owner to resolve such defects or deficiencies.

Neither the Certificate of Substantial Performance, Certificate of Final Acceptance,

nor any payment made thereunder by the Owner shall relieve the Contractor of his responsibilities for faulty materials or defective workmanship. Notwithstanding the provisions of this article, if any statute in force in the jurisdiction where the product was manufactured, or if manufacturer's warranty extends the liability for faulty products or workmanship beyond the scope of this Contract, then the provisions of such statute or manufacturer's warranty shall apply.

2.27 ESTIMATED QUANTITIES

The quantities shown on the tender form are approximate and are subject to change. The Owner reserves the right to decrease or increase these quantities at the tendered prices. The work will be measured up monthly and the Tenderer will prepare his claim based on these measurements. **Any decrease or increase in quantities will be at the unit prices quoted in the tender and no extra compensation will be allowed.**

The Owner reserves the right to delete any items or groups of items entirely, without penalty. There shall be no payment for "anticipated profit" on any items where the quantity is adjusted or the item deleted.

2.28 HOLDBACK FUNDS

Subject to the following paragraphs the Owner shall, upon receipt of the following documents release the Construction Remedies Act Holdback (10% of monies due to the Contractor) sixty-one (61) days after the Certificate of Substantial Performance of the work has been issued: Statutory declaration to the effect that; all expenses incurred by the Contractor in carrying out contract have been paid except for statutory holdbacks properly retained; The Construction Remedies Act, Regulation 2021-81, Form 7 is posted at the improvement time frame required by the Construction Remedies Act; and the Contractor is not aware of any claim or lien made with respect to the Owner's holdback as contemplated by the Construction remedies Act. A certificate issued to the Owner by a certifier in accordance with the Construction remedies Act; and a Clearance certificate from WorkSafe NB. The Owner may retain further amounts under the Construction Remedies Act. The Owner may retain from the Contract amounts required as Completion Retention and Deficiency Retention. Both are subject to further Construction Remedies Act holdbacks in terms of 10% of monies due to the Contractor for a period of sixty-one (61) days after the Certificate of Final Completion is issued. Where the Contractor does not provide a Statutory Declaration or does not complete the work as directed or to the satisfaction of the Engineer/Architect the Owner may withhold payment of the monies which would otherwise been due, and during this time, the Owner shall not be required to pay interest. The Owner may retain final amounts, under the contract, for any known claims, unpaid amounts due to subcontractors, laborer's or suppliers, defective workmanship, equipment, materials penalties, and liquidated damages.

2.29 INTERIM PAYMENT CERTIFICATES AND HOLDBACK

At the end of each month during the progress of the work or at pre-determined

"milestones"; the Engineer will prepare a **payment certificate** for the estimated value of the work satisfactorily completed and materials actually used, in the execution of the work **during the month** or since the last payment.

Prior to any payment, except the first, the Contractor must submit a completed Statutory Declaration (See Appendix B).

Prior to any payment, the Contractor must also submit an up-to-date clearance certificate from WorkSafe NB.

Ten percent (10%) of all monies due to the Contractor in accordance with the **payment certificates**, shall be retained by the Owner and shall be termed the Holdback in accordance with the Construction Remedies Act.

Should the Contractor have claims of any description which he considers are not included in the Interim Payment Certificates, such claims must be made in writing to the Engineer within sixty one (61) days from the date of the completion of the portion of the work to which such claims apply. In default of the presentation of such claims within the time stipulated such claims will not be considered.

The Owner reserves the right to refuse to process any Interim Payment Certificate if the progress of the works or the conduct of the Contractor is not satisfactory or the Contractor has in any other way done or neglected to do anything so as to make it doubtful whether the works will be completed in accordance with the Contract.

Monthly payments will not be processed until clean-up and property restoration is carried out to the satisfaction of the Engineer. Furthermore, clean-up and property restoration is to be done on a daily basis.

No Interim Payment Certificate shall be held to bind the Engineer in the evaluation of the works for the purposes of the Certificate of Final Acceptance and the Engineer may, by any Interim Payment Certificate, make corrections or modifications to any previous Payment Certificate which may have been issued.

A certificate issued under this clause is neither to be considered an approval of the works or materials nor a waiver of any rights of the Owner arising under the Contract against the Contractor or his authorities.

2.30 RELEASE OF HOLDBACK MONIES

Subject to the following paragraphs the Owner shall, upon receipt of the following documents release the Construction Remedies Act Holdback (10% of monies due to the Contractor) sixty-one (61) days after the Certificate of Substantial Performance of the work has been issued: Statutory declaration to the effect that; all expenses incurred by the Contractor in carrying out contract have been paid except for statutory

holdbacks properly retained; The Construction Remedies Act, Regulation 2021-81, Form 7 is posted at the improvement time frame required by the Construction Remedies Act; and the Contractor is not aware of any claim or lien made with respect to the Owner's holdback as contemplated by the Construction remedies Act. A certificate issued to the Owner by a certifier in accordance with the Construction remedies Act; and a Clearance certificate from WorkSafe NB. The Owner may retain further amounts under the Construction Remedies Act. The Owner may retain from the Contract amounts required as Completion Retention and Deficiency Retention. Both are subject to further Construction Remedies Act holdbacks in terms of 10% of monies due to the Contractor for a period of sixty-one (61) days after the Certificate of Final Completion is issued. Where the Contractor does not provide a Statutory Declaration or does not complete the work as directed or to the satisfaction of the Engineer/Architect the Owner may withhold payment of the monies which would otherwise been due, and during this time, the Owner shall not be required to pay interest. The Owner may retain final amounts, under the contract, for any known claims, unpaid amounts due to subcontractors, laborer's or suppliers, defective workmanship, equipment, materials penalties, and liquidated damages.

2.31 MATERIAL AND LABOUR ORIGIN

Canadian materials and labour shall be used to the full extent they are procurable and consistent with proper economy and the expeditious performance of the project.

2.32 VARIATIONS AND EXTRA WORK

In executing the works, the Contractor shall make such variations as the Engineer may direct in writing and the works with such variations shall be taken to be the works to be executed under the contract and all provisions contained therein shall apply. All such works shall be valued at the scheduled rates and prices if the prices are applicable.

Further to Clause 37 of the General Conditions of the Standard Construction Contract, the Engineer may from time to time through the course of the work request in writing that the Contractor submit an additional cost or a credit, as appropriate, for a change in the scope of the contract.

The Contractor shall respond promptly and in writing to these "Contemplated Change Orders". Quotations submitted shall include all work except for the Harmonized Sales Tax (HST).

If a decision is made to proceed with the extra work and the Contractor's cost/credit is acceptable, the Engineer will advise in writing that the work is to be done and that the cost/credit has been accepted.

The Owner is under no obligation to pay for extra work unless proper confirmation of such a "Change Order" has been made by the Engineer in writing.

All "Change Orders" shall be subject to the same contract, quality, and payment conditions as the balance of the contract work.

2.33 ASSIGNMENT SUBLETTING AND SUBCONTRACTORS

The Contractor shall not assign the contract or any part thereof or any benefit or interest therein or thereunder without the written consent of the Engineer.

Notwithstanding the provision of the foregoing, the Contractor shall, where it is so listed in the Tender Form, employ Subcontractors for execution of those parts of the work requiring specialist skills. Any change to the list of Subcontractors submitted in the Tender Form must be submitted in writing to the Engineer, whose written approval must be received prior to them commencing any work.

The Contractor agrees to preserve and protect the rights of the Owner under the Contract with respect to any work to be performed under subcontract. The Contractor shall:

a. require all Subcontractors to perform work in accordance with and subject to the terms and conditions of the Contract Documents,
b. be fully responsible to the Owner for acts and omissions of all Subcontractors and of persons directly or indirectly employed by them, the same as for acts and omissions of persons directly employed.

The Contractor therefore agrees that all terms and conditions of the Contract Documents are incorporated into all Subcontract Agreements that are entered into with his Subcontractors.

The Contractor **shall** have a supervisor on site at all times **to oversee the work of the Subcontractor.**

All directions, clarifications, orders and notices given by the Engineer with respect to the execution of any part of the works (whether executed by the Subcontractor or not) will be given to the Contractor who shall, where applicable, be entirely responsible for the compliance of the Subcontractors therewith.

It is the Contractor's responsibility to define the limits of work to be done by the sub-contractors and equipment and material to be supplied through each sub-contractor, and to ensure there is no overlap or omission in the total work. Similarly, control over scheduling of the work shall be the Contractor's responsibility.

It shall also be the Contractor's responsibility to ensure that all sub-contractors conform to all contract requirements, such as shop drawings, manuals, co-operation, etc.

2.34 CONSULTANT'S RELATIONSHIP

Nothing in this contract shall create nor be implied to create any contractual arrangement between the Engineer and the Contractor.

2.35 AUTHORITY OF THE ENGINEER

The Engineer shall have full authority to define the meanings of the drawings and other contact documents. The Engineer, either personally or through delegation of authority to representatives such as Project Engineers, Resident inspectors, Consultants, etc., shall be the sole judge of the workmanship and materials in respect of both quality and quantity and shall have full powers to examine, inspect and approve or reject materials, methods of procedure and workmanship furnished or used in the execution of the contract and to determine whether or not materials and workmanship are of the character required by the intent and meaning of the drawings and other contract documents.

The Engineer's decision of all questions in dispute with regard to the foregoing matters shall be final and binding on the Contractor, except as provided elsewhere in these documents concerning settlements of disputes.

2.36 OBSERVATION

The Engineer may conduct testing and observation by Assistants, or Consultants for all materials used and all work done under this contract. The Contractor shall furnish the Engineer all information regarding the work and the materials deemed necessary or pertinent and with such samples as may be required.

No work shall be covered up or put out of view until it has been examined, measured and approved by the Engineer. Any work done in the absence of the observer shall be opened up for thorough examination and must be rebuilt or replaced as directed, at the Contractor's expense. No approval by an observer shall be taken as, or construed to be, an acceptance of defective or improper work or material, which must, in every case be removed and properly replaced whenever discovered at any stage of the work.

The Owner may appoint a consulting firm to conduct testing and observation of materials, equipment, the work or any aspect thereof in whole or in part for general conformity with the Specifications.

2.37 WEIGHING OF MATERIALS

Where contract unit prices are for weight measure of material, the Contractor shall provide, install and maintain approved scales for the measurement of such materials. The scales shall be of sufficient capacity and dimension to fully contain the loaded vehicle. The scale platform and mechanism shall be kept clean and in good working order at all times. The approach roadway shall be on a flat grade, level with the scale platform for at least one truck length.

The scale shall be tested at the beginning of each construction season in accordance with the requirements of the Government of Canada prior to being used. The Certificate issued by the testing authority shall be displayed at the scales at all times.

If the scales are moved, repaired or altered in any way, they shall again be tested and certified in accordance with Government of Canada requirements before additional use. Only original weight certificates from the quarry or pit of material origin will be accepted and used as basis for payment. Copies of weight certificates will not be accepted. Weight certificates are to be original digitally printed vouchers. Hand-written weight certificates and certificates other than those approved will not be accepted.

Anytime there is a discrepancy in the daily totals for materials, the Contractor shall submit daily summary sheets tallying the total material deliveries for each work day.

(The Observer's Quantity Sheets may be given to the Contractor's Foreman and require his signature/approval; any discrepancies shall be noted within 2 working days of the foreman's receipt of these daily Quantity Sheets.) The daily summary sheet shall record each weight certificate; the type and size of each material, the weight of material delivered to the site, and shall correspond to the weight certificates that the Engineer receives from each material delivery. Failure to supply these daily summary sheets within specified time limits shall result in non-payment for materials delivered.

2.38 WEIGHING OF TRUCKS – VERIFICATION OF SCALES

The Owner reserves the right to periodically and randomly spot check truck weights by requiring the truck or trucks to be weighed at another Government inspected scale within the immediate area. The Contractor is hereby advised that no payment will be made for this requirement, it shall be considered incidental to the work.

If it is determined that the gross vehicle weight as indicated on the weight slip is incorrect, the Contractor's scale shall be immediately closed until such time as it is again certified in accordance with Government of Canada requirements. An appropriate adjustment to all weights accepted prior to the time of closure will be made.

The Owner hereby reserves the right to place an Inspector at any and all scale sites during times when materials are being weighed for use on Greater Shediac Sewerage Commission projects. The cost of this Inspector will be borne by the Owner.

Any material hauled and/or placed in violation of the maximum weights provision of the Motor Vehicle Act of the Province of New Brunswick will not be measured for payment. The Contractor must ensure that all motor vehicles are registered for the gross weights they intend to haul.

2.39 EXCESS AND/OR UNSUITABLE MATERIALS

Unless a disposal site is designated, all excess materials found upon or excavated from the site shall become the property of the Contractor and shall be disposed of in accordance with all federal, provincial and municipal regulations and requirements, including acquisitions of permits, etc. The excess **and/or unsuitable** materials shall remain in the custody of the Contractor until delivery at the designated place.

All related costs shall be incidental to the **work**. The Contractor must indicate by letter, prior to start of contract, where excess materials will be disposed of and provide written documentation showing that the Owner of the disposal site has granted approval, and that all environmental approvals, and any other required permits as may be necessary from regulatory agencies within the Province have been obtained.

When insufficient space is available to allow placing of excavated materials on the right-of-way, the Contractor shall load, haul and stockpile such excavated materials at an off-site location arranged for by, and at the sole expense of the Contractor. When all excavation work is complete, the Contractor shall, at his own expense, bring back as much acceptable material as may be required to properly refill all excavations or trenches, or for general backfilling purposes.

2.40 PAYMENT BY TRUCK RATES

Truck measurement will only be allowed by written permission from the Engineer.

Trucks that are not adequately loaded will not be counted on the tally sheet or Inspector's report. The Contractor is responsible to see that trucks are properly loaded. No additional allowance of volume will be considered for heaped loads.

2.41 INCLEMENT WEATHER

During unsuitable weather, when in the opinion of the Engineer the conditions are unfavourable for good work, construction shall cease. All work must be protected by the Contractor at his own expense. Allowances for workdays missed due to inclement weather will be as per Clause 2.17.

2.42 PROTECTION OF EXISTING PROPERTY MARKERS AND MONUMENTS

The Contractor is responsible to retain a Land Surveyor, acceptable to the Owner, currently licensed to practice in the Province of New Brunswick, to replace any known property marker or monument that is disturbed by the Contractor. Failure to do so within two (2) weeks of receiving notice from the Owner shall result in the Owner having the work done with costs deducted from any holdback monies owed to the Contractor.

2.43 PUBLIC CONVENIENCE

During the progress of the works, the convenience of the public and of the residents

along streets affected by construction activities must be provided for as far as practicable. Convenient access to driveways, houses and buildings along the street must be maintained wherever possible. Access to commercial and specifically designated properties shall be maintained at all times.

No material or other obstruction shall be placed within ten (10) meters of fire hydrants, which must at all times be readily accessible to the Fire Department.

2.44 FIRST AID STATION

During the progress of the works, the Contractor shall at all times provide and maintain, in an easily accessible location on the work site, a First-Aid Box equal to that required by Regulation 91-121 under the Occupational Health and Safety Act for the free use as necessary of all persons on the site.

THE CONTRACTOR MUST ENSURE THAT EACH JOB SITE HAS A DESIGNATED, RESPONSIBLE FIRST AID PROVIDER.

2.45 MATERIALS, EQUIPMENT, TOOLS AND PLANT

All materials, equipment, tools or plant brought by the Contractor upon site or land occupied by the Contractor in connection with execution and carrying out of the works upon arrival on site be deemed to be the property of the Owner; and not be removed from site except on the completion of the works or with the permission of the Engineer.

This clause will not in any way diminish the liability of the Contractor under General Condition "Insurance and Indemnity" nor will the Owner be in any way accountable for any loss or damage which may happen to or in respect of any such materials, equipment, tools, plant or work, either by the same being lost, stolen, injured or destroyed by fire, tempest or otherwise.

Unless noted, it is the Contractor's responsibility to order and arrange for delivery of all materials necessary for completion of this contract. Failure to have any materials on site at the time that they are required for construction will be the Contractor's responsibility and will not be considered for an extension to completion date.

Quality of Materials

All material employed in the work must be new, the best of their respective kinds, and consistent with what is herein specified.

Storage of Materials

The Contractor will arrange for timely deliveries of materials necessary to the execution of the work and will have them on hand well in advance of the time they are actually required. The Contractor shall provide and store all construction materials

in a location as approved by the Engineer. The Contractor shall be completely responsible for the material he supplies and shall make up any deficiencies in the material occasioned by loss, theft or other reasons at his own expense. All material will be stored in strict accordance with the manufacturer's requirements.

2.46 SHOP DRAWINGS

a. The Contractor shall submit for review detailed shop drawings of all equipment and all material required to complete the project, and no material or equipment may be delivered to the job site or installed until the Contractor has in his possession the reviewed shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Contractor shall furnish the number of copies required by the contract, but in no case less than six (6) copies.

b. Prior to delivery of any material to job site, and sufficiently in advance of requirements to allow the Engineer ample time for checking, submit for review detailed, dimensioned drawings or cuts, showing construction, size, arrangement, operating clearances, performance characteristics and capacity. Each piece of material or equipment proposed shall be a standard catalogue product of an established manufacturer and of quality, finish, and durability to that specified.

c. Samples, drawings, specifications, and catalogues submitted for review, shall be properly labeled indicating specified service for which material or equipment is to be used, section and article number of specifications governing, as well as Contractor's name and name of job.

d. Catalogues, pamphlets, or other documents submitted to describe items on which review is being requested, shall be specific and identification in catalogue, pamphlet, etc. of item submitted shall be clearly made in ink. **Data of a general nature will not be accepted.** Shop drawings with engineering content must bear the stamp and signature of the Engineer responsible for their preparation. This Engineer must be licensed or registered in New Brunswick.

e. Review rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

f. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to any extension of contract time, and no claim for extension by reason of such default will be allowed.

g. Shop drawings are to be submitted for all supplied items and other items which may be required by the Contract documents.

2.47 OPERATIONS AND MAINTENANCE MANUALS

The Contractor shall be responsible for supplying written operating and maintenance instructions, which shall be sufficiently comprehensive to enable the operator to operate and maintain the equipment supplied.

The instructions shall be prepared as a systems manual applicable solely to the equipment supplied by the manufacturer to these specifications, and shall include those devices and equipment supplied by him. The instructions shall include, but not be limited to the following:

1. Descriptions of, and operating instruction for, each major component of the facility as supplied, including detailed parts lists.
2. Instructions for operation of the equipment in all intended modes of operation.
3. Instructions for all adjustments which must be performed at initial startup of the facility and adjustments which must be performed in the course of preventive maintenance as specified by the manufacturer.
4. Copies of the reviewed shop drawings for the equipment.
5. A list of major equipment components with complete model and serial number information, and a list of local and head office manufacturer's representatives including telephone and fax numbers.
6. Operation and maintenance instructions shall be specific to the equipment supplied in accordance with these specifications. Instruction manuals applicable to many different configurations, and which require the operator to selectively read portions of the instructions, shall not be acceptable.
7. One (1) draft copy of the operating and maintenance manual shall be submitted to the Engineer no later than two (2) weeks prior to the completion of the work. The reviewed copy will be returned to the General Contractor, and three (3) final copies shall be prepared incorporating all of the Engineer's comments.
8. All information and instructions concerning the operation and maintenance of all mechanical equipment and controls are to be included in the Operating and Maintenance Manual to be provided by the Contractor. This manual is to be arranged in a hard cover, durable, three ring binder, three (3) complete sets for delivery to the Engineer. Pages shall be consecutively numbered and each manual will be arranged in two sections: Operating Instructions and Mechanical Maintenance.
9. Warranty documents are to be included in the final operating and maintenance manuals.

2.48 RECORD DRAWINGS

Contractor and/or Consultant shall be required, within 60 days after completion of contract, to provide the Greater Shediac Sewerage Commission with all as built information of work completed. Drawings are to be submitted in both hardcopy and digital AutoCAD (DWG) format.

2.49 JOB MEETINGS

The Contractor and/or his representatives shall be required to attend periodic job meetings at the site at the discretion of the Engineer.

2.50 TEMPORARY FACILITIES

The Contractor shall provide temporary enclosures for the protection of materials subject to damage by weather exposure. He shall provide temporary toilet facilities for his personnel and temporary heat as required for proper protection and drying out of the work up to the date of completion. He shall also supply any temporary power that he requires and proper sanitation facilities for employees.

2.51 PROTECTION OF ENVIRONMENT

The Contractor must clean up the site periodically and keep it graded smooth as work progresses, to the complete satisfaction of the Engineer. The Contractor shall follow accepted practices to assure that no damage to the environment results from the construction. Things to avoid include, but are not limited to, destruction of vegetation surrounding the construction area, spills or leakage of fuels, other petroleum products, or chemicals, etc.

The Contractor is advised that under the regulations of the New Brunswick Clean Environment Act, natural watercourses must be protected. The Contractor will ensure that no equipment, material, or substance that could cause pollution will be allowed to enter watercourses. The Contractor will be responsible for clean up and removal of any pollution which does occur, at no cost to the Owner.

All required silt fencing and erosion control structures shall be placed by the Contractor prior to the start of any construction work on site, as indicated on the drawings and as directed by the Engineer and the NBDENV.

The work may be subject to the restrictions and requirements of a “Certificate of Approval to Construct” as issued by the NBDENV. Work shall not commence until this has been received by the Owner and a copy provided to the Contractor.

2.52 PROTECTION OF THE WORK

The Contractor shall protect the work from all damage from the elements and all other effects in such a manner as the Engineer may direct. The Contractor, however,

shall not be relieved of the responsibility for any injury or damage through the Contractor failing to protect the work, even though the Engineer did not specifically request such protection to be provided.

The Contractor shall comply with all Local Ordinances regarding the obstruction of streets, the opening of drains and sewers, and the protection of pedestrians. He shall properly protect all adjoining shrubbery, lawns, fences, buildings, signage, mail boxes etc., from injury during the progress of the work.

2.53 BARRICADES AND WARNING SIGNS

The Contractor will provide, erect and maintain all necessary barricades, suitable and sufficient warning lights, danger signals and other signs, provide a sufficient number of flagmen and watchmen and take all necessary precautions for the protection of the work and the safety of the public.

The entire work is at the Contractor's risk and he will be held responsible for all accidents or injury that may happen to working individuals until the job is formally taken over by the Owner.

All necessary warning signs will be maintained in legible condition at all locations where the need exists. Only approved Department of Transportation signs will be used. Signs will be located as required by the Engineer.

All traffic control must be compliant to the New Brunswick Department of Transportation Work Area Traffic Control Manual, latest version.

2.54 CO-ORDINATION OF SUB-TRADES

If the Contractor uses any sub-contractors on this project, it shall be the Contractor's responsibility to define the limits of work to be done by and equipment and material to be supplied through each sub-contractor, and to ensure there is no overlap or omission in the total work. Similarly, control over scheduling of the work shall be the Contractor's responsibility.

It shall also be the Contractor's responsibility to ensure that all sub-contractors conform to all contract requirements, such as shop drawings, manuals, co-operation, etc.

2.55 ENVIRONMENTAL AND ARCHAEOLOGICAL REQUIREMENTS

The Contractor shall carry out the work in compliance with the various federal, provincial and municipal acts, regulations, and policies involving protection of the environment, and any approvals or permits issued.
The Contractor shall take all precautions necessary as determined by the appropriate regulating authorities for protection of watercourses affected directly or indirectly by work on the contract.

In areas of potential runoff where construction activity may cause the drainage runoff to transport sediment(s), and the contract documents do not provide for sediment control in these areas, the Contractor shall ensure that sediment control fences or erosion control structures are properly located for effective runoff control.

The Contractor shall ensure that any water running off any exposed soils created as a result of the project, or pumped from any excavation to a watercourse, or a ditch leading to a watercourse, is pumped to a settling pond or filtered through a vegetated area or through a sediment control system.

Sediment control fence shall be installed as indicated on the drawings and shall be installed as per manufacturer's instructions. The Contractor shall ensure that at no time during his construction activities, or warranty and maintenance period, will his activities create conditions conducive to mosquito breeding, through the formation of ground depression, holes, ruts, ponds, swales and ditches, other than those intended by virtue of the approved construction and drainage plans. Any natural drainage will not be altered so as to cause water accumulation on vacant or adjacent lands.

If, at any time during construction, objects of potential historical or archaeological value are uncovered by the Contractor, or if any suspected endangered plant or animal species or any contaminated soils are identified during the work, all work shall cease and shall not continue until the site has been reviewed by representatives of the museum, or the appropriate agencies and the Engineer has approved resumption of the work.

2.56 CLEAN-UP

Throughout the course of the work, the Contractor will be required to keep all streets in a clean condition free of mud, dirt, rock, dust, etc. from the construction.

Maintaining all streets in a clean condition will not be measured for payment but is considered incidental to the work.
It will not be permitted that the cleaning/sweeping equipment leaves the site during the construction. If the Contractor removes the cleaning equipment during the work, the Owner will hire others to clean the work site on a daily basis, or as required (to be determined by the Engineer). Related costs will be deducted from monies due to the Contractor. **All streets affected by construction activities shall be swept on a daily basis or as directed by the Engineer.**

The site, as much as is practical must be kept in a clean and orderly appearance and free from excess material at all times.
The Contractor must clean up the site periodically and keep it graded smooth as work progresses, to the complete satisfaction of the Engineer. The Contractor must ensure

that no trash or garbage is left in the trench or on site. All garbage is to be picked up and removed from the site on a daily basis.

Upon completion of the job, all surplus construction materials, all tools, equipment, temporary structures, etc. will be removed from the site by the Contractor. All rubbish, trash, etc., becomes the property of the Contractor and must be removed from the site. The site as much as practicable must be kept in a clean and orderly appearance and free from excess material at all times.

2.57 COOPERATION

The Contractor will, to the satisfaction of the Engineer, allow the other Contractors reasonable access to the work and will co-operate with them in the carrying out of their duties and obligations.

No claim will be entertained for any inconvenience or any slowdown in work due to these other Contracts.

2.58 NON-USE OF OWNER'S HYDRANTS AND VALVES

The use of Owner's hydrants to obtain water and tampering with or use of Owner's water main valves is strictly prohibited.

2.59 BLASTING

PRIOR TO ANY BLASTING OPERATIONS BEING UNDERTAKEN THE CONTRACTOR SHALL FURNISH A SEPARATE GENERAL LIABILITY INSURANCE POLICY OR RIDER SATISFACTORY TO THE OWNER COVERING ALL ASPECTS OF THE INTENDED BLASTING ACTIVITIES, AND OBTAIN WRITTEN APPROVAL FROM THE ENGINEER.

No explosives shall be stored on the site nor shall any blasting be done without prior approval in writing and then only in such places and at such times as the Engineer may permit. Such approval, shall not relieve the Contractor of the sole responsibility for any damage or accident to adjoining utilities, properties, structures and persons as a result of blasting operations.
The supplying, hauling, handling and storing of all explosives and accessories shall be done in accordance with the rules and regulations of the Explosives Division, Department of Energy Mines and Resources, Ottawa and the Mining Act.

The control, general safety, handling, record keeping, and conducting of blasting operations shall be carried out in accordance with the latest version Of New Brunswick Regulation 91-191 under the Occupational Health and Safety Act. The Contractor shall inspect buildings in the immediate vicinity before commencing blasting operations and record condition of buildings with special reference to size and location of cracks, etc. This record must be witnessed by the Property Owner, his Agent or a Third Party and shall be made available to the Owner on request. Areas to be blasted shall be covered with proper mats and shields adequate to prevent flying rock and debris.

Notwithstanding any permission or authorization, the Contractor shall take full responsibility for all claims whatsoever arising from the hauling, handling and storing of explosives and all effects arising from blasts, including vibration, concussion, flying material, movement of silt, interruption of groundwater supplies, etc.

2.60 LAWS, ACTS, REGULATIONS, BYLAWS AND CODES

The Contractor shall be responsible for carrying out the works in strict accordance with all Federal, Provincial and Municipal Laws, Acts, Regulations, Bylaws, Codes, etc. These requirements may affect methods of installation, construction methods, disposal of materials and may require written notifications and/or permits of the appropriate authority prior to commencement of the contract.
Where written notification and/or permit of the above authorities are required a copy of the said notification and/or permit shall be submitted to the Engineer, prior to commencement of work.

2.61 TRUCK ROUTES

All heavy equipment, including trucks hauling imported material or excavated material or empty, shall proceed to and from the work site by taking the shortest route to and from the nearest truck route and then the shortest truck route to and from the origins and destination of the required trip.

2.62 SPECIAL EXCAVATION

The Contractor shall carry out special excavation required for the construction of the work when ordered by the Engineer. The work shall include the digging of test pits to determine the location or elevation of pipes, sewers, conduits, structures or other objects or to ascertain underground conditions. Compensation for such exploratory work shall be negotiated or paid for under force account.

2.63 RAILWAY/HIGHWAY TRANSPORTATION FACILITIES

It is the responsibility of the Contractor to contact the appropriate representatives of the Canadian National Rail or the N.B. Department of Transportation regarding any work affecting services or facilities within their right-of-way. The Contractor shall advise them within a reasonable time period prior to any construction. The Contractor is responsible to maintain ongoing communications with the railway or highway personnel. Any necessary scheduling, procuring of required railway/ highway personnel or equipment, etc., or costs incurred as a result of the construction shall be borne by the Contractor and be incidental to the contract.

Canadian National Rail can be contacted at:

Regional Engineer - Technical Services CN Rail - St. Lawrence Region
Floor 4, Central Station
P. O. Box 8107 Montreal, Quebec H3C 3N3

506-853-2514

The N.B. Department of Transportation and Infrastructure can be contacted at:

District Highway Engineer
N.B. Department of Transportation and Infrastructure
46 Toombs Street Moncton, NB E1A 3A5
506-856-2000

SECTION 3.0 – DUST CONTROL AND SILT FENCE AND EROSION CONTROL

3.1 DUST CONTROL

3.1.1 Work Under Other Sections

Section 6.0 - Trenching, Bedding and Backfilling, Restoration and Maintenance.

3.1.2 Scope

This section governs the supply of all materials, labour and equipment necessary for the control of dust on all work sites as required and herein specified.

The Contractor is responsible for dust prevention on any street or site where works have been or are being carried out. Dust prevention shall be in effect until such works are restored to original condition or upon issuance of the "Certificate of Final Acceptance".

Dust prevention shall include sweeping of paved roadways and/or sidewalks and flushing of same, when deemed necessary by the Engineer. All methods of dust prevention must be approved by the Engineer.

3.1.3 Water

If construction equipment traveling to and from or across the construction site, or removal of vegetation, results in dust which in the opinion of the Engineer is a nuisance to the adjacent properties, water truck(s) shall be available to apply water to prevent the creation of (or maintain moisture level to minimize) dust pollutants which occur any time the Contractor is hauling, or soil surfaces are exposed, or the works site is open to public access over dusty surfaces. The Contractor shall be prepared to apply water several times daily on a seven-day-per-week basis as required and/or at the direction of the Engineer.

Water to be used for dust control shall be contaminant-free and obtained from a source approved by the appropriate regulatory agency. **The Contractor shall provide his own water and at no time shall he use the Owner's water for this purpose.**

Water shall be applied by equipment capable of applying the water at a uniform and evenly distributed rate in amounts as required and/or as directed.

The supply and application of water for control of dust pollutants will not be measured for payment but shall be considered incidental to the work. Failure to comply will result in the Owner having the work carried out whenever necessary, with the costs of such being deducted from the next Interim Payment Certificate as determined by the Engineer.

3.1.4 Calcium Chloride

Calcium chloride can be used, but should be limited to off-hours and weekends. The use of calcium chloride should not be applied within 8 metres of a water body. **Application shall be by means of an approved spreader or equal. Hand placement shall not be permitted**. The surface shall be thoroughly dampened by sprinkling with water immediately preceding the application of flake calcium chloride.

Calcium chloride shall be in the form of loose, dry flakes or pellets and fine enough to feed readily through the common form spreaders used in roadwork.

Liquid calcium chloride is an approved alternate which shall be spread using a mechanical sprinkler. All calcium chloride used shall meet the requirements of the Standard Specification for Calcium Chloride, A.S.T.M. D-98.

The calcium chloride shall be delivered in original manufacturer's containers each plainly showing the manufacturer's name, the net weight and the percentage of calcium chloride guaranteed by the manufacturer.

Flake calcium chloride and liquid calcium chloride shall be spread at a coverage rate of 300 grams per square meter. The liquid shall contain a concentration of 35% calcium chloride. Subsequent applications shall be reduced to half of the previous rate, unless otherwise directed by the Engineer.

When approved by the Engineer, the supply and application of calcium chloride for control of dust pollutants will be measured for payment as indicated in the Tender Form and Measurement for Payment Sections of these Specifications. Calcium chloride placed without having received the authorization of the Engineer will not be measured for payment. Failure to provide dust control when necessary or directed will result in the Owner having the work carried out whenever necessary, with the costs of such being deducted from the next Interim Payment Certificate as determined by the Engineer.

No calcium chloride shall be placed within two (2) weeks prior to asphalt placement.

3.1.5 Measurement

Dust control and prevention is not measured for separate payment but is considered incidental to the work unless the use of calcium chloride is approved by the Engineer. If so, measurement will be by the number of bags applied.

3.1.6 Payment

Payment for calcium chloride when authorized for dust control and prevention shall be at the contract unit price for a standard 40 kg bag of calcium chloride flakes. This shall include supply and transportation of all labour and material, equipment including

an efficient spreader, calcium chloride, supply, placement, water clean-up and all work incidental thereto, all as specified or as indicted by the Engineer.

3.2 SILT FENCE AND EROSION/ENVIRONMENTAL CONTROL STRUCTURES

3.2.1 Scope

This section governs the supply of all labour, equipment and materials necessary for the installation of silt fence and environmental control structures as required in this work. It is anticipated that these items may be required to remain in place for up to two (2) years.

3.2.2 Materials

3.2.2.1 Silt Fencing

Materials for silt fencing shall be as stated under NBDTI Specification Item 602.2, January 2015 edition.

3.2.2.2 Erosion Control Structures

Materials for erosion control structures shall be as stated under NBDTI Specification Item 605.2, January 2015 edition, for Type "C" structures.

3.2.3 Construction

The Contractor shall install silt fencing and erosion control structures at the start of the work as shown on the Drawings and as required by these Specifications. The Contractor shall install additional silt fencing when required by specific activities such as stockpiling of materials for reuse in the work in order to control silt runoff from these areas that may reach ditching that drains to adjacent watercourses. The location and maintenance of silt fencing and erosion control structures is to satisfy applicable environmental protection practices required under the Clean Environment Act of New Brunswick.

The silt fencing and erosion control structures shall remain effectively on site for the period prior to any grubbing, stripping or excavation until work is completed and all exposed surfaces have a dense growth that will control silt run-off. They are not to be removed until authorized by the Engineer.

Until the silt fencing and erosion control structures are authorized to be removed, the Contractor shall maintain them as part of the work. This includes but is not limited to replacement of torn or damaged sections, replacement of broken supports, reattachment of fabric to supports, re-anchoring of washed out fabric, replacement of washed out or broken bales, and cleaning out of accumulated silt that reduces the effectiveness of any of these structures.

Sediment removed from the fences or erosion control structures shall be acceptably

disposed of by the Contractor off the site, as part of the work.

When the silt fencing and erosion control devices have been authorized for removal, the Contractor shall promptly remove them from the site and reinstate the surfaces and ditches to the Engineer's satisfaction.

3.2.4 Measurement

The quantity to be measured for payment will be as one unit complete, acceptably installed, maintained and removed

3.2.5 Payment

Payment for work under this section shall be at the contract lump sum price for the provision and maintenance of silt fencing and erosion control structures.

Payment shall include the supply and transportation of all labour, equipment and materials, installation of silt fencing, installation of erosion control structures, maintenance, silt removal and disposal, removal of the structures, reinstatement of the site, clean-up, and all work incidental thereto, all as shown on the Drawings or as specified or as directed by the Engineer.

SECTION No.4 - SANITARY SEWER SYSTEMS

4.1 WORK UNDER OTHER SECTIONS

Section No.6 - Trenching, Bedding and Backfilling, Restoration and Maintenance.

4.2 SANITARY SEWER MAINS

4.2.1 Scope

This section governs the supply of all labour, materials and equipment and incidentals necessary for the complete installation and testing of all sanitary sewer mains as shown on the drawings and herein specified.

4.2.1.1 Sewage Flows

Sanitary sewage flows shall be base on NB Department of Environment and Local Government Guidelines; with values not less than the following:
Daily per capita sewage flows of not less than 450 litres (100 gallons).
Sewage flow for Industrial and Commercial shall not be less than 3200 litres/hectare (285 gallons/acre) and approved by the Owner. Industrial shall be required to provide the anticipated average and peak daily flow rates.
Include in the computation of sewage quantities a factor of peak sewage flows in accordance with the NB Department Guidelines.
Infiltration allowance shall not be less than 50550 litres/hectare/day (4500 gallons/acre/day) but shall be approved by Owner; prior to completion of design.

4.2.1.2 Hydraulics

The Manning Equation is expressed as:

$$Q=\frac{1.486}{n} \times A \times R \times S$$

where Q is the discharge (cfs)
R is the hydraulic radius (ft)
S is the slope of the conduit (ft/ft)
n is the roughness coefficient (pvc=0.010, conc=0.013)
A is the pipe area (sq. ft.)

4.2.2 Materials

All CSA and ASTM specifications and latest revisions are considered as part of this Specification.

Minimum size of sanitary sewer mains shall be 200 mm.

Sanitary sewer pipe and gaskets will be supplied by the Contractor.

Sanitary sewer mains and fittings 375 mm and smaller in diameter shall be polyvinyl chloride pipe, meeting the requirements of CSA B182.2 and ASTM D3034, SDR35, standard specifications for polyvinyl chloride (PVC) plastic pipe and shall be color coded "green".

Sanitary sewer mains 450 mm and larger in diameter shall be reinforced concrete pipe conforming to CSA A257.2, Class 65D (ASTM C76 Class III), 100D (ASTM C76 Class IV), 140D (ASTM C76 Class V) for reinforced concrete pipe (pipe class as indicated on the drawings).

OR

Polyvinyl chloride (PVC) sewer pipe and fittings meeting the requirements of ASTM D3034 (Standard Specifications for Type PSM PolyVinyl Chloride [PVC] Plastic Sewer Pipe and Fittings), SDR35, and CSA B182.2, color coded "green".

OR

Profile PVC sewer pipe and fittings meeting the requirements of ASTM F794 (Standard Specification for Polyvinyl Chloride [PVC] Profile Gravity Sewer Pipe and Fittings) and CSA B182.4, latest edition, and color coded "green".

Joints to be bell and spigot type with rubber gasket meeting the requirements of CSA A257.3 for concrete pipe and ASTM D3212 for PVC gravity sewer pipe. This is a push-on joint and must be watertight.
The bell will be an integral and homogeneous part of the pipe barrel with no reduction in the wall thickness.

Bored Sewer Mains
Bored sewer mains shall meet the requirements of ASTM F-714, DR17 and ASTM D-2837 standard specification for high density polyethylene (HDPE) pipe and CSA B137-1.

Joints between lengths of HDPE pipe and HDPE fittings shall be made by fusion butt-welding.

Connection of bored sewer main to sanitary sewer main and manhole shall be done after final contraction/expansion of the pipe (a period of 48 hours after the installation is recommended, to be confirmed by manufacturer).

Connection to sanitary manholes to be done as follows:

-Where bored sanitary sewer main is installed prior to the manhole, slide one (1) end of the manhole onto the bored pipe.

Where manhole is installed prior to the bored sanitary sewer the following steps are to be followed:

-Insert a 600 mm long HDPE pipe section into manhole;
-Fuse a flexible HDPE restraint on top of the 600 mm HDPE pipe at the center;
-Join HDPE pipe and HDPE pipe section with an electrofusion coupling.

Connection of HDPE to gravity PVC sewer main shall be made using a Fernco rubber coupling or approved equal of appropriate size and style to make a waterproof connection and to provide smooth flow within the pipe with no obstruction.

4.2.3 Equipment

In laying out the sewer lines, the Engineer will establish only the locations and elevations of manhole. The Contractor will utilize laser beam instrumentation and techniques to determine intermediate line and grade for all pipes except where and when the Engineer may allow other methods to be used.

Approved laser alignment equipment must be used to control line and grade during all pipe laying. An approved laser sighting triangle or template must be used by the Contractor in setting each pipe.

4.2.4 Construction Methods

Sanitary sewer mains shall be installed according to the sizes and in locations as indicated on the drawings.

Installation of all sanitary sewer mains shall be according to recommendations of the pipe manufacturer and in accordance with NB Department of Environment and Local Government Design Guidelines, and recognize good practice. Proper implements, tools and facilities shall be provided and used by the Contractor for safe and efficient execution of the work. Unless otherwise specified, all sanitary sewers sized 200 mm – 300 mm shall be installed to a minimum 0.4% grade, excepting permanent dead-end sewers, which shall have a minimum 0.6% grade. Sewers greater than 300 mm shall have a minimum design grade of 0.3%. Sewer gradients shall ensure that a minimum velocity of 0.6 m/s (2fps) and a maximum of 3.3 m/s (10fps) are not exceeded. Minimum depth of cover shall be 2.5 meters, or as directed by Engineer.

Pipe and fittings shall be carefully lowered into trench in such a manner as to prevent damage to them. Under no circumstances shall pipe or fittings be dropped into trench.

Pipe shall be thoroughly inspected in the field before and after laying. Any defective or damaged pipe shall be immediately removed from the site and replaced with new sound material at the Contractor's expense.

Laying of pipe in prepared trenches shall be commenced at lowest point with bell of pipe pointing upgrade. During the time when pipe laying is not in progress, open ends of pipe shall be closed by a watertight plug.

Pipe shall be laid true to line and grade with uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the bell which shall not bear upon the sub-grade or bedding. Any pipe, which is not in true alignment or shows any undue settlement after laying shall be taken out and re-laid at the Contractor's expense.

No pipe will be laid on a foundation into which frost has penetrated, or at any time when the Engineer may deem that there is a danger of the formation of ice or the penetration of frost at the bottom of the excavation.

Trenches where pipe laying is in progress shall be kept dry and no pipe shall be laid in water or upon wet bedding. As the pipes are laid, they must be thoroughly cleaned and protected from dirt and water. No length of pipe shall be laid until the preceding length has been thoroughly embedded and secured in place so as to prevent any movement or disturbance of the pipe.

No walking on or working over the pipes after they have been laid will be allowed until there is at least 300 mm of cover over them, except as may be necessary in refilling the trench and compacting the bedding material.

Where sewer mains are to be laid on a curve or curved alignment to avoid obstructions, the amount of deflection allowed shall not exceed that required for satisfactory connection of the joint. Maximum deflections in pipe joints shall be according to recommendations of pipe manufacturer.

Laser beam equipment shall be installed in the pipe, just above the pipe, or in the bottom of the manhole. Installation of the laser beam contrary to the aforementioned shall require approval of the Engineer.

4.2.4.1 **Handling of Pipe**

All pipe and accessories will be loaded and unloaded by lifting with hoists or skidding so as to prevent shock and damage.

Under no circumstances will such materials be dropped. Pipe handled on skid-ways will not be skidded or rolled against pipe already on the ground. Pipe will not be dragged along the ground at any time. All material will be handled and stored in accordance with the manufacturer's requirements.

Pipe will be so handled so that any coating will not be damaged. When handling PVC pipe, avoid severe impact blows, abrasion damage and gouging or cutting

by metal surfaces or rocks. Avoid stressing bell joints and damage of bevel ends. If, however, any part of the pipe is damaged, the repair will be made by the Contractor in a manner satisfactory to the Engineer.

4.2.4.2 Jointing of Pipe

The ends of the pipe, rubber gaskets, fittings, etc., will be wiped clean immediately before joining the pipes to remove foreign matter from the joints. Apply lubricant to the spigot up to the reference mark and to the face of the gasket (MJ gasket included).

All joints will be made in accordance with the pipe manufacturer's instructions. The pipes must be aligned and pushed together in a manner that will ensure a satisfactory joint. Pipes may be pushed together by means of a crow-bar solidly wedged into the ground, or by using a suitable pipe puller at the joint, or in some instances by very carefully pushing with a backhoe, or by any other method that may be approved by the Engineer.

When pushing against the pipe, a block of wood must be used to prevent any damage to the pipe.

Where sanitary sewer mains are to be laid on a curve or curved alignment to avoid obstructions, the amount of deflection allowed shall not exceed that required for satisfactory connection of the joint. Maximum deflections in pipe joints shall be according to recommendations of pipe manufacturer.

4.2.4.3 Marker Tape

Installation of the gravity main shall be accompanied by a 50 mm wide metal marker tape located 600 mm above the top of the pipe. Gravity main pipes shall carry the message "CAUTION – SEWER MAIN BURIED".
The cost of supplying and installing this marker tape will not be measured separately for payment but will be considered incidental to the price of the gravity sewer main.

4.2.5 Connections to Existing Piping

In some locations, the work may require that new sanitary sewer mains be connected to existing gravity sewers.

Where new pipes are to be connected to existing pipes, the existing pipes are to be plugged at the existing manhole until all upstream system work has been completed, tested, flushed and is ready to receive wastewater flows. A watertight plug is to be installed at the end of the new pipe to prevent any groundwater, dirt or debris from entering the pipe. The survey coordinates of the end of the pipe shall be obtained to facilitate the location of the pipe later.

The Contractor shall be aware that at these connection points it may not be possible for all work can be done at one time and shall allow for this in pricing the work.

4.2.6 Visual and Video Inspection

The sewers, manholes and all related appurtenances shall be cleaned of all foreign material either by flushing or by hand. The video inspection shall not be permitted before and during the flushing operation. Before the video inspection begins, enough water will be added to the upstream manhole so it can be seen flowing at the downstream manhole. The video inspection shall be done from manhole to manhole by passing the video camera through the sewer pipe in the direction of the flow.

The sewer shall be inspected for alignment and obstructions. Water ponds in gravity sewers that cannot be eliminated by flushing and cleaning will be considered as evidence of pipe settlement. One hundred percent (100%) of the sewers will be video inspected.

Any and all defects such as water ponds, leaking joints, sags, improper grade or alignment, excessive deflection, obstructions, etc. may be cause for rejection and such defects must be repaired by the Contractor at no expense to the Owner.

Initial video inspection will be at the cost of the owner (included in the tendered unit price for sanitary sewer) but any costs for re-video of sewer mains required to inspect repaired defects will be the Contractor's expense. The Project Inspector shall be present when new sewer is being video inspected. Details of requirements for closed circuit television inspection are included in Appendix "C", at the end of these specifications.

4.2.7 Testing Sanitary Sewer Mains

One hundred percent (100%) of all sanitary sewer mains shall be tested using the air ex-filtration method.

The Contractor shall notify the Engineer at least forty-eight (48) hours in advance of performing sanitary sewer main vacuum tests.

The Contractor shall provide all labour, equipment and materials required to provide leakage tests on sanitary sewer mains and manholes.

Should the sanitary sewer main ex-filtration tests prove unsatisfactory, the Contractor shall excavate to determine the cause, make repairs, backfill and retest at his own expense.

Sanitary Sewer Main Vacuum Test – to the latest version of ASTM C1618 for concrete pipe and F1417 for PVC pipe testing using low pressure air.

- Conduct vacuum tests from manhole to manhole;

- Plug the test section outlet in the downstream manhole. Install a bulkhead on the test section inlet of the upstream manhole;
- Use a vacuum pump to increase the negative pressure to 27.6 kPa (4.0 psi). Close the vacuum source. Allow the negative pressure to increase to 24.1 kPa (3.5 psi). Begin recording of the test time;
- The Engineer will complete Appendix D1. If the actual leakage time is greater than the **allowable** then the test section is acceptable;

Test all pipe less than 1200 mm in diameter from manhole to manhole.

Test all pipe 1200 mm in diameter or greater one joint at a time. The maximum allowable leakage per joint tested individually shall be that calculated for a 1 meter length of pipe of that diameter at the rate of 0.001 cubic meters per minute square meter of internal pipe surface area.

4.2.8 Measurement

Measurement of sanitary sewer mains shall be in linear meters (installed) measured along the center line of the pipe and will exclude the distance across the manhole.

4.2.9 Payment

Payment for work under this section shall be at the contract unit price for the appropriate size and type of pipe, including fittings.

Payment shall include excavation, excavation of boring pit (including rock excavation), the supply and installation and joining of the pipe, couplings, fusing operations, backfilling, dewatering, Video Inspection, compaction and testing of sewer main; the removal and disposal of excess materials shall be included.

Payment shall also include the necessary trench restoration and maintenance according to Section No. 4.

There shall be no separate payment for imported bedding material, in accordance with Section No. 4.

Payment for imported granular backfill shall be according to Section No. 4.

4.3 SANITARY SEWER LATERALS

4.3.1 Scope

This section governs the supply of all materials, labour, equipment and incidentals necessary for the complete installation of sanitary sewer laterals.

4.3.2 Materials

Sanitary service lateral pipes, bored pipes, tees, wyes, bends, couplings, rings, fittings, elbows, caps and saddles shall be provided by the Contractor.

Sanitary service lateral pipe and fittings shall be polyvinyl chloride (PVC) sewer pipe DR35 colour coded green meeting the requirements of the latest ASTM D3034 and CSA B182.1 and shall be a minimum 100 mm diameter for residential and 150 mm diameter for commercial. Joints will be bell and spigot type with locked in rubber gasket.

Caps for ends of laterals shall be PVC.

Saddles shall be PVC gasket and strap on type of the size as indicated on the drawings, meeting the same requirements as the sanitary service pipe. Rubber "Insert-a-tee" or "Kor-n-tee" type connections with stainless steel bands are also accepted.

Bends shall be of the long radius type only. Only PVC tees will be accepted when main sewer pipe has a depth of 3 meters or greater.

A settlement joint will be required when main sewer pipe has a depth of 3 meters or greater. Acceptable settlement joint, as manufactured by Royal Pipe Systems or approved equal.

Bored Sanitary Sewer Laterals

Bored sewer service laterals shall meet the requirements of ASTM F-714, DR17 and ASTM D-2837 standard specifications for high density polyethylene (HDPE) pipe and CSA B137-1.

Joints between lengths of HDPE pipe and between lengths of HDPE pipe and HDPE fittings shall be made by fusion butt-welding. The minimum grade on a bored sanitary sewer lateral service shall be 2.5%; if the required grade and elevation at the property line is not achieved the Contractor will be required to re-bore the lateral at no cost to the Owner.

Connection of bored sewer laterals to PVC sewer lateral pipe shall be done after final contraction/expansion of the pipe has occurred from thermal stabilization in its installed location (a period of 48 hours after the installation is recommended, to be confirmed by the pipe manufacturer).

Transition from HDPE to PVC pipe shall be made near the property line using a Fernco rubber coupling, or approved equal. A minimum length of 600 mm of PVC pipe shall be installed from the transition coupling to the property line. PVC pipe to be ended with bell end and PVC cap at the property line.

Connection with PVC service pipe and fittings shall be made using a Fernco rubber coupling or approved equal.

Transition from HDPE to PVC pipe shall be made using a Fernco rubber coupling, or approved equal, or as directed by the Engineer or GSSC representative. A minimum length of 600 mm of PVC pipe shall be installed from the transition coupling to the property line. PVC pipe to be ended with bell end and PVC cap.

4.3.3 Construction Methods

Sanitary service laterals shall be installed at lot centerline, at locations staked, or as directed by Engineer or GSSC representative and according to the sizes as indicated on the drawings; installed at minimum 2.0% grade for all existing and new streets to property line; new services shall be minimum 1.0% from property line to new buildings and minimum 1.0% to existing buildings. Laterals from the property line to a building, with a diameter of 150 mm or more, are permitted to be graded at a minimum of 0.6%.

Greater depths may be required where existing structures require services and the sewer main permits the greater depth.

Connection of roof water leaders and foundation weeping tiles to the sanitary sewer is prohibited.

Service laterals shall be staked with a minimum 50 mm x 100 mm green marker stake set vertically in the ground at the capped end of the lateral and extending one meter above grade.

Connections of service laterals shall be made with wyes, tees or saddles which shall be properly fitted to the sewer main. Orientation of the connection shall be as detailed on the drawings. When connecting a saddle, the appropriate circular hole shall be cut into the main in a neat and workmanlike manner with an appropriately sized hole saw, without seriously damaging the pipe. All connections shall be made watertight.

Laterals shall be placed and bedded in dewatered trenches.

When directed by Owner, a lateral may require boring and not open-cut trench. The Contractor must suitably show that he has the means and experience to maintain desired grade in the pipeline. The acceptance of the lines installed shall only be approved following the completion of a video inspection showing the line if free of sags and improper alignment. The Contractor shall be responsible for providing the video inspection as per Appendix “G”. The decision of acceptance or refusal by the Owner shall be final.

Where reconnection or repair of an existing lateral pipe is being completed as part of the work, the existing lateral pipe will be reconnected to the new or existing main section by inserting a new lateral section (minimum 1 meter from main) between the existing lateral and the new or existing main section. This new required / repaired lateral section will be connected to the existing lateral pipe with approved couplings as per Section 4.3.2 and installed as per Section 4.3.3 and connected to the new or existing main as per Section 4.2. Commercial service laterals are considered complete to sewer main; whereas Residential services are terminated at the right of way limits.

All connections shall be made watertight. Contractor to supply all labour, materials (including the section of new laterals up to 1 meter long) and equipment necessary for connection of the existing lateral to the existing main.

All sanitary services that exceed 30m from main line sewer connection to building shall be provided to permit cleanout every 30m in order to clean both the upstream and downstream pipe. Tee Wye is to be placed in the direction of flow and include a water tight cap. The size of the cleanout shall be 100mm diameter for a 100mm diameter service or as per section 2.4.7.2 of the National Plumbing Code of Canada.

4.3.4 Measurement

Measurement of sanitary service laterals shall be measured by the number of units acceptably installed of each type from the sewer main to the capped end of the service lateral.

Reconnections of existing service laterals will be measured as the number of units acceptably reconnected.

4.3.1 Payment

Payment for this work shall be at the contract unit price for sanitary sewer laterals and for sanitary sewer reconnections.

Payment shall include excavation, excavation of boring pit (including rock excavation), the supply and installation of the pipe, saddles, bends, cleanouts, pipe caps, marker stakes, couplings, fusing operations and the excavation dewatering, backfilling, connections, testing, removal and disposal of excess materials as in accordance with the General Conditions, and all incidental items.

Payment shall also include trenching, restoration and maintenance according to Section No. 3.

There shall be no separate payment for imported bedding material, in accordance with Section No.3.

Payment for the imported granular backfill shall be according to Section No. 3.

4.4 INSULATION

4.4.1 Scope

This section governs the supply of all materials labour, equipment and incidentals necessary for the complete installation of the insulation to prevent sanitary sewer mains and service laterals from freezing.

4.4.2 Materials

Insulation to be provided by the Contractor.

Insulation shall be extruded, expanded polystyrene insulation with the following minimum characteristics:

- Compressive strength – 210 kPa;
- Water absorption (% by volume) - Max. 0.7%;
- Capillarity (none);
- Shear strength - 275kPa.

4.4.2.1 Acceptable products:

Styrofoam HI-40, Celfort 300 as manufactured by Owens Corning, or approved equal.

4.4.3 Construction Methods

Insulation shall be installed in the locations as shown on the drawings and as directed by the Engineer.

Insulation shall be installed at the top of bedding level for a width of 1200 mm. The insulation shall be 50 mm thick unless otherwise noted on the drawings.

Joints between sheets of insulation shall be secured with an appropriate sheeting tape. Acceptable product, duck tape, or approved equal.
Insulation shall be covered with a minimum of 150 mm of bedding before backfilling.

4.4.4 Measurement

Measurement of insulation shall be the number of square meters installed at the specified width and thickness.

4.4.5 Payment

Payment for work under this section shall be at the contract unit price for the appropriate type of insulation, including additional bedding material.

Payment shall include the supply, installation and transportation of all material, insulation, tape and disposal of excess materials as in accordance with the general conditions, and incidental items.

Payment shall also include trench restoration and maintenance according to Section No. 4.

There shall be no separate payment for imported bedding material, in accordance with Section No. 4.

Payment for the imported granular backfill shall be according to Section No. 4.

4.5 SANITARY SEWER MANHOLES

4.5.1 Scope

This section governs the supply of all labour, materials and equipment necessary for the complete installation of all sanitary manholes as shown on the drawings and herein specified.

It is the Contractor's responsibility to approve all Shop Drawings and verify their correctness. Review of the Contractor's drawings by the Engineer shall not relieve the Contractor of the responsibility for the correctness thereof, nor from the results arising from any error or omission in details of design.

One set of Shop Drawings shall be submitted to the Engineer for review.

4.5.2 Location

Manholes, shall be installed at locations indicated on the drawings, at all changes in grade, size or alignment, at all intersections, at the end of each line and at distances not greater than 120 m for sewer 600 mm and smaller and 150 m for sewers 600 mm and larger.

4.5.3 Materials

Pre-cast manhole sections and frames and covers shall be supplied by the Contractor.

Manholes shall be of pre-cast concrete sections, which will meet the requirements of the latest CSA A257.4 and ASTM C478 for pre-cast reinforced concrete manhole sections.

Joints between sections will be rubber gasket and Ram-nek gasket as indicated on the detail drawings, and will meet the requirements of the latest CSA A257.3. In addition, joints between sections will have waterproofing membrane as indicated on the detail drawings. Waterproofing membrane to be Bakor Blueskin WP 200 c/w Aquatac Primer, Colphene 3000 by Soprema c/w Elastocol Stick Primer or approved equal.

Base sections shall be of pre-cast concrete with reinforced concrete slabs within. Bases will also have cast in rubber gaskets to suit the inlet and outlet pipes and factory installed benching. The benching in manholes is to be done to minimize hydraulic losses through chamber. Channels and benching shall be smooth and uniform and shall not be less than 75% of the diameter of the largest pipe.

Drop manholes shall be used when the difference between the invert elevation of the inlet and the outlet pipe is greater than 600 mm. Internal drop shall be made of pre-cast concrete or shall be RELINER, by RELINER – Duran Inc., complete with drop bowl assembly, PVC DR-35 pipe, PVC band and S.S. clamp with maximum spacing of 0.5 meters. The manhole diameter shall be a minimum of 1200 mm. Anchoring systems is to be in accordance with the drawings.

Adjustment units for final height shall be with 150 and 300 mm concrete riser sections, as per detail drawings.

Manhole sections shall be L.E. Shaw Ltd., Strescon or approved equal.

4.5.4 Manholes Frames and Covers

All off-road manhole frames and covers shall be Pamrex by CertainTeed c/w SCS locking kit installed or an Approved equal. Ductile iron shall meet the requirements of the latest ASTM A536.

Adjustable manhole frames and covers shall be Laperle C-50 M1 or approved equal, shall be ductile iron and shall meet the requirements of the latest ASTM Standard A536 for ductile iron castings. Final concrete structure elevation to ensure a minimum of 50 mm remaining adjustability from finished grade.

4.5.5 Construction Methods

Manholes shall be constructed of pre-cast concrete sections according to the details indicated on the drawings.
Proper implements, tools and facilities shall be provided and used by the Contractor for safe and efficient execution of the work. Manhole base sections shall be set on a 150 mm layer of bedding material conforming in all respects to the requirements for pipe bedding. Manholes shall be constructed plumb.

Joints in pre-cast manhole sections shall be in accordance with Section 4.5.3.

Manhole frames and covers in paved roadways shall be set 10 mm below finished grade and shall conform to the crown of the road. Manhole frames and covers located in gravel roadways shall be set 25 mm below finished grade.

Manhole frames and covers located off traveled roadways shall be set 100 – 300 mm above finished grade, and shall include a lockdown frame and cover (Pamrex or approved equal). Each manhole shall also include a 100 mm x 100 mm (4" X 4") wood marker posts or metal sign stand, which shall be embedded 1 m in the ground, and protrude 1.5 m above ground level, painted safety yellow with reflective markings at top of post on all sides. Tape must conform to C.G.S.B 62 GP-11M reflectivity level 1, silver and orange in color, and be a minimum 100 mm (4") band width.

The Contractor will be required to test these manholes as they are constructed, before flows are permitted to pass through the new connection.

Whenever bypassing of sewer flow is being carried out, the Contractor shall have personnel on site continuously and back-up system components must be kept on site in the event of a failure of the first system.

Plugs or caps shall also be provided where required to block off and seal ends of pipes that are being abandoned or otherwise isolated, incidental to the work.

4.5.6 Testing of Sanitary Sewer Manholes

One hundred percent (100%) of all sanitary sewer manholes placed shall be tested.

The Contractor shall notify the Engineer at least forty-eight (48) hours in advance of performing sanitary manhole ex-filtration tests.

Should the sanitary sewer manhole ex-filtration or vacuum tests prove unsatisfactory, the Contractor shall excavate to determine the cause, make repairs, backfill and retest at his own expense.

4.5.7 Sanitary Manhole Vacuum Test (air) or Leakage Test (water) – to latest version of ASTM C1244M

Conduct Vacuum testing one manhole at a time:

- All lift holes must be plugged. Plug all pipe inlets discharging into the test manhole and all pipe outlets discharging from the test manhole. Install a bulkhead on the test manhole;
- Use a vacuum pump to increase the negative pressure to 27.6 kPa (4.0 psi). Close the vacuum source. Begin recording of the test time. Allow the negative pressure to increase to 24.1 kPa (3.5 psi);
- The Engineer will complete Appendix D2. If the actual leakage time is greater than the allowable leakage time, the test section is acceptable.

Or

Conduct Leakage testing one manhole at a time:

- All lift holes must be plugged. Plug all pipe inlets discharging into the test manhole and all pipe outlets discharging from the test manhole. Install a bulkhead on the test manhole;
- Fill test manhole with water.
- The Engineer will complete Appendix D3. If the actual leakage time is greater than the allowable leakage time, the test section is acceptable.

4.5.8 Measurement

This work shall be measured as the total number of manholes installed of the appropriate size.

4.5.9 Payment

Payment for work under this section shall be at the contract unit price for the appropriate size and type of manholes. This includes supply and transportation of all labour, equipment and material, excavation, installation, manhole, cast-in-place base where specified, frame and cover, cutting of pipes, gaskets, couplings, fittings including plugs and caps, grout, connections, dewatering, bedding, compaction, backfilling, leakage testing, adjustments, benching, inside drop (including drop bowl assembly with pipe), trench restoration and maintenance, environmental protection, clean-up and all work incidental thereto, all as specified or as shown on the drawings, or as laid out by the Engineer. For manholes installed on the existing system, this shall also include by-passing of flows, stand-by equipment and personnel, and all other related work and services.

4.6 GRAVITY CHECK VALVE

4.6.9 Scope

This Section governs the supply of all materials labour, equipment and incidentals necessary for the complete installation of gravity check valve.

4.6.10 Materials

External Check Valves:

Valve shall be all-rubber of the flow operated check type with a slip-on or flanged connection as shown on the Drawings. The check valve is to be designed to slip over the specified pipe outside diameter and attached with stainless steel clamps.

The port area shall contour down to a duckbill, which shall allow passage of the flow in one direction while preventing reverse flow. The valve shall be one piece rubber construction with nylon reinforcement.

Acceptable products: Tidelfex Series TF, as manufactured by Red Valve Company Inc, or approved equal.

Internal Check Valves:

Valve shall be all rubber of the flow operated check type. The check valve shall be designed for installation inside the pipe, to be oriented as shown on the Drawings. Anchoring to the pipe is to be made with integrated stainless steel saddle and stainless steel bolts.

Acceptable products: Tidelfex Series 37 G, as manufactured by Red Valve Company Inc, Proflex Style 740 as manufactured by Proco or approved equal.

4.5.9 Construction Methods

Gravity check valves shall be installed in the locations as shown on the drawings and as directed by the Engineer. The valves are to be installed as per the Manufacturer's recommendations.

4.5.10 Measurement

Measurement of gravity check valve shall be as the number units of each size acceptably installed.

4.5.11 Payment

Payment for work under this section shall be at the contract unit price for the appropriate size and type of gravity check valve. Payment shall include supply and transportation of all labour, equipment and material, preparation of pipes, installation of the valve including stainless steel clamps, connection to a flange, testing, clean-up, and all work incidental thereto, all as specified or as shown on the drawings, or as laid out by the Engineer.

4.6 ABANDONMENT OF MANHOLES

4.6.1 Scope

This Section governs the supply of all labour, materials and equipment necessary for the complete abandonment of existing manholes no longer required in the system, as shown on the drawings and herein specified.

4.6.2 Location

Manholes to be abandoned shall be as indicated on the drawings or as laid out by the Engineer.

4.6.3 Materials

Material used in the abandonment of manholes shall be:

Fill Concrete:

Fill concrete when required shall conform to the following requirements.

Portland cement shall conform to the requirements of CSA Standard CAN3-A5-M, Type 10 or Type 30 (High Early Strength for winter construction).

Supplementary cementing materials, when permitted, shall conform to the requirements of CSA Standard CAN3-A23.5-M.

Both fine and coarse aggregate shall conform to the requirements of CSA Standard CAN3-A23.1-M. The gradation shall conform to Table 1 of the CSA Standard for 10 mm minus.

Mixing water used shall meet the requirement of CAN3-A23.1-M.

Air-entraining admixtures shall conform to the requirements of CSA Standard CAN3-A266.1-M.

Mix Design for Fill Concrete:
Maximum cement content 25 kg/m^3

Maximum strength at 28 days (measured in accordance with CAN3-A23.2-9C) = 0.40 MPa

Slump (measured in accordance with CAN3-A23.2-5C) 150-200 mm

Air content (measured in accordance with CAN3-A23.2) 4% - 6%

Prior to the production of fill concrete for use in this contract, the Contractor shall provide to the Owner a certificate from a certified testing company stating that the concrete to be supplied conforms to the above requirements.

4.6.4 Construction Methods

Manholes shall not be abandoned until the remainder of the system is ready to receive wastewater and all required sanitary sewer pipe connections have been completed and accepted.

For manholes to be abandoned, all top section(s) above the manhole base shall be removed and disposed of. The remainder of the manhole structure shall be filled with fill concrete as described above. When the concrete fill has acceptably set, the excavation shall be backfilled in accordance with Section 6.0. The top surface of the fill shall match that of the surrounding ground and the surface restored to match surrounding conditions. Surface restoration is to match that specified for the adjacent areas.

Surplus materials shall be removed and acceptably disposed of.

4.6.5 Measurement

Measurement shall be by the number of manholes acceptably abandoned.

4.6.6 Payment

Payment for work under this section shall be at the contract unit price for abandonment of a manhole. This includes supply and transportation of all labour, equipment and material, excavation, removal of manhole sections, fill concrete, plugging or capping of adjacent pipes to be abandoned, backfilling, surface reinstatement, disposal of surplus and waste material, maintenance, clean-up and all work incidental thereto, all as specified or as shown on the drawings, or as laid out by the Engineer.

SECTION No.5 - SANITARY PRESSURE PIPE SYSTEMS

5.1 SANITARY PRESSURE PIPES

5.1.1 Work Under Other Sections

Section No.6 - Trenching, Bedding and Backfilling, Restoration and Maintenance.

5.1.2 Scope

This section governs the supply of all labour, materials and equipment and incidentals necessary for the complete installation and testing of all sanitary sewer pressure pipes as shown on the drawings and herein specified.

5.1.2.1 Hydraulics

The Hazen-Williams Formula shall be used for design, and is expressed as:

$$V=1.318 \times C \times R \times S$$

where V is the velocity (fps)
R is the hydraulic radius (ft)
S is the slope of energy gradient (H/L)
C = 100 shall be used for forcemains.

5.1.3 Materials

5.1.3.1 Sewer Pressure Pipes

All pipes will be the size and type as shown on the drawings. The pipe shall be laid at a minimum 2.1 meters cover. The Contractor is responsible for locating this line at the connection points.

The polyvinyl chloride IPS Series Pressure Pipe will be polyvinyl chloride DR26 municipal sewer pipe and meet the requirements of the latest AWWA Standard C907 and CSA B137.3, Series 160 DR26 and shall be colour coded white.

Joints to be bell and spigot type with rubber gasket meeting the requirements of CSA B137.3 and ASTM D2241. This is a push-on joint and must be watertight. The bell will be an integral and homogeneous part of the pipe barrel with no reduction in the wall thickness.

OR

Where specified, polyvinyl chloride IPS Series Pressure Pipe [molecularly oriented polyvinyl chloride – PVCO] municipal sewer pipe meeting the requirements of the latest AWWA Standard C909 and CSA B137.3.1, Series 160 DR26 as specified, cast iron O. D., and shall be colour coded white. Pipe to be IPEX Bionax PVCO pipe or approved equal.

Pipe shall be joined by an integral bell elastomeric gasket joint conforming to ASTM D3139, with spigot ends beveled by the manufacturer to facilitate assembly. Pipe ends shall be capped at the factory for protection prior to storage and shipment.

5.1.3.2 **Fittings**

All fittings shall be Ductile-iron fittings meeting the requirements of AWWA C153, 2415 KPA Class.

OR

PVC pressure fittings Class 160 (DR26) meeting the requirements of AWWA C907 and CSA B137.3 and to be push-on bell and spigot type.

Joints

Joints for iron fittings will be a mechanical type, meeting the requirements of the latest AWWA Standard C111 for rubber-gasket joints ductile-iron fittings. Fittings will be complete with component parts.

PVC Pressure fittings shall be the push-on bell and spigot type.

Joint Restraints

As shown on the drawings, all fittings for DR26 PVC pipe shall be restrained. Joint restraint system components are to be used on all fittings and valves.

All iron fittings, joint restraint system components and couplings shall be ductile-iron with high strength low alloy steel tee bolts and nuts tightened using a torque wrench to the manufacturer's specifications, completely wrapped with 8-Mil poly according AWWA C105.

Mechanical joint restraint for ductile iron fitting shall be PVC Star Grip 4000 by Star Pipe Products, 2000 PV by EBAA Iron, 1300 S by Uniflange or approved equal.

Mechanical joint restraint for PVC pressure fittings shall be 1360 S by Uniflange or approved equal.

No extra payment will be made for the supply and installation of joints and fittings restrainers, but shall be considered incidental to the work.

5.1.4 Equipment

In laying out the sewer pressure pipes, the Engineer will establish only the locations and elevations of discharge locations. The Contractor will utilize laser beam instrumentation and techniques to determine intermediate line and grade for all pipes except where and when the Engineer may allow other methods to be used.

Approved laser alignment equipment must be used to control line and grade during all lying of pipe. An approved laser sighting triangle or template must be used by the Contractor in setting each pipe.

5.1.5 Construction Methods

Sanitary pressure pipes shall be installed according to the sizes and in locations as indicated on the drawings.

Installation of all sanitary pressure pipes shall be according to recommendations of the pipe manufacturer and in accordance with recognized good practice. Proper implements, tools and facilities shall be provided and used by the Contractor for safe and efficient execution of the work.

Pipe and fittings shall be carefully lowered into trench in such a manner as to prevent damage to them. Under no circumstances shall pipe or fittings be dropped into trench. Pipe shall be thoroughly inspected in the field before and after lying. Any defective or damaged pipe shall be immediately removed from the site and replaced with new sound material at the Contractor's expense.

Lying of pipe in prepared trenches shall be commenced at lowest point with bell of pipe pointing upgrade. During the time when pipe lying is not in progress, open ends of pipe shall be closed by a watertight plug.

Pipe shall be laid true to line and grade with uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the bell, which shall not bear upon the sub-grade or bedding. Any pipe, which is not in true alignment or shows any undue settlement after lying shall be taken out and re-laid at the Contractor's expense.

No pipe will be laid on a foundation into which frost has penetrated, or at any time when the Engineer may deem that there is a danger of the formation of ice or the penetration of frost at the bottom of the excavation.

Trenches where pipe lying is in progress shall be kept dry and no pipe shall be laid in water or upon wet bedding. As the pipes are laid, they must be thoroughly cleaned and protected from dirt and water. No length of pipe shall be laid until the preceding length has been thoroughly embedded and secured in place so as to prevent any

movement or disturbance of the pipe.

No walking on or working over the pipes after they have been laid will be allowed until there is at least 300 mm of cover over them, except as may be necessary in refilling the trench and compacting the bedding material.

Mechanical joint connections and tightening and torquing of bolts shall be in accordance with the manufacturer's instructions and recognized good practice.

All tees, bends, valves and fittings on sanitary pressure pipes shall be provided with joint restraints.

Laser beam equipment shall be installed in the pipe, just above the pipe, or in the bottom of the manhole. Installation of the laser beam contrary to the aforementioned shall require approval of the Engineer.

5.1.5.1 **Handling of Pipe**

All pipe and accessories will be loaded and unloaded by lifting with hoists or skidding so as to prevent shock and damage.

Under no circumstances will such materials be dropped. Pipe handled on skid-ways will not be skidded or rolled against pipe already on the ground. Pipe will not be dragged along the ground at any time. All material will be handled and stored in accordance with the manufacturer's requirements.

Pipe will be so handled so that any coating will not be damaged. When handling PVC pipe, avoid severe impact blows, abrasion damage and gouging or cutting by metal surfaces or rocks. Avoid stressing bell joints and damage of bevel ends. If, however, any part of the pipe is damaged, the repair will be made by the Contractor in a manner satisfactory to the Engineer.

5.1.5.2 **Jointing of Pipe**

The ends of the pipe, rubber gaskets, fittings, etc., will be wiped clean immediately before joining the pipes to remove foreign matter from the joints. Apply lubricant to the spigot up to the reference mark and to the face of the gasket (MJ gasket included).

All joints will be made in accordance with the pipe manufacturer’s instructions. The pipes must be aligned and pushed together in a manner that will ensure a satisfactory joint. Pipes may be pushed together by means of a crow-bar solidly wedged into the ground, or by using a suitable pipe puller at the joint, or in some instances by very carefully pushing with a backhoe, or by any other method that may be approved by the Engineer. When pushing against

the pipe, a block of wood must be used to prevent any damage to the pipe.

Where pressure sewer pipes are to be laid on a curve or curved alignment to avoid obstructions, the amount of deflection allowed shall not exceed that required for satisfactory connection of the joint. Maximum deflections in pipe joints shall be according to recommendations of pipe manufacturer.

5.1.6 Marker Tape

Installation of the sanitary pressure pipes shall be accompanied by a 50 mm wide metal marker tape located 600 mm above the top of the pipe. Sanitary pressure pipes shall carry the message "CAUTION – FORCE MAIN BURIED". The cost of supplying and installing this marker tape will not be measured separately for payment but will be considered incidental to the price of the sanitary pressure pipes.

5.1.7 Testing of Sanitary Pressure Pipes

All sanitary pressure pipes must be tested by the Contractor after installation. All piping must pass the specified tests before being measured for payment. The cost of testing will be included in the tendered price for the installation of pipe and accessories.

Testing will be carried out after backfilling of sections of pipelines as directed by the Engineer and must be done prior to the placement of roadway base material or surface restoration.

The pipeline must be thoroughly flushed before applying the pressure test.

The Contractor will provide all necessary labour, materials and equipment for the test, including a suitable pump and measuring tank, pressure hoses and connections, plugs, caps, gauges, valves and all other apparatus necessary for filling the main, pumping at the required test pressure, and recording the pressure and leakage losses.

If a water supply is not available in the pipeline already laid, the Contractor will, at his own expense, supply a sufficient quantity of water for testing and flushing. Water will not be provided by the Owner.

The pipeline will be tested in sections not exceeding 350 meters unless otherwise permitted by the Engineer.

Care will be taken to strut and brace all caps, bends, tees, valves and other parts to prevent movement when pressure is applied.

The test section of the pipe will be filled slowly taking care to expel all air from the high points. If air valves, service connection or other means of venting air are not

provided, the Contractor will, at his own expense, drill and tap small holes for the purpose at high points. He will also provide a suitable saddle, main stop, valve, corporation stop or approved equal, to vent air which can be shut when pressure is applied, and after satisfactory completion of the test must shut the valve and remove piping that may have extended to ground level.

After completion of the preliminaries described above, the Contractor will proceed to apply pressure to the pipeline using a suitable force pump equipped with a measuring tank.

The test section will normally be subjected to a minimum hydrostatic pressure of 1000 kPa for 2 hours for sanitary pressure pipes but in any case, the test pressure will be limited to 50% above the operating pressure for the pipes in use.

At the commencement of the test, the hydrostatic pressure will be brought up to the pressure specified for inspection. This pressure will then be maintained by pumping additional water into the main from the measuring tank.

The leakage is deemed as the amount of water supplied from the tank in order to maintain the specified pressure for a period of two (2) hours.

No pipe installation will be accepted until the leakage is less than the number of liters per hour as determined by the following formula:

$$L = \frac{n * d * \sqrt{P}}{130{,}000}$$

Where:

L	=	allowable leakage in liters per hour
n	=	number of joints in section under test
d	=	nominal diameter of pipe in mm
P	=	test pressure in kPa

Should any test disclose leakage greater than that specified above, the Contractor will, at his own expense locate and repair the defects in the pipeline and fittings, and the test will be repeated until the leakage is within the specified allowance.

5.1.8 Flushing of Sanitary Pressure Pipes

All sanitary pressure pipes must be thoroughly flushed. The Contractor must supply all labour, water, and facilities required to carry out the flushing. The flushing shall be carried out using adequate volume and pressure to remove all loose material within the pipe. The Contractor must provide a screen or other acceptable apparatus at the lower end of the section being flushed to retain and dispose of all debris flushed from the pipe. The Contractor is responsible for removing any debris not so retained from

adjacent sections. Under no circumstances shall dirt be flushed into existing pipes. The cost of this flushing must be included in the tendered price for sewer pipes. The Contractor shall provide his own water as this will not be provided by the Owner, incidental to the work.

5.1.9 Measurement

Measurement of sanitary pressure pipes shall be in linear meters (installed) measured along the center line of the pipe.

5.1.10 Payment

Payment for work under this section shall be at the contract unit price for the appropriate size and type of pipe, and fittings which include mechanical restrainers on all sides. Payment shall also include excavation, supply and installation, and jointing of the pipe and fittings, coupling, backfilling, dewatering, compaction and testing of the sanitary pressure pipes; the removal and disposal of excess materials shall be included.

Payment shall also include the necessary trench restoration and maintenance according to Section No. 4.

There shall be no separate payment for imported bedding materials in accordance with Section No. 4.

Payment for imported granular backfill shall be according to Section No. 4.

5.2 GATE VALVES AND VALVE BOXES

5.2.1 Scope

This section governs the supply of all labour, materials and equipment and incidentals necessary for the complete installation and testing of gate valves and valve boxes as shown on the drawings and herein specified.

5.2.2 Materials

The valves will be epoxy coated, standard iron body brass mounted gate valves with non rising stem and 50 mm square nut operators with extensions, meeting the requirements for the latest AWWA Standard C-509-01 for resilient seated gate valves for water and sewerage systems. When fully open, the gate valve disc shall be raised completely above the pipe section so as to leave the full pipe diameter unobstructed.

Valves will open in a counter clockwise direction and will have mechanical joints with high strength low alloy steel tee bolts and nuts tightened using a torque wrench to the manufacturer's specifications, completely wrapped with 8-mil poly according AWWA

C105.

Valves will be Mueller, Clow, AVK or approved equal. Valve shall come with proper stem extension to provide max depth of 1m from finished grade to top of gate valve nut.

Each valve will be complete with approved three piece cast iron screw type valve box adjustable (as manufactured by Bibby Ste. Croix or approved equal) or composite valve box (as manufactured by Mueller MVB or approved equal), complete with 686 mm ductile iron adjustable top and guide plate.

Valve boxes are to be supplied with proper range as shown on drawing and as required at the point of installation. Valve boxes will have a minimum base diameter of 350 mm. Top section will have two lugs for turning. Valve boxes will be adjustable from 1.8 m to 2.1 m.

Covers must have an appropriate opening to allow for insertion of a pick for removal of the cover. Acceptable covers: Bibby Ste. Croix VB-825 (112 mm depth) or Mueller AJBV-5C when using the self-adjusting Mueller valve box top section, or approved equal, and shall be marked "SEWER".

5.2.3 Construction Methods

Gate valves of the indicated size shall be installed at locations shown on the drawings. Gate valves shall be properly joined to the mains with mechanical joint connections according to the requirements of the manufacturer and recognized good practice. Furthermore, all gate valves are to be restrained. The valves shall be set so that the valve stems are vertical and plumb.

Gate valves will be installed level. The base of the valve box shall be set so as not to transmit stress to the valve and shall be accurately centered over the wrench nut of the valve, with the valve box set plumb. Valve box can also be set on top of the valve using a rubber valve box adaptor to prevent transmission of road shocks and keep the valve box in a vertical position. Acceptable valve box adaptor: As manufactured by Carson Guard, or approved alternate.

The valve box must be set and maintained in a vertical position over the operating nut and must be properly supported in place with the cover flush with finished grade. Drainage from the valve box will be provided by placing crushed rock around the valve. Covers on valve boxes shall be set flush with the finish grade.

5.2.4 Measurement

Measurement of gate valves shall be by the number of gate valves installed.

5.2.5 Payment

Payment for work under this section shall be at the contract unit price for each gate valve of the appropriate size, including valve box. This includes supply and transportation of all equipment, labour and material, excavation, dewatering, installation, mechanical joint restraints, tee bolts and nuts, polyethylene wrap, valve box, valve box adjustments, valve box adaptor, stem extension as required, bedding, backfilling, compaction, clean-up and all work incidental thereto, all as specified or as shown on the drawings or as laid out by the Engineer.

Trench restoration and maintenance shall be according to Section 6.0 - Trenching, Bedding, Backfilling, Restoration and Maintenance.

There shall be no separate payment for imported bedding material, in accordance with Section 6.0 - Trenching, Bedding, Backfilling, Restoration and Maintenance.

Payment for imported granular backfill shall be according to Section 6.0 - Trenching, Bedding, Backfilling, Restoration and Maintenance.

5.3 VACUUM/AIR RELEASE VALVES AND CHAMBERS

5.3.1 Scope

This section governs the supply of all labour, materials, equipment and incidentals necessary for the complete installation and testing of vacuum/air release valves and chambers as shown on the drawings and herein specified that are a part of the sanitary pressure pipe system. In general, these shall be installed at high points on the sanitary pressure pipe system.

5.3.2 Materials

The valves will be combination air valves manufactured and tested in accordance with AWWA Standard C512. The valves shall be designed for application on sanitary sewer pressure systems, to sense the presence of air/gas inside the pipe and permit evacuation of air/gas from the pipeline without loss of fluid and to open to the atmosphere when a vacuum condition exists in the pipe at the valve location to prevent pipe collapse.

The body shall have a 50 mm diameter NPT cleanout and a 25 mm NPT drain on one side of the casting and an additional three (3) NPT connections for the addition of backwash accessories. The seat shall provide drip tight shut off to full valve pressure rating and the float shall incorporate a sensitivity skirt to minimize spillage.

The valve body and cover shall be constructed of ASTM A126 Class B cast iron with non-stick fusion bonded epoxy [internal and external]. The float, plug, guide shafts

and bushings shall be constructed of Type 316 stainless steel. Resilient seats shall be Buna-N.

Backwash accessories shall be furnished with the valve and shall consist of an inlet shut-off valve, a clean water inlet valve, rubber supply hose with fittings, and quick disconnect couplings.

Wastewater combination air valves shall be Model 801ABW as manufactured by Val-Matic or approved equal.

Chambers for combination air valves shall be of the size and configuration as shown on the drawings. Pre-cast chamber sections and frames and covers shall be supplied by the Contractor. Chambers shall not bear on the sanitary pressure pipe at any point.

Chambers shall be of pre-cast concrete sections which meet the requirements of the latest CSA A257.4 and ASTM C478 for pre-cast reinforced manhole sections.

Joints between sections will be rubber gasket and Ram-nek gasket as indicated on the Drawings and are to meet the requirements of CSA A257.3.

Base sections shall be of pre-cast concrete of the dimensions as shown on the Drawings.

Adjustments for final height at the surface shall be with 150 mm and 300 mm concrete riser sections, as per the Drawings.

Chamber sections shall be L. E. Shaw or Strescon or approved equal.

Standard [off-road] chamber frames and covers shall be Type 411W cast iron and shall meet the requirements of the latest ASTM Standard A48 for grey iron castings.

Adjustable manhole frames and covers [for use in paved areas of streets or other paved areas] shall be Laperle C-50 M1 or approved equal, shall be ductile iron and shall meet the requirements of the latest ASTM Standard A536 for ductile iron castings.

5.3.3 Construction Methods

Combination air valves shall be installed on the sanitary pressure pipe as shown on the Drawings. Valves shall be installed on a gasketed stainless steel plate bolted to a tee fitting installed in the sanitary pressure pipe at the required location, in accordance with Clause 6.1. The stainless steel plate shall include a welded pipe stub and 150 lb flange over an opening to the pipe to permit watertight and secure attachment of the combination air valve in the orientation shown.

Base sections for the combination air valve chambers shall be set adjacent to the pipe on a bed of compacted crushed rock bedding material as shown on the Drawings. Base sections shall be set so that the chamber can be installed plumb and at the proper elevation for the chamber cut-outs to clear the pipe and at the proper location for accessing the valve.

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and efficient execution of the work. The bottom chamber section shall be properly located on the base sections. Joints between chamber sections shall be made as specified in Clause 6.3.2, Materials.

Chamber frames and covers in paved roadways shall be set 10 mm below finished grade and shall conform to the crown on the road. Chamber frames and covers located in gravel roadways shall be set 25 mm below finished grade.

5.3.4 Measurement

Measurement of combination air valves shall be by the number of valves acceptably installed, and shall include the tee and related fittings on the sanitary pressure pipe and the valve chamber.

5.3.5 Payment

Payment for work under this section shall be at the contract unit price for each combination valve of the appropriate size, including fittings and chamber. This includes supply and transportation of all equipment, labour and material, excavation, dewatering, installation, tee on the sanitary pressure pipe, mechanical joint restraints, tee bolts and nuts, polyethylene wrap, tee plate with pipe and flange, gaskets, combination valve, accessories, chamber including base sections and frame and cover, bedding, backfilling, compaction, shop drawings, clean-up and all work incidental thereto, all as specified or as shown on the drawings or as laid out by the Engineer.

Trench restoration and maintenance shall be according to Section 6.0 - Trenching, Bedding, Backfilling, Restoration and Maintenance.

There shall be no separate payment for imported bedding material, in accordance with Section 6.0 - Trenching, Bedding, Backfilling, Restoration and Maintenance.

Payment for imported granular backfill shall be according to Section 6.0 - Trenching, Bedding, Backfilling, Restoration and Maintenance.

SECTION No.6 – TRENCHING, BEDDING, BACKFILLING, RESTORATION AND MAINTENANCE

6.1 TRENCHING

6.1.1 Trench Excavation, Common

6.1.1.1 Scope

This section governs the supply of all labour, materials and equipment necessary for trenching sewer mains, force mains, water mains, laterals and appurtenances. Refer to Section No. 7, when clearing and grubbing is required prior to trench excavation.

6.1.1.2 Construction Methods

Sediment control structures and sediment control fence shall be installed prior to any excavation work where required and shown on the drawings. No separate payment will be made for supply and installation of the structure and fence where shown on the drawings, it shall be considered incidental to the work.

All trenches shall be excavated according to the requirements of the General Regulation 91-191 under the Occupational Health and Safety Act of the Province of New Brunswick, latest revision.

A trench box or cage may be required in all sewer main installations in order to keep the amount of surface restoration to a minimum. In addition, multiple trench boxes or cages may be required in all sewer main installation exceeding the single trench box height. The requirement for trench box will be as shown on the drawings or as identified separately herein.

The approximate location and layout of the pipe is indicated on the drawings and will be confirmed in the field by the Engineer. Clean-up and re-establishment of ditches disturbed during the installation of sewer mains will be done at no extra cost to the Owner and will be considered incidental to the work.

At all road crossings and other points as directed by the Engineer, trenches will be bridged in a secure manner, and in such a manner as to prevent any serious interruption of traffic upon the roadway or sidewalks, and to afford the necessary access to public and private premises.

Under no circumstances will temporary dumping of material or stockpiling of material on the surface of the road be permitted during construction of the works.

At the end of each working day, the Contractor will be responsible to restore all disturbed ditches and re-install the culvert pipes that were removed or disturbed during the work in progress, incidental to the work.

The Contractor will do all excavation of whatever substances encountered to the lines, widths and grades shown on the drawings or to a depth as indicated by the levels of the Engineer or his assistant. Excavated materials not required for fill or backfill will be removed from the site and disposed of by the Contractor. Excess excavation below the required level will be backfilled at the Contractor's expense with suitable materials as determined by the engineer in 150 mm layers compacted to 95% of maximum dry density as determined by ASTM D698.

Trenching shall be open cut and excavated only so far in advance of the laying of pipe as safety requirements and soil conditions permit. The centre-line of the trench shall follow the line of the pipe as shown on the drawings or as laid out on site by the engineer.

The Contractor will not have more than twenty meters of trench open at any time in advance of the pipe laid, unless permission has been given by the Engineer. If work is stopped on the whole or any part of the trench and the trench is left open for an unreasonable length of time in advance of the placing of the pipe, the Contractor will, when directed by the Engineer, refill such trench or part thereof at his own expense, and will not again open such trench or part thereof until he is ready to proceed with construction.

If the Contractor should refuse, neglect, or fail to refill completely such trench within two hours after receipt of notice in writing to do so, the Engineer may order the refilling of the trench with the cost and expense thereof to be charged to the Contractor and the Owner may retain the amount of such cost and expense out of any monies due or to become due to the Contractor. The Engineer may stop the excavation and any other portion of the work required by the Contractor to complete the system and backfilling up to such a point as he may direct. The Contractor will not become entitled to demand or receive any allowance or compensation other than an extension of time of completion for as many days as the Engineer may determine.

All trenches must be backfilled at the end of each day unless special permission is given by the Engineer to leave them open and that all traffic control requirements are met. No excavation is to be left unprotected during the course of the day's work.

The width of the trench at pipe depth shall be 600 mm to 900 mm greater than the outside diameter of the pipe. For pipes in a common trench, the trench width shall be as for one pipe plus a minimum of 300 mm clearance between service lateral pipes, and a minimum of 600 mm for main pipes.

Within the limits of the specified trench excavation, unstable or unsuitable soil that cannot be re-used for backfill will be removed and replaced with suitable material from the pipe trench excavation in 300 mm layers compacted to 95% of maximum dry density as determined by ASTM D698. The Engineer will determine the depth of removal of unstable soil for which the Contractor will replace with suitable material from the trench excavation, included in the pipe price. There will be no separate payment for removal and disposal of unsuitable material, and placement of this material for backfill. Extra payment will only be received for supplying the replacement material to the site.

The trench shall be excavated to the depth required for placing of the pipe bedding material.

Where the bottom of the trench at sub-grade is found to be unstable or unsatisfactory, the Contractor shall excavate and remove such unsuitable material to the width and depth as directed. The trench shall be dewatered for the proper placing of the bedding material and pipe. The sub-grade shall be restored by backfilling with suitable material from the trench excavation as determined by the engineer or with pipe bedding material in 150mm layers compacted to 95% of maximum dry density as determined by ASTM D698. Pipe bedding material shall be according to Section 6.1.4.5 Payment and measurement of sub-excavation will be at the applicable price as noted in the schedule of unit prices unless otherwise agreed with the Engineer.

Trenches shall be widened where required for the installation of manholes and other appurtenances.

In locations where the trench must be excavated across or along paved surfaces, the Contractor will remove the pavement and road surfaces as a part of the trench excavation and the amount removed will depend upon the width of trench specified for the installation of the pipe. The width of pavement removed along the normal trench will not exceed the required width of the trench specified by more than 150 mm on each side as laid out on site.

The marked width of proposed pavement removal will not relieve the responsibility of the Contractor to comply with New Brunswick Regulation 91-191 under the Occupational Health and Safety Act.

Where excavation depths and/or soil conditions require a trench width at the surface greater than 4 m, asphalt removal will be limited to 4 m and a trench box (cage) shall be used, in all circumstances.

Cutting of asphalt must be done by **using a saw to give a square, undamaged edge for bonding**. UNDER NO CIRCUMSTANCES WILL RIPPING OR CUTTING OF ASPHALT BY EXCAVATION MACHINERY BE ALLOWED.

If the Contractor removes or damages pavement or surfaces beyond the limits specified above, such pavement and surfaces will be repaired at the expense of the Contractor.

All trenches in roadways shall have "bump ahead" and "bump" signs installed; they are to remain until the final lift of asphalt is completed.

6.1.1.3 Measurement

There shall be no separate measurement of work related to trench excavation in common material.

Measurement of asphalt removed as part of trench excavation shall be done as part of the work for Trench Restoration.

6.1.1.4 Payment

No separate payment shall be made for trench excavation in common material. All trenching in common material together with necessary sheeting and shoring and disposal of excavated material shall be included in the contract price for pipe in place. Removal and disposal of existing pipes, structures and appurtenances (as directed) will be considered incidental to the excavation and will not be measured separately for payment.

6.1.2 Trench Excavation in Rock

6.1.2.1 Scope

This section governs the supply of all labour, materials and equipment necessary for trenching for service mains, service laterals and all appurtenances in material classed as rock. If rock as defined is encountered during any phase of construction, the Contractor shall immediately notify the Engineer. Any excavation done in rock prior to notification will not be considered for payment.

6.1.2.2 Definition

Rock is defined as solid rock, boulders, concrete or masonry exceeding one-half cubic meter (1/2 cu.m.) in volume for which drilling and blasting are required

for removal. Soft, layered, broken rock or mudstone which can be excavated by a hydraulic excavator equipped with a 1.5 cubic meter general duty bucket (Based on Crown Construction Contract Act's Schedule B) and operating normally, is classed as common material; production slowdown due to excavation in this material shall not be compensated for in any way.

A Contractor may choose to bring on site a larger excavating machine than that stated above or larger than is presently on site in order to excavate the rock thus eliminating the need for drilling and blasting.

Compensation and payment for this option shall be limited to the difference in the rate between the machine originally on site and the larger machine, at the hourly rental rates as per General Conditions. Compensation for the rental rate difference shall be made only for the time the larger machine is actually operating. A maximum of two (2) hours transportation (float) time shall also be paid at the NBDTI's standard rate for the float used.

In the event when there is no tendered price for rock excavation, the owner will establish a fair price based on average prices currently in effect in the region, for excavation where drilling and blasting was carried out to facilitate excavation in rock.

6.1.2.3 **Construction Methods**

Dimensions of Trenches in Rock

Rock shall be excavated to a depth of at least 300 mm below the bottom of the pipe to be installed. Width of trench excavation in rock shall be at least 600 mm greater than the outside diameter of the pipe (300 mm each side) for a single main in a trench. For two or more mains in a common trench, the width of trench shall be as specified for a single main plus 600 mm clearance between pipes. For service laterals, the minimum width of trench shall be 1 m.

Disposal of Excavated Rock

Rock fragments larger than 200 mm in greatest dimension shall not be used for trench backfill and are to be disposed off site. No separate payment will be provided for disposal of rock larger than 200 mm, but to be considered incidental to the work.

Surplus Material

All surplus or unsuitable excavated material will remain the property of the Contractor. The Contractor will be required to remove this material off site on a daily basis. The cost of this work will not be measured separately for payment but will be considered incidental to the works.

Blasting Operations

Blasting for rock excavation will be permitted only after 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 will be repaired by the Contractor at his own expense. The Contractor's methods of procedure in blasting will conform to local and municipal laws and ordinances.

Pipes will be carefully protected from all blasts. Excavation requiring blasting will be fully completed at least six meters in advance of any laying of pipe. The mouth of the pipe will be covered with a suitable plug to prevent foreign material from entering.

Where required, matting, logging, close drilling and light charging will be performed where blasting may damage adjoining property or public utilities.

The Contractor will be responsible for all claims and damages to utilities, property, structures, persons, etc., caused by blasting or from any cause whatsoever resulting from any operations in connection with this work.

The Contractor must provide all necessary notices, signs, watchmen, and signals to safeguard the public, and must give sufficient warning to all persons in the vicinity of the work before blasting. It is required that the Contractor conduct a pre-blast survey if blasting is required. This survey will be considered incidental to the work and will not constitute a basis for payment.

6.1.2.4 Measurement

Trench excavation in rock shall be measured in cubic meters.

Calculations shall be based on the established profile of the top of the rock and the depth of 300 mm below the bottom of the proposed pipe. Maximum trench width for calculation of quantities shall be as follows:

- for single main, trench width = pipe O.D. plus 600 mm (300 mm each side).
- for service laterals in the following installation(s), trench width = pipe O.D. plus 600 mm total:
  - single service; and
  - sanitary service and water or storm service and water;
- for service laterals in the following installation(s), trench widths are:
  - sanitary service, storm service and water service; trench width of 1200 mm; and

- sanitary service and storm service; trench width of 1000 mm;
- for multiple mains, trench width = width as for single main plus 600 mm clearance between pipes.

6.1.2.5 Payment

Payment for the work under this item shall be at the contract unit price for trench excavation in rock.

The price shall include drilling to establish rock profile breaking, pre-blast survey, blasting and for disposal of rock not used for trench backfill and all incidental items.

6.1.3 Boring

6.1.3.1 Scope

This section governs the supply of all labour, materials and equipment necessary for boring for service mains and service laterals.

6.1.3.2 Construction Methods

All boring pits shall be excavated according to the requirements of the General Regulation 91-191 under the Occupational Health and Safety Act of the Province of New Brunswick, latest revision.

A trench box or cage must be used for all boring pits in order to keep the amount of surface restoration to a minimum. In addition, multiple trench boxes or cages must be used in all locations exceeding the single trench box height.

The Contractor will do borings for services, sewer mains installation and other points shown on the drawings or as directed by the Engineer.

Borings will be done in any material encountered during the course of the work, **including rock**. Boring in rock or any material encountered will not be measured for payment but shall be considered incidental to the boring (including services and main line boring).

Exact locations of services and sewer mains will be determined in the field by the Engineer. Excavated materials not required for fill or backfill will be removed from the site as directed by the Engineer and disposed of by the Contractor. Excess excavation not approved by the Engineer will be backfilled at the Contractor's expense with suitable materials as directed by the Engineer and thoroughly tamped.

Borings for service and sewer main installations shall be done by horizontal or directional boring. The slope of the service across the roadway shall be minimum 1.00% grade, unless otherwise approved by the Engineer.

The service elevation at the property line shall be in accordance with the drawings when shown or as determined by the Engineer in the field. The Contractor shall re-bore any services not meeting these requirements at no additional cost to the Owner.

The Contractor is not permitted to work on private property, unless written permission is granted by the property owner and approved by the Engineer.

6.1.3.3 Payment

No separate payment shall be made for boring operations (including any material encountered during the boring operations and excavation of boring pits). All boring operations, excavation and disposal of excavated material shall be included in the contract price for boring pipe in place.

6.1.4 Bedding

6.1.4.1 Scope

This section governs the supply of all labour, materials and equipment necessary for bedding of all mains and service laterals.

6.1.4.2 Bedding Material

Bedding material shall be crushed rock composed of clean, hard sound, durable uncoated particles that do not contain friable, soluble or reactive mineral, free of clay, organic, frozen lumps or other deleterious materials or conditions that would make the crushed rock prone to decomposition or disintegration, or present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the work.

Bedding material shall conform to one of the following gradation limits, as specified:

31.5 mm minus (for normal dry trench conditions), in accordance with Table 201-2 of the NBDTI Standard Specifications latest edition:

ASTM Sieve size	% passing
31.5 mm	100 -
25.0 mm	95 - 100
19.0 mm	71 - 100

12.5 mm	56 - 82
9.5 mm	47 - 74
4.75 mm	31 - 59
2.36 mm	21 - 46
1.18 mm	13 - 34
0.300 mm	5 - 18
0.075 mm	0 – 8

The following gradation of crushed rock (generally termed “drainage stone”) shall be used for wet trench conditions only and must have the Engineer’s approval prior to use. It shall be completely wrapped in non-woven goetextile filer fabric in order to hinder the migration of fine materials into the rock.

ASTM Sieve size	**% passing**
20.0 mm	100 -
14.0 mm	40 - 80
10.0 mm	20 - 62
5.0 mm	0 - 20
2.5 mm	0 - 10
0.08 mm	0 - 3

At least 50% of the particles retained on the 5 mm sieve shall have one or more surfaces formed by the fracture of a larger particle.

The plasticity index of that fraction of the aggregate base material passing the No. 40 sieve shall not exceed three (3).

The contractor will be responsible, before the commencement of the work and at any time during the construction at the request of the Engineer (at no cost to the Owner), to provide the Engineer with the following information.

The analyses are to be completed by an approved testing geotechnical firm and samples must be collected at the proposed site by the same firm:

1. Source of supply of aggregate;
2. Sieve analysis.

The Owner reserves the right to reject any source of supply of aggregate on the basis of past field performance, document by the records and experience of the Owner and/or the Engineer with a specific material, regardless of compliance with physical requirements of grading limits.

6.1.4.3 Bedding Construction Methods

Bedding methods and materials must conform to the pipe manufacturer's requirements for all materials that are being bedded. The use of excavated material for bedding is strictly forbidden unless otherwise directed and approved in writing.

Once the trench has been excavated to the required grade, bedding shall be placed in layers to a minimum depth of 150 mm or 300 mm in rock and compacted to a density of 95% of maximum as determined by ASTM D698.

Bedding shall be placed in 150 mm lifts to a minimum height of 300 mm over the top of the pipe. The bedding shall be tamped or rodded by hand under the haunches of the pipe upon placing of the first lift. Succeeding layers shall then be placed and compacted to a density 95% of maximum as determined by ASTM D698.

Pipe-bedding material shall not be placed in water or trenches having soft and unstable bottom conditions.

Compacting equipment for pipe bedding material shall be suitably sized so as not to cause damage to the pipe or movement of the pipe due to impact and vibration and of ample size to provide the degree of compaction specified.

The completed bedding shall meet the requirements for a Class "B" bedding, on PVC, Corrugated Metal Pipe, Ductile Iron and all lateral piping and for a modified Class "B" bedding on concrete pipe.

6.1.4.4 Measurement

There will be no separate measurement for imported pipe bedding material.

6.1.4.5 Payment

Supply, hauling, placing and compaction of imported bedding material shall be considered incidental to the work. All costs associated with this item must be incorporated into bid items for pipe, structures and appurtenances.

There shall be no separate payment for imported bedding material when authorized and obtained from excavations.

6.1.5 Backfilling

6.1.5.1 Scope

This section governs the supply of all labour, materials and equipment necessary for backfilling of all pipes, service laterals and appurtenances.

6.1.5.2 **Backfill Material**

Common backfill material shall be approved material obtained from excavation. The material shall be free of roots, brush, organic material, frozen lumps and shall not contain any boulders or broken rock larger than 200 mm greatest dimension.

Imported fill material shall be a sound, durable, granular material free from clay, frozen lumps, organic or deleterious matter and conform to the following gradation limits:

ASTM Sieve size	% passing
112 mm	100 -
80 mm	95 - 100
20 mm	15 - 100
5 mm	0 - 80
0.080 mm	0 – 10

Non-Compressible Fill

Non-compressible fill materials when required shall conform to the following requirements.

Portland cement shall conform to the requirements of CSA Standard CAN3-A5-M, Type 10 or Type 30 (High Early Strength for winter construction).

Supplementary cementing materials, when permitted, shall conform to the requirements of CSA Standard CAN3-A23.5-M.

Both fine and coarse aggregate shall conform to the requirements of CSA Standard CAN3-A23.1-M. The gradation shall conform to Table 1 of the CSA Standard for 10 mm minus.

Mixing water used shall meet the requirement of CAN3-A23.1-M.

Air-entraining admixtures shall conform to the requirements of CSA Standard CAN3-A266.1-M.

Mix Design for Non-compressible Fill

- Maximum cement content: 25 kg/m^3
- Maximum strength at 28 days (measured in accordance with CAN3-A23.2-9C): 0.40 MPa
- Slump (measured in accordance with CAN3-A23.2-5C) 150-200 mm
- Air content (measured in accordance with CAN3-A23.2) 4% - 6%

Prior to the production of non-compressible fill for use, the Contractor shall provide to the Owner a certificate from the Owner's testing company stating

that the design mix of the fill to be supplied conforms to the above requirements.

6.1.5.3 Backfill Construction Methods

Once pipe bedding material has been placed to the required depth and degree of compaction, the remaining depth of trench shall be backfilled with common backfill. This backfill shall be placed in layers not exceeding 400 mm in thickness (before compaction) and shall be compacted to at least 95% of the maximum dry density as determined by ASTM D698.

Where the excavated material is unsuitable for ordinary backfill, the Contractor shall dispose of this material as in accordance with the General Conditions, and backfill with imported granular material upon written order from the Engineer.

Backfilling of trenches with imported granular material shall be in layers not exceeding 300 mm after compaction and compacted to a density of 95% of maximum density as determined by ASTM D698.

When the Engineer designates that non-compressible fill is to be placed as backfill and when the utility has been repaired or installed, bedded and protected with sand as required, the trench shall be filled with the non-viscous, non-compressible fill, up to the underside of the pavement materials. Internal vibrators or other methods of consolidation may be used to ensure that any undercut areas of pavement are fully supported.

When non-compressible fill is being used in a water main trench, full-width horizontal 50 mm polystyrene board insulation should be placed at approximately 100 mm above the buried pipe.

Backfilling operations shall not be carried out in freezing weather except by special permission of the Engineer. When backfilling, is done in freezing weather, neither the material used or the area being filled be frozen.

Excess backfill material shall be cleaned up and disposed of at the end of the day's work.

6.1.5.4 Measurement

Measurement for imported granular backfill shall be per metric tonne as recorded on weight slips. Measurement for non-compressible fill shall be per cubic meter, as measured in place.

6.1.5.5 Payment

There shall be no separate payment for backfilling where the backfill is common backfill taken from the excavation.

Payment for imported granular backfill shall be at the contract unit price per metric tonne and shall include the supply, hauling, placing and compaction of this material.

Payment for non-compressible fill shall be at the contract unit price per cubic meter, as measured in place, and shall include the supply, hauling, and placing of this material.

6.1.6 TRENCH RESTORATION AND MAINTENANCE

6.1.6.1 Scope

This section governs the supply of all labour, equipment and materials necessary for restoration and maintenance of trenches throughout the job site, until issuance of the Certificate of Final Acceptance.

6.1.6.2 Materials

Asphalt concrete for pavement restoration shall conform to New Brunswick Department of Transportation and Infrastructure specifications for Type B mix (Base Course) and Type D Mix (Surface Course). Granular base crushed rock for trench restoration shall conform to Section No.7.

6.1.6.3 Construction Methods

Restoration

The Contractor shall conduct and confine all construction operations within the limits of the pipe installations.

The entire site and all properties, facilities, structures, fences, shrubs, lawns, trees, signs, driveways, sidewalks, ditches, culverts, appurtenances, etc. affected by the work must be fully restored to original or better condition before issuance of the "Certificate of Final Acceptance".

Trench Maintenance

The Contractor shall be responsible for maintaining all trenches until issuance of the "Certificate of Final Acceptance".

Trenches in traveled roads shall be maintained with granular base course as specified in Section No. 6 only until such time as asphalt can be placed to allow a smooth travel surface.

The Contractor shall inspect trench backfill conditions and conduct a weekly program of trench maintenance, or daily when weather or traffic conditions dictate, until issuance of the "Certificate of Final Acceptance".

Dust Prevention

The Contractor is responsible for dust prevention on any street or site where works have been or are being carried out. Dust prevention shall be in effect until such works are restored to original condition or upon issuance of the "Certificate of Final Acceptance".

Dust prevention shall include sweeping of paved roadways and/or sidewalks and flushing of same, when deemed necessary by the Engineer. All methods of dust prevention must be approved by the Engineer. All methods of dust prevention must be in accordance with the General Conditions.

The Contractor shall not use oil for dust prevention.

6.1.6.4 Payment

Payment shall be for imported granular base material and asphalt concrete. Measurement for these items shall be per tonne in place. There shall be no separate payment for trench maintenance.

Dust prevention will not be measured separately for payment unless the use of calcium chloride is approved by the Engineer. In such a case, payment will be at the contract unit price for calcium chloride.

SECTION No.7 – ROADBED CONSTRUCTION

7.1 ROADBED CONSTRUCTION

7.1.1 Work Under Other Sections

Section No.6 – Trenching, Bedding, Backfilling, Restoration and Maintenance.

7.1.2 Scope

This section governs the supply of all labour, materials and equipment necessary for the completion of the sub-base and base materials in roadways and parking lots.

7.2 CLEARING AND GRUBBING

7.2.1 Scope

This section governs the supply of all labour and equipment necessary for removal and disposal of all trees, logs and stumps and other perishable matter from the full width of the right-of-way, easements and parking lot areas in order to carry out the installation of services and/or road or parking lot construction.

7.2.2 Construction Methods

Clearing means and consists of the cutting of trees, bushes and brush within the entire width of the right-of-way and easements, including the disposal of such cut materials, by removal from the site and disposal of all materials.

Grubbing means and consists of removal of stumps, roots, logs, branches and other organic matter in the area as described above, including removal and disposal of such grubbed material from the site.

All materials resulting from the clearing operation become the property of the Contractor, in accordance with the General Requirements, who will remove it from the site prior to completion date of the contract, or as directed.

The Contractor shall obtain all necessary permits prior to start of any clearing and grubbing operations and shall be responsible for damage to adjacent properties along the limits of clearing and grubbing.

The material from the grubbing operation shall be disposed of as in accordance with the General Requirements.

Under no circumstances shall material resulting from the grubbing operation be disposed of under fill or embankments, nor shall excavation be combined with the grubbing operation.

Upon completion of clearing and grubbing operations, site will be left in conditions that grading operations and installation of services can be undertaken immediately.

7.2.3 Execution

The Contractor shall inspect the site and verify with the Engineer the items designated to remain.

The Engineer will identify the clearing limits and buffer zone limits with ribbons or similar means. The Contractor shall clear as indicated by the Engineer, by cutting at a height of not more than 200 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 200 mm above ground surface. The Contractor shall cut off branches and cut down trees overhanging the area cleared, as directed by the Engineer. The Contractor shall also cut off any unsound branches on trees designated to remain as directed by the Engineer.

Silt fence and erosion control structures shall be installed as shown on the drawings, incidental to the work.

Removal and Disposal

The Contractor shall remove cleared material off site. Any merchantable timber shall be salvaged, unless otherwise approved by the Engineer. Salvaged material shall become the property of the Contractor and shall be removed from the work site.

To avoid compromising the structure of the existing lagoon dikes along a portion of the access road, all cleared and salvaged material shall be stockpiled in an area designated by the Engineer and removed from the work site once the access road has been built.

Bury or burning of lumber on the project site shall not be permitted. Nonmerchantable trees not felled by cutting may be shredded in place using equipment designed for that purpose, but shall not be bulldozed down. All other nonmerchantable trees, and all brush and slash produced from the work, shall be shredded or chipped and evenly distributed over the ground within the clearing limits.

Finished Surface

The Contractor shall leave the ground surface in a condition suitable for stripping of topsoil and grubbing to approval of Engineer. The Contractor shall minimize ground disturbance to minimize the potential for erosion and sedimentation of the watercourses and wetlands.

Directional hand felling and harvesting shall be used where ground conditions are not suitable for access by heavy equipment. When cable skidders are used, every effort shall be made to avoid rutting soft ground areas by utilizing the full range of the cables.

Clearing shall not be performed within the watercourses and wetland 30 m buffer zone. There shall be no long skids of timber on steep slopes adjacent to watercourses, and no felling or skidding trees across a watercourse.

7.2.4 Measurement

Measurement for clearing and grubbing shall be in square meters or hectares. Grubbing operations shall be considered to include a depth of material of 300 mm.

For clearing and grubbing the area of single trees, rows of trees, or hedges shall be calculated by using the measurements from tip to tip of the longest branches. For single trees the area shall be considered as a circle.

7.2.5 Payment

Payment for work under this item shall be at the contract unit price for clearing and grubbing. This includes cutting, burning, disposal of all materials, clean-up and all work incidental thereto.

7.3 EXCAVATION OF ROADWAY

7.3.1 Scope

This section governs the supply of all labour and equipment necessary for the excavation of roads, draining swales and back slopes within the right-of-way or designated limits, as well as parking lots outside of the street right-of-way.

7.3.2 Materials

All material including rock excavated within the right-of-way shall be classed as common excavation.

Rock excavation will not be measured for payment but shall be considered incidental to the work.

Common excavation material of acceptable quality shall be used as Borrow “A” material for embankments or fill areas if required.

7.3.3 Construction Methods

Roadways, parking lots and ditches/swales shall be excavated to the lines and grades indicated on the drawings or as staked in the field.

Suitable excavated material from roads or trenches shall be used as fill to bring roads to subgrade where required. This material shall be free of roots and organic material and of rocks larger than 150 mm in greatest diameter.

The top layer of all road cut sections shall be scarified to a depth of 150 mm below subgrade level, moistened if necessary, and recompacted to 95% maximum dry density as determined and by ASTM D698.

Fill sections and embankments shall be placed in lifts having a maximum thickness of 300 mm and shall be compacted to 95% maximum dry density as determined by ASTM

D698. Moisture content during compaction shall be not more than three (3) percentage points above or below the optimum moisture content, as determined by ASTM D698.

At the completion of excavation and fill sections or embankment construction, the subgrade shall be shaped and rolled to give a smooth firm surface in accordance with the design grades and slopes.

7.3.3.1 Excavation

The Contractor will excavate the area for the work shown on the accompanying drawings to the lines and grades as shown on the cross sections or as staked out by the Engineer in the field.

Common excavation will include all material including rock. Measurement for payment will be based on in-place calculations using cross-sections done before excavation, and again following excavation. The Contractor's representative will be required to be present during the surveys and agree to the survey data and quantities in writing prior to start of excavation work and after the completion of the excavation.

Shaping will be carried out as the excavation progresses so as to ensure that surface drainage is maintained at all times.

Where sub-grade elevations have to be raised, Borrow "A" material will be used. Finished surface of the roadway sub-base will be graded to ensure the road is free of waves and undulations, smooth, hard and to the correct profile.

If excess material from the excavation operations is considered suitable by the Engineer and meeting the requirements of Borrow "A" material [in accordance with Item 121 of the NB Department of Transportation and Infrastructure Standard Specification (January 2015) and is free from organic material, it may be used, at no extra cost to the work where fill is required to achieve proper level of sub-grade. If it is not suitable, excess excavated material shall be disposed of off site by the Contractor at no extra cost.

Material which is approved by the Engineer for reuse in the work can be stockpiled away from the work area, with adjacent areas protected from soil migration by silt fencing, as directed by the Engineer. All material from the excavation which is reused in the work will include trucking, stockpiling, environmental protection, placing, compaction, grading, and stockpile area restoration as required. There shall be no additional payment for material re-used or for disposal of unsuitable or excess excavation material.

If the Contractor over-excavates the depth or width of the work from that specified for the work, over-excavated areas shall be brought back to grade with approved material placed in layers not greater than 300 mm thick, and

compacted to minimum of 95% of maximum dry density is achieved, as determined by ASTM D698. The Contractor shall not be paid for excess excavation, and the work shall be brought back to grade at no expense to the Owner.

The Contractor will be required to provide dewatering of the site for the proper completion of the work. Dewatering shall be done in accordance with proper environmental procedures to prevent the discharge of suspended solids to watercourses. Dewatering shall be incidental to the work.

7.3.3.2 Ditching

The Contractor will be required to form ditches as shown on the drawings. Ditches will have a side slopes in accordance with the drawings. Ditches on this site shall be seeded and mulched progressively and as soon as possible after their construction.

If excess material from the ditching operations is considered suitable by the Engineer and meeting the requirements of Borrow "A" material [in accordance with Item 121 of the NB Department of Transportation and Infrastructure Standard Specification (January 2015) and free from organic material, it may be used, at no extra cost to the work, where fill is required to achieve proper level of sub-grade. If it is not suitable, excess excavated material shall be disposed of off site by the Contractor at no extra cost.

7.3.4 Measurement

Measurement for roadbed excavation shall be in cubic metres place measure based on volumes calculated by the average end area method for material acceptably excavated. The top elevations used in calculations shall be the elevations taken after grubbing operations and stripping, when these operations are paid for separately. If material is suitable for re-use (as determined by the Engineer), stock-piling, material re-used or disposal of surplus stock-piled material and environmental protection will be included in the excavated volume measured and will not be measured for separate payment.

Measurement for ditching shall be in lineal metres for a single ditch acceptably constructed. If material is suitable for re-use (as determined by the Engineer), stock-piling, material re-used or disposal of surplus stock-piled material and environmental protection will be included in the measurement for ditching and will not be measured for separate payment.

7.3.5 Payment

Excavation

Payment for work for roadbed excavation shall be at the contract unit price for excavation. This shall include supply and transportation of all labour, equipment and

material, excavation, shoring if required, dewatering, re-use of material, removal and disposal of unsuitable or excess material, environmental protection, compaction, grading and fine grading, and all work incidental thereto as shown on the Drawings or as specified herein or as directed by the Engineer.

Excavation required for the installation of pipes is included under Section 6.0, Trenching, Bedding, Backfilling, Restoration and Maintenance, will not be measured for payment under this section.

Ditching
Payment for work for ditching shall be at the contract unit price for ditching. This shall include supply and transportation of all labour, equipment and material, ditching, fine grading, disposal off-site or re-used on site for construction of other works under this Contract or as topsoil material for property restoration, stock-piling, environmental protection, clean-up and all work incidental thereto all as specified or as shown on the Drawings or as directed by the Engineer.

7.4 DITCHING AND RE-DITCHING

7.4.1 Scope
This section governs the supply of all labour and equipment necessary for the excavation of draining swales and back slopes within the right-of-way or designated limits, as well as parking lots outside of the street right-of-way.

7.4.2 Materials
All material including rock excavated within the right-of-way shall be classed as common excavation.

Rock excavation will not be measured for payment but shall be considered incidental to the work.

Common excavation material of acceptable quality shall be used as Borrow “A” material for embankments or fill areas if required.

7.4.3 Construction Methods
Ditches/swales shall be excavated to the lines and grades indicated on the drawings or as staked in the field.

Fill sections shall be placed in lifts having a maximum thickness of 300 mm and shall be compacted to 95% maximum dry density as determined by ASTM D698. Moisture content during compaction shall be not more than three (3) percentage points above or below the optimum moisture content, as determined by ASTM D698.

At the completion of ditching and fill sections, the subgrade shall be shaped and rolled to give a smooth firm surface in accordance with the design grades and slopes.

7.4.3.1 Ditching

The Contractor will be required to form ditches as shown on the drawings. Ditches will have a side slopes in accordance with the drawings. Ditches on this site shall be seeded and mulched progressively and as soon as possible after their construction.

If excess material from the ditching operations is considered suitable by the Engineer and meeting the requirements of Borrow "A" material [in accordance with Item 121 of the NB Department of Transportation and Infrastructure Standard Specification (January 2015) and free from organic material, it may be used, at no extra cost to the work, where fill is required to achieve proper level of sub-grade. If it is not suitable, excess excavated material shall be disposed of off site by the Contractor at no extra cost.

7.4.4 Measurement

Measurement for ditching and re-ditching shall be in lineal metres for a single ditch acceptably constructed. If material is suitable for re-use (as determined by the Engineer), stock-piling, material re-used or disposal of surplus stock-piled material and environmental protection will be included in the measurement for ditching and will not be measured for separate payment.

7.4.5 Payment

Payment for work for ditching and re-ditching shall be at the contract unit price for ditching or re-ditching. This shall include supply and transportation of all labour, equipment and material, ditching, fine grading, disposal off-site or re-used on site for construction of other works under this Contract or as topsoil material for property restoration, stock-piling, environmental protection, clean-up and all work incidental thereto all as specified or as shown on the Drawings or as directed by the Engineer.

7.5 MATERIALS

7.5.1 Borrow "A/A1"

Where specified, the Contractor shall construct the road to the lines and grades for the sub-grade elevations shown on the drawings using Borrow "A" or Borrow "A1" material as specified and as directed by the Engineer. Surplus material from excavation meeting the requirements of Borrow "A/A1" shall be used prior to importing additional Borrow "A/A1" material.

Prior to the importing any Borrow "A/A1" material to the site, the Engineer must approve the Borrow "A/A1" pit and the area in the pit which the Contractor uses as his source of material. The Contractor will be required to provide a sieve analysis of the proposed material, at his expense.

Material testing and analysis of the proposed source (the pit) and material shall be done in accordance with and conform to Item 121.2 of the NB Department of

Transportation and Infrastructure Standard Specification (January 2015).

Testing results for the proposed material and source to be used as Borrow "A/A1" material shall be submitted to and approved by the Engineer prior to hauling and placement.

The Contractor will be responsible, before the commencement of the work and at any time during the construction at the request of the Engineer (at no cost to the Owner), to provide the Engineer with the following information. The analyses are to be completed by an approved testing geotechnical firm and samples must be collected at the proposed source by the same firm:

- Source of supply of aggregate;
- Sieve analysis;
- Micro-Deval Analysis (not to exceed 60% for Borrow "A" or 50% for Borrow "A1");
- Plasticity Index not to exceed 5 for Borrow "A" or Borrow "A1".

When submitting results to the Engineer, the geotechnical testing firm must confirm that the material either meets the specifications or that it is not suitable for the intended use. This is to be in letter report format submitted directly to the Engineer on the letterhead of the testing firm.

The Owner reserves the right to reject any source of supply of Borrow "A/A1" on the basis of past field performance, documentation records, and the experience of the Owner and/or the Engineer with a specific material, regardless of compliance with physical requirements of grading limits.

No extra payment will be made when using suitable excess material from the previous excavation (including excavation, stripping and ditching) which meets the requirements of Borrow "A/A1" and will then be considered incidental to the work, including hauling, shaping and compaction. Only suitable imported Borrow "A/A1" material will be measured for separate payment.

7.5.2 Aggregate Base (Crushed Rock)

The crushed rock for roadway (0-31.5 mm), will consist of clean, hard, sound and durable particles free from soft or disintegrated pieces, mud, dirt, organic or other deleterious materials as described in Item 201 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015).

Aggregate base properties shall meet the requirements of Table 201-1 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015). **Under no circumstances will Pit Run material will be accepted as aggregate base.**

The crushed rock, when tested in accordance with the N.B. Department of Transportation and Infrastructure's method with standard laboratory sieves, will conform to Table 201-2 (Crushed Rock) of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015).

The contractor will be responsible, before the commencement of the work and at any time during the construction at the request of the Engineer (at no cost to the Owner), to provide the Engineer with the following information. The analyses are to be completed by an approved testing geotechnical firm and samples must be collected at the proposed site by the same firm:

- Source of supply of aggregate;
- Sieve analysis;
- Micro-Deval Analysis (not to exceed the requirements of Table 201-1 (25%) of the NBDTI Specifications (January 2015) for Aggregate Base Material);
- Freeze Thaw – (not to exceed the requirements of Table 201-1 (20%) of the NBDTI Specifications (January 2015));
- Flat & Elongated Particles (not to exceed the requirements of Table 201-1 (35%) of the NBDTI Specifications (January 2015));
- Plasticity Index (not to exceed the requirements of Table 201-1 (3%) of the NBDTI Specifications (January 2015) for Aggregate Base Material).
- Standard Proctor values and Optimal Moisture.

When submitting results to the Engineer, the geotechnical testing firm must confirm that the material either meets the specifications or that it is not suitable for the intended use. This is to be in letter report format submitted directly to the Engineer on the letterhead of the testing firm.

The Owner reserves the right to reject any source of supply of aggregate base on the basis of past field performance, documentation records, and the experience of the Owner and/or the Engineer with a specific material, regardless of compliance with physical requirements of grading limits.

7.5.3 Aggregate Sub-Base (Crushed Rock, Crushed Gravel, Pit Run or Imported Crushed Sandstone)

The crushed rock, crushed gravel, pit run or imported crushed sandstone for sub-base material to be used as part of the structure of the roads and driveway sub-base material, will consist of clean, hard, sound and durable particles free from soft or disintegrated pieces, mud, dirt, organic or other deleterious materials as described in Item 201 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015).

Aggregate sub-base properties shall meet the requirements of Table 201-1 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January

2015).

If sandstone is used, the Engineer must approve the sandstone pit and the area in the pit which the Contractor uses as his source of material. The Contractor will be required to provide a sieve analysis and freeze thaw of the proposed material, at his expense.

The crushed rock, crushed gravel, pit run or crushed sandstone when tested in accordance with the N.B. Department of Transportation and Infrastructure's method with standard laboratory sieves, will conform to Table 201-2 (Crushed Rock, 75 mm % Passing gradation), Table 201-3 (Crushed Gravel, 75 mm % Passing gradation), Table 201-4 (Pit Run) and Table 201-5 (Crushed Sandstone Sub-base, 100 mm % Passing gradation) of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015).

The Contractor will be responsible, before the commencement of the work and at any time during the construction at the request of the Engineer (at no cost to the Owner), to provide the Engineer with the following information.

The analyses are to be completed by an approved geotechnical testing firm and samples must be collected at the proposed site by the same firm:

- Source of supply of aggregate;
- Sieve analysis;
- Micro-Deval Analysis (not to exceed the requirements of Table 201-1 (30%) of the NBDTI Specifications (January 2015) for Aggregate Sub-Base Material);
- Freeze Thaw – (not to exceed the requirements of Table 201-1 (20%) of the NBDTI Specifications (January 2015));
- Flat & Elongated Particles (not to exceed the requirements of Table 201-1 (35%) of the NBDTI Specifications (January 2015));
- Plasticity Index (not to exceed the requirements of Table 201-1 (5%) of the NBDTI Specifications (January 2015) for Aggregate Sub-Base Material).
- Standard Proctor values and Optimal Moisture.

When submitting results to the Engineer, the geotechnical testing firm must confirm that the material either meets the specifications or that it is not suitable for the intended use. This is to be in letter report format submitted directly to the Engineer on the letterhead of the testing firm.

The Owner reserves the right to reject any source of supply of aggregate sub-base on the basis of past field performance, documentation records, and the experience of the Owner and/or the Engineer with a specific material, regardless of compliance with physical requirements of grading limits.

7.5.4 Earth or Common Material [Soil Borrow "A"]

Earth or common materials used in non-load bearing embankments shall consist of approved material from excavations or approved imported borrow material. Common material used for non-load bearing embankments shall consist of soil or rock and contain no roots, stumps, organics and/or other deleterious substances or stones over 150 mm in greatest dimension. Borrow material shall meet the requirements of NBDTI Specifications for "Soil Borrow A", Item 121 (January 2015). Borrow "B" material is not acceptable. The Engineer shall be advised in advance of the proposed source of imported earth or common material.

7.5.5 Geotextile Fabric

If required, geotextile fabric shall be installed in accordance with manufacturer's recommendations. Woven fabric shall be used for stabilization and separation under granular roadbase material when specified.

The Contractor shall submit, upon request, the manufacturer's recommended procedures for installation and instructions for handling of the selected geotextiles. The areas to be covered with geotextile shall be prepared by shaping the ground to a uniform and regular surface, free from bumps and depressions including protruding rocks. It shall not be placed on any material that may tear or puncture the fabric.

Where more than one width of fabric is used, it shall be joined by an overlap of at least 500 mm and all overlap joints shall be securely held in place with geotextile anchor pins. In no case shall equipment travel on uncovered geotextile fabric.

The Contractor shall immediately repair any damaged geotextile by covering with a patch of the same fabric extending a minimum of 500 mm beyond the perimeter of the damaged area.

Overlapped joints, patches and seams shall be measured as a single layer of fabric; no separate payment shall be made for overlap.

Geotextile fabrics shall meet the following minimum requirements:

PROPERTY	UNIT	ASTM TEST	WOVEN
Mullen Burst Strength	KPa	D3786	1500
Tearing Strength (Trapezoid Method)	N	D4533	200(W1)
Grab Tensile Strength (Both Directions)	N	D4632	400(W1)
Elongation at Break	%	D4632	25 max.

Apparent Opening Size	Um	D4751	840 max.
UV Degradation	% Ret.	D4355	70 min.
Permittivity	Sec – 1	D4491	0.01 min.

Property values are Minimum Average Roll (MAR) values. A specification based upon minimum roll average ensures that over 95% of the fabric in a lot will meet or exceed minimum requirements.

Geotextile fabric shall be Terrafix 400W or approved equal.

7.5.6 Construction Methods

7.5.6.1 Placing, Spreading and Compaction of Borrow "A/A1" Material

Fill areas will be brought to the lines and grades as shown on the drawings or as directed by the Engineer. The finish grade of the side slopes shall be smooth and uniform.

Borrow "A/A1" material will be placed in layers not exceeding 300 mm and compacted and until a minimum of 95% of maximum dry density is achieved, as determined by ASTM D698. Each layer will be thoroughly compacted over its entire width before placing the next layer. Where, in the opinion of the Engineer, the required compaction is not being obtained, the further placing of material will cease and the material in place will be given additional compaction until acceptable.

At all times, the Contractor will operate sufficient compaction equipment to thoroughly compact the material at the rate at which it is being placed. Choice of compaction equipment will be made by the Contractor and approved by the Engineer.

In areas incapable of supporting earth moving equipment the thickness of the first layer of material may be increased sufficiently to support equipment. The layer will be placed over the full width of the section. The surface will be thoroughly compacted as required in these specifications, following which the remainder of the fill will be built in layers of the specified normal thickness.

The Contractor shall provide equipment suitable for the soil conditions of this site.

The shaped and compacted surface must be smooth, hard, free from waves and undulations and competent in the opinion of the Engineer to provide adequate support for the construction.

Fill areas will not be left unfinished for any length of time unless authorized by the Engineer.

The cost of trucking, moving, placing, shaping and compacting of imported Borrow "A/A1" material for the construction of roads and related area to be filled will be included in the price tendered for imported Borrow "A/A1" material. No separate payment will be made for overhaul.

7.5.6.2 Granular Base Construction

7.5.6.2.1 Preparation

Prior to the placing of granular base the subgrade shall be properly shaped, graded and compacted so as to be firm and able to support construction equipment without displacement. The sub-base profile shall match that required to result in the final roadway surface profile and crown when all sub-base, base and pavement materials have been placed. Soft or yielding subgrade shall be corrected and made stable before granular base construction proceeds. All standing water shall be removed from subbase area prior to placing any granular base material.

Where the gradation of the subgrade soil and the sub-base are such that mixing of the two materials may occur, an approved geotextile fabric shall be placed.

The overall thickness for streets and parking lots shall be in accordance with the contract drawings.

For asphalt driveways, the overall thickness shall be 375 mm of which 75 mm shall be asphalt concrete Type D, 300 mm shall be granular base material as specified in Section 7.5.1, Aggregate Base. When matching existing driveway conditions, the depth of crushed stone to be placed will be at the Engineer's discretion.

7.5.6.2.2 Placing, Spreading and Compaction of Sub-Base and Base Material

Sub-base and base material will be placed, graded and compacted to the lines, grades and dimensions shown on the Drawings or as directed by the Engineer. **Material placed wider or deeper than specified will not be measured for payment.**

Placing on a wet or muddy roadbed subgrade will not be permitted. Sufficient crown will be maintained at all times during construction to ensure ready runoff of surface water. The Contractor will shape the material to the lines and grades shown on the Drawings. All humps, hollows, and depressions will be eliminated during shaping.

Both the sub-base and base materials will be shaped by means of a blade grader (other than a tractor) while being compacted. Ruts formed by hauling or traffic will be dragged full at least once a day or as often as necessary to prevent cutting through the surface material. When completed, the surface will be smooth, hard, free from ruts, waves, and undulations and competent in the opinion of the Engineer to provide adequate support for the road surface. The allowable tolerance is 15 mm from the design profile and cross section.

The sub-base material will be placed over the previously prepared subgrade surfaces after all required piping has been placed. It will be placed in successive uniform layers not more than 300 mm thick, to minimize the potential for segregation, across the entire length of the roadbed and site surface as directed by the Engineer. The maximum lift thickness shall be determined in the field by a test strip, to ensure the maximum effectiveness and compatibility of the compaction equipment with respect to the material being placed for each piece of equipment and each material type. The test strip shall be conducted in the presence of the Engineer and the approved testing company's inspector, and shall occur prior to the placement of any further material in the work.

When sub-base material is placed over geotextile fabric, the first layer of sub-base material shall be carefully placed and spread with a dozer so there is no traffic on the geotextile until the first layer of 300 mm of sub-base has been spread and compacted.

Granular sub-base and base materials shall be placed by methods which do not lead to segregation or degradation.

Sub-base material shall be compacted until a minimum of 95% of maximum dry density is achieved, as determined by ASTM D698.

The base material will be placed in successive uniform layers not exceeding 150 mm thick across the entire length of the roadbed as directed by the Engineer and compacted until a minimum of 95% of maximum dry density is achieved, as determined by ASTM D698.

Compaction must commence immediately following the spreading and shaping of each layer. Water shall be added as required to give a moisture content within two percentage points of optimum as determined by ASTM D698 incidental to the work.

Each layer will be thoroughly compacted over its entire width before placing the next layer. At all times, the Contractor will operate sufficient compaction equipment to thoroughly compact the material at the rate at which it is being placed.

Following compaction the surface of the granular base shall be shaped to required line, grade and cross-section. The Contractor shall perform grade checks at every stake location for fine grading. The surface shall be smooth, dense and free from ridges or loose material. The surface shall not vary more than 12 mm vertically in 3 m horizontally in conformance with the roadway cross section as shown on the Drawings, and shall not be uniformly high or low.

7.5.7 Proof Rolling

For proof rolling of the subgrade and the aggregate base materials, use a fully loaded tandem truck. Make sufficient passes of proof rolling equipment to make sure that every point on the surface has been subjected to at least one pass of loaded tire and to determine that no greater than 25 mm of deflection occurs. This shall be done in the presence of the Engineer or the Engineer's representative.

Where proof rolling reveals areas of defective subgrade or aggregate base material, remove defective material and replace to the depth and extent directed by the Engineer at no additional cost to the Owner. Material which must be removed and replaced will not be measured for separate payment.

Maintain the finished aggregate base conditions until asphalt concrete is applied. Proof rolling will not be measured separately but shall be considered incidental to the work.

7.5.8 Measurement

Imported Borrow "A" or imported Borrow "A1" or imported Soil Borrow "A" material shall be measured as the number of cubic metres, place measure, based on volumes calculated by the average end area method for each type of this material acceptably placed.

Aggregate sub-base and base materials shall be measured as the number of tonnes of each type of material, acceptably placed. Aggregate sub-base or base materials placed in excess of 110% of the theoretical quantity, based on the measurements specified on the Drawings, or as determined by "Final Measure" of the area of this work, shall not be included for payment.

Geotextile material shall be measured as the number of square metres place measure excluding overlaps, acceptably placed.

7.5.9 Payment

Imported Borrow "A or Imported Borrow "A1" or Imported Soil Borrow "A" Material

Payment shall be at the Contract unit price for Imported Borrow "A" or imported Borrow "A1" or imported Soil Borrow "A" material. This includes the supply and transportation of all labour, equipment and materials, sourcing, testing, loading, placing, spreading, shaping, compaction, adjustment of moisture content, traffic

control, dust control, proof rolling, clean up and all work incidental thereto, all as specified or as shown on the Drawings or as directed by the Engineer.

Aggregate Sub-base and Base Material
Payment shall be at the Contract unit price for Aggregate Sub-base Material or Aggregate Base Material. This includes the supply and transportation of all labour, equipment and materials, sourcing, testing, loading, weighing, placing, spreading, shaping, compaction, adjustment of moisture content, traffic control, dust control, proof rolling, clean up and all work incidental thereto, all as specified or as shown on the Drawings or as directed by the Engineer.

A slip must be received from each truck at the time of delivery, showing the weight of the load, identifying the class of material carried, and identifying the truck and driver. Only one load shall show on each slip. Any slips not received and signed by the Engineer or his representative at the time of delivery will not be included in the weight for payment.

Imported Common/Borrow "A" Material
Payment shall be at the Contract unit price for Imported Common/Borrow "A" material. This includes the supply and transportation of all labour, equipment and materials, sourcing, testing, loading, placing, spreading, shaping, compaction, adjustment of moisture content, traffic control, dust control, clean up and all work incidental thereto, all as specified or as shown on the Drawings or as directed by the Engineer.

Geotextile Fabric
Payment shall be at the Contract unit price for Geotextile Fabric. This includes the supply and transportation of all labour, equipment and materials, surface preparation, placement including overlapped joints, protection, traffic control, shop drawings, clean-up and all work incidental thereto all as specified or as shown on the Drawings or as directed by the Engineer.

7.6 ROADWAY SHOULDER CONSTRUCTION

7.6.1 Scope
This section governs the supply of all labour, equipment and materials necessary for the construction of roadway shoulders according to these specifications and the contract drawings.

7.6.2 Materials
All materials shall be supplied by the Contractor. The crushed rock or crushed gravel for shoulder material (0-31.5 mm), will consist of clean, hard, sound and durable particles free from soft or disintegrated pieces, mud, dirt, organic or other deleterious

materials as described in Item 201 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015).

Shouldering material properties shall meet the requirements of Table 201-1 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015). **Under no circumstances will Pit Run material will be accepted as shoulder material.**

The crushed rock or crushed gravel, when tested in accordance with the N.B. Department of Transportation and Infrastructure's method with standard laboratory sieves, will conform to Table 201-6 (Shoulder Material) of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015).

The contractor will be responsible, before the commencement of the work and at any time during the construction at the request of the Engineer (at no cost to the Owner) to provide the Engineer with the following information. The analyses are to be completed by an approved geotechnical testing firm and samples must be collected at the proposed site by the same testing firm:

- Source of supply of aggregate;
- Sieve analysis;
- Micro-Deval Analysis (not to exceed the requirements of Table 201-1 (30%) of the NBDTI Specifications (January 2015) for Aggregate Base Material);
- Freeze Thaw – (not to exceed the requirements of Table 201-1 (20%) of the NBDTI Specifications (January 2015));
- Flat & Elongated Particles (not to exceed the requirements of Table 201-1 (35%) of the NBDTI Specifications (January 2015));
- Plasticity Index (not to exceed the requirements of Table 201-1 (3%) of the NBDTI Specifications (January 2015) for Aggregate Base Material).
- Standard Proctor values and Optimal Moisture.

The Owner reserves the right to reject any source of supply of shouldering material on the basis of past field performance, documentation records and experience of the Owner and/or the Engineer with a specific material, regardless of compliance with physical requirements of grading limits.

7.6.3 Construction Methods

Shoulder material shall be spread by the use of a shoulder spreader of a type approved by the Engineer. This shoulder spreader shall be capable of placing shoulder material over a width and to a depth as required and shall be constructed so that it will not place or leave any material on the asphaltic concrete pavement. Any shoulder material that should fall on the asphalt shall be cleaned off immediately.

Shoulder material shall be placed in layers not exceeding 150 mm and compacted to a

minimum of 95% of maximum dry density is achieved, as determined by ASTM D698.

Immediately after completion of the work or any portion of it as directed by the Engineer, the Contractor shall remove from the site all unused material, refuse and dirt placed by him on or in the vicinity of the site to leave the road in a neat, clean and safe condition.

7.6.4 Measurement

The quantities to be measured for payment shall be the number of tonnes of crushed rock shoulder material acceptably placed. Crushed rock shoulder material placed in excess of 110% of the theoretical quantity, based on the measurements specified on the detail drawings, or as determined by "Final Measure", shall not be included for payment.

7.6.5 Payment

Payment for this work shall be at the contract unit price for crushed rock used for shoulder construction. This includes the supply and transportation of all labour, equipment and materials, sourcing, testing, loading, weighing, placing, spreading, shaping, compaction, adjustment of moisture content, traffic control, dust control, proof rolling, clean up and all work incidental thereto, all as specified or as shown on the Drawings or as laid out by the Engineer.

A slip must be received from each truck at the time of delivery, identifying the class of material carried, showing the weight of the load and identifying the truck and driver. Only one load shall show on each slip. Any slips not received and signed by the Engineer or his representative at the time of delivery will not be included in the weight for payment.

7.7 DRIVEWAY RESTORATION

7.7.1 Scope

This section governs the supply of all labour, equipment and materials necessary for the crushed rock component of driveway restoration according to these specifications and the Drawings. Asphalt required for driveway restoration is to be done in accordance with Section 8.0, Asphalt Concrete Paving, Resurfacing, Patching and Restoration.

7.7.2 Materials

All materials shall be supplied by the Contractor. For driveways finished in crushed rock, the Contractor shall supply crushed rock material to match the gradation and colour of the existing driveway. The crushed rock material for driveway restoration will consist of clean, hard, sound and durable particles free from soft or disintegrated pieces, mud, dirt, organic or other deleterious materials. The Contractor shall identify the source of this material to the Engineer for his evaluation prior to transporting any material to the site.

Crushed rock material properties shall meet the requirements of Table 201-1 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015). When tested in accordance with the N.B. Department of Transportation's method with standard laboratory sieves, the grading limits of the material shall conform to Table 201-7 (0-19 mm) of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015). **Under no circumstances will Crushed Gravel or Pit Run material will be accepted as driveway material.**

The Contractor will be responsible, before the commencement of the work and at any time during the construction at the request of the Engineer (at no cost to the Owner), to provide the Engineer with the following information. The analyses are to be completed by an approved testing geotechnical firm and samples must be collected at the proposed site by the same firm:

- Source of supply of aggregate;
- Sieve analysis;
- Micro-Deval Analysis (not to exceed the requirements of Table 201-1 (30%) of the NBDTI Specifications (January 2015) for Aggregate Base Material);
- Freeze Thaw – (not to exceed the requirements of Table 201-1 (20%) of the NBDTI Specifications (January 2015));
- Flat & Elongated Particles (not to exceed the requirements of Table 201-1 (35%) of the NBDTI Specifications (January 2015));
- Plasticity Index (not to exceed the requirements of Table 201-1 (3%) of the NBDTI Specifications (January 2015) for Aggregate Base Material).
- Standard Proctor values and Optimal Moisture.

The Owner reserves the right to reject any source of supply of driveway crushed rock on the basis of past field performance, documentation records, and experience of the Owner and/or the Engineer with a specific material, regardless of compliance with physical requirements of grading limits.

7.7.3 Construction Methods

7.7.3.1 Crushed Rock Driveways

Existing crushed rock driveways shall be restored to a depth of 200 mm with approved Crushed Rock material. Crushed rock for driveway restoration shall be 19 mm minus (unless otherwise directed), but in all cases driveway restoration materials must match as closely as possible to the existing driveway materials. This work shall include any excavation and removal of materials to prepare the subgrade and produce a smooth and firm surface on which to place the crushed rock.

Where it is necessary to do restoration of driveways that are constructed of

crushed rock/stone not readily available at local quarries because of the type, gradation and colour, the Contractor must retain and stockpile the stone in the individual Owner's driveway for use in driveway restoration. In cases where not enough of the existing material can be recovered to restore the driveway to the full depth specified, the Contractor will be required to first place a layer of driveway crushed rock material as specified herein and then cover this with a layer of the original material to achieve the proper depth and surface profile.

7.7.3.2 Asphalt Driveways

Existing asphalt paved driveways shall be restored to a depth of 200 mm plus the depth of asphalt to be placed as shown on the Drawings.

When repairing existing asphalt driveways, the edge of existing asphalt to be restored shall be cut in a straight line to full depth using a cutting saw. Cuts shall be parallel to the road surface unless indicated otherwise by the Engineer. The surface of the existing asphalt adjacent to the cut shall be swept clean in areas requiring paving. Asphalt type, thickness and placement shall conform to Section 8.0, Asphalt Concrete Paving, Resurfacing, Patching and Restoration of these Specifications.

Restoration is to be completed as soon as possible at each individual property and not be left to the end of the project. The driveways are to be made accessible at the end of each day. For existing asphalt driveways, additional driveway crushed rock shall be placed as a temporary ramp to the paved area until the asphalt is placed.

Driveway material shall be placed in layers not exceeding 200 mm and compacted to a minimum of 95% of maximum dry density is achieved, as determined by ASTM D698. Driveway restoration is to result in an edge of the driveway surface which is uniform and matches that of the original driveway. Existing lawns, plantings, fences, etc., shall be protected throughout this work.

Immediately after completion of the work or any portion of it, the Contractor shall remove from the site all unused material, refuse and dirt placed by him on or in the vicinity of the site to leave the road and driveway in a neat and clean condition.

7.7.4 Measurement

The quantity to be measured for payment shall be the number of square metres of driveway restored with crushed rock driveway material, acceptably placed. This includes the reuse of existing stone where required.

7.7.5 Payment

Payment for this work shall be at the contract unit price for the unit area of driveways restored with crushed rock. This shall include the supply and transportation of all

labour, material and equipment, surface preparation including any excavation required, crushed rock, spreading, compaction, removal and reuse of unique driveway stone where indicated, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as laid out by the Engineer. Asphalt paving repair of existing asphalt paved driveways shall be measured and paid in accordance with Section 8.0, Asphalt Concrete Paving, Resurfacing, Patching and Restoration.

SECTION No.8 - ASPHALT CONCRETE PAVING, RESURFACING, PATCHING AND RESTORATION

8.1 ASPHALT CONCRETE PAVING, RESURFACING, PATCHING AND RESTORATION

8.1.1 Scope

This section governs the supply of all labour, equipment and materials necessary for the placement of asphalt concrete pavement in accordance with these plans and specifications, the contract drawings or as directed by the Engineer.

8.1.2 Materials

General

All materials shall be supplied by the Contractor and must meet or exceed all requirements of the New Brunswick Department of Transportation and Infrastructure Standard Specifications, latest edition, unless these specifications provide otherwise.

Aggregate

Aggregate for asphalt concrete shall be approved sound material meeting gradation requirements for Types B, C and D shall be as per NBDTI Standard Specifications, latest edition, Table 260-8.

Laboratory proof of this gradation to be supplied to the Owner upon request.

Asphalt Concrete

Asphalt concrete pavement shall be a dense graded hot laid plant mix conforming to the requirements of the NBDTI Standard Specifications, Section 260.2.3 for Type "B" Base Course, Type "C" Base or Surface Course, Type "D" Surface Course. Material type to be used shall be in accordance with the contract drawings.

Finished Pavement

Finished pavement shall conform to the lines, grades, dimensions and cross-sections as specified herein, or as set in the field, or in the case of patching and utility cuts, to the surrounding pavement conforming to the existing roadway crown and slope.

Asphalt Binder

Asphalt binder shall be Performance Grade (PG 58-28), as approved by the Engineer, and shall meet the requirements of AASHTO MP1-98, Table 1 – Performance Graded Asphalt Binder Specification. Certified producer's test data shall be supplied or representative samples on request.

Tack Coat

Tack coat shall be SS-1 Grade asphalt emulsion and shall conform in all respects to the provisions of CAN/CGSB 16.2. Certified producer's test data, manufacturer's certification that the materials supplied meet the specified requirements, or

representative samples shall be supplied on request.

Anti-Stripping Admixtures
Anti-stripping admixtures shall be supplied by the Contractor and incorporated into the mix at 0.5% of the asphalt content in conformance with the NBDTI Standard Specifications (Section 260.2.1), latest edition. The type and dosage of all asphalt binder anti-stripping shall be noted on the delivery slip.

Asphalt Concrete Mixes
Asphalt concrete mixes Type B, C and D shall meet the requirements of NBDTI Standard Specifications, Section 260.2.3.

In determining these properties, the ASTM bulk specific gravity for the aggregate shall be used and allowance shall be made for asphalt cement absorbed by the aggregate.

Water required for the works shall be supplied by the Contractor. The Contractor will not be permitted to use the Owner's hydrants.

Subbase material shall be approved, sound, crushed rock conforming to Section No. 7.

Pavement Reinforcement mesh shall be self-adhesive GlasGrid Type 8501 (for full width reinforcement) or 8502 (for joints and major intermittent transverse cracks), or approved equal. Full width reinforcement shall have a minimum tensile strength of 100kN/M (560 lb/in) across width and along length. Detail repair reinforcement shall have a minimum tensile strength of 200kN/M (1120lb/in) across width and 100kN/M (560 lb/in) along length.

8.2 Equipment and Construction Methods

8.2.1 General
All equipment and construction methods shall conform with the requirements and practices of the New Brunswick Department of Transportation and Infrastructure as stipulated in their General Specifications, latest edition, unless these specifications provide otherwise.

8.2.2 Mix Design
Two weeks prior to the date paving operations are to commence, the Contractor shall present information in writing outlining the proposed mix and job mix formula based on the use of aggregate stockpiles which are representative of those to be used for the work.
This information shall include evidence that the proposed mix meets the requirements specified herein.

The laboratory tests shall be done using aggregate and asphalt cement representative of those proposed for use in the project. At the same time as the mix design information is provided, stockpiles of aggregates proposed for use in asphalt concrete for the project shall be available for sampling to permit checking of the mix design. Checking of the mix design shall be at no expense to the Contractor except that sample of materials shall be provided free of charge.

The Engineer or his authorized representative shall have access at any time to all parts of the paving plant for the verification of weights or proportions and character of materials and the determination of temperature used in the preparation of the mixture.

8.2.3 Preparation

Adjustment of Structures

All structures such as manholes, inlets and valve boxes shall be adjusted to match the finished surface transverse and longitudinal grade.

Structures that have been set to finished grade must not be disturbed. Damage to these structures due to grading or asphalting operations shall be repaired at the Contractor's expense.

If crushed stone or asphaltic material should fall inside the structures, they shall be cleaned out immediately following occurrence.

Resurfacing and Patching Preparation on Existing Pavement

Where asphalt concrete is placed as a resurfacing for existing pavement, all holes and areas showing signs of surface or base failure shall be cut out using a saw to give a square, undamaged edge for bonding.

If the subbase granular material is excessively wet and/or does not meet minimum compaction requirements, the areas so affected shall be excavated, filled with new granular material and compacted all as per 7 of the technical specifications.

The holes or excavated areas shall be brought level with the surrounding pavement with a layer of Type "B" Base Course material, placed and compacted to these specifications.

The edge of the surrounding pavement must first be painted with tack coat. Disposal of the excavated material shall be in accordance with the General Requirements. Thickness of asphalt placed shall be in accordance with the standard drawings.
Where asphalt widening is undertaken, the edges of existing asphalt shall be cut, removed, cleaned thoroughly and tack applied before new base asphalt is placed. The

cuts shall be made with a cutting saw, giving a straight vertical face through the full thickness of the pavement to provide a smooth butt joint.

Where asphalt concrete is placed as a resurfacing layer over existing pavement, tack coat shall be applied at a coverage rate of 0.16 liters per square meter, prior to placing new asphalt concrete. The full width of surface to be treated shall be cleaned with a power or hand broom, to remove all sand, gravel, mud, etc. from existing paved area. This shall be incidental to the work.

Tack coat shall be applied in a uniform manner by means of approved pressure distributors. (The use of brooms for manual application on patching contracts is acceptable.) Tack coat shall not be applied in wet weather or at an ambient temperature lower than 10^{o}C.

Distributors shall be equipped with a tank gauge and measuring stick graduated in liters; and a sampling valve. The Contractor may place the bituminous tack coat by hand placement methods at longitudinal joint locations. Tack shall be applied only when the surface to be treated is dry and swept clean over the full width of surfaces to be treated.

The Contractor shall protect or cover concrete walks, curbs, walls, adjacent structures and other appurtenances, prior to spraying bituminous tack coat, to avoid over-spray of these sites. Any tack coat adhering to concrete walks, curb or adjacent structures along the street shall be removed at the Contractor's expense.

Traffic shall be diverted around freshly sprayed surfaces, if possible, until tack coat has set. Tack coat shall not be applied over an area greater than can be covered by the asphaltic concrete placed in the same day.

Temperature of the tack when applied shall be between 38°C and 66°C.

The Contractor shall be responsible to reinstate, at his own expense, any bituminous tack-coated surface which becomes fouled due to weather and/or traffic.

Where the Engineer has designated use of pavement reinforcement, Type 8501 for full width cracking (or approved equal) shall be used unless otherwise specified. All remedial work such as base repairs, crack sealing, pothole filling, leveling or padding course application, etc. shall be performed prior to placing the reinforcement. Surface must be prepared as a clean, dry, even surface. On a milled or planed surface, a minimum 19mm leveling course of asphalt must be placed prior to the pavement reinforcement and final lift of asphalt.

Placing Asphalt Concrete

Asphalt concrete binder and surface courses shall be placed to proper line and grade to give the compacted depth, crown, profile and cross section as per these specifications and detail drawings.

In order to bring the existing roadway surface to proper shape and crown, patching, padding and/or leveling courses of asphalt shall be placed as required or directed. This work shall be considered as being incidental to the job and no additional payment or allowance will be made over and above the rate of payment for the type of asphalt used, as per the Schedule of Quantities and Prices.

Seal shall be placed in two course widths for paved street widths of 9.14 m or less. The joint shall follow the street centre line. The underlying base course shall be placed with the joint offset minimum 150 mm from the seal course. At no time shall longitudinal joints coincide.

Temperature of mixture shall not exceed 165^{o}C. Temperature of mixture shall not be less than 118^{o}C immediately after spreading and prior to initial rolling.

Mixture which does not comply with specifications and mixture which cannot be incorporated in the work shall be rejected.

Adequate spreading and compaction units shall be provided at the job site. The sizes, types and numbers of units required and their methods of operations shall be as stipulated in the New Brunswick Department of Transportation and Infrastructure General Specifications, latest edition. Mixtures shall be compacted to a density not less than ninety-three percent (93%) of the maximum theoretical density (MTD).

For patching operations a minimum of one Class "B" steel-tired tandem roller weighing at least eight (8) tonnes must be used with each patching crew.

Along curb and gutter, sluice boxes, manholes and similar structures and places not accessible to roller, the mixture shall be thoroughly compacted by means of hot hand tampers and effectively sealed.

Each course after final compaction shall be smooth and true to required crown and grade. It shall have average thickness specified and shall vary no more than 6 mm from specified thickness.

The surface of finished pavement shall be free from depressions exceeding 3 mm as measured with a 3 m straight edge.

Any part of pavement not meeting the requirements of specifications shall be removed by the Contractor and replaced with fresh, hot mixture compacted to conform to surrounding area and thoroughly bonded to it.

If surface becomes dirty or five (5) days pass between layers, new tack coat must be applied.

Weather Conditions: When paving on aggregate base, the base must be free from standing water. Asphalt concrete shall not be placed when weather conditions of fog or rain prevail, nor when the pavement surface shows any signs of moisture. Mixes placed on existing paved surfaces shall be laid upon a dry base.

Base mixture shall not be placed unless air temperature at surface of road is 2°C and rising. When air temperature drops below 2°C, paving operations will cease. Seal mixture shall not be placed unless air temperature at surface of road is 7°C and rising.

Transportation of Asphalt Mix: Trucks for transporting asphalt mixtures shall have tight, metal boxes free of foreign materials. Loads shall be covered with tarpaulins of sufficient size to overhang the fully loaded boxes and be tied down on three sides and the front shall be tight to the box of the truck or shielded to prevent air infiltration. Tarpaulins shall be rolled back and the hot mix shall be uncovered immediately prior to dumping the load into the paver. Trucks may be lightly lubricated with an approved release agent, as required, but must be raised and drained after each application and before loading.

Placing Asphalt Concrete: No traffic shall be allowed on newly placed asphalt concrete until finish rolling is complete and the finished mat has been permitted to cool to 60°C. Water required to lower the mat temperature shall be supplied by equipment capable of applying the water at a uniform and evenly distributed rate in such amounts as required and/or as the Engineer may direct.

Compaction equipment shall consist of at least one of each of the following i.e., 1. Vibratory Roller, 2. Pneumatic Tire Roller, and 3. Finish Roller.

Finish rolling will be carried out with a steel drum roller, without vibration and exerting a contact pressure on compression roll of at least 3.0 kg/mm of drum width.

Transverse Construction Joint: A transverse construction joint shall be constructed at the end of each day's work and at other times when paving is halted for a period of time which will permit the asphalt concrete to cool below 115°C.

On Arterial and Collector streets, where the asphalt concrete surface and/or base

course has been terminated, the mat shall be tapered at 50:1 minimum. When paving resumes, tapers from surface courses previously laid shall be cut back to full mat thickness to expose fresh, straight vertical surfaces, free from broken or loose material and tacked in accordance with 7.2.3.
A transverse key joint shall be constructed between existing and new asphalt concrete pavement at the beginning and at the end of the project and other locations where the new pavement terminates against existing pavement. If a key is cut in advance of paving the joint area, the Contractor shall construct a smooth taper at the joint area to a minimum slope of 50:1.

Longitudinal Construction Joints: All longitudinal joints left exposed overnight or which are exposed to moisture from rain and all curb, manhole, culvert or other abutting structures, shall receive an application of tack coat. Longitudinal joints shall be constructed to ensure that maximum compression under rolling is achieved. There should not be any excess material scattered on the surface of the freshly laid mat.

Temporary Traffic Markings: The Contractor shall place, daily, temporary reflective lane boundary markings on all newly constructed or milled pavement to be exposed to traffic, in areas as designated by the Engineer. Minimum spacing shall be 20m centre to centre on tangents and 15 m centre to centre on curves.

Replacements
If, at any time before the work is finally accepted, any raveling, shoving or other fault develops in the pavement as laid, all materials in such place shall be removed, the edges of the joints cut square and painted with tack coat and fresh mixture placed and compacted. All such removal and replacement of unsatisfactory material shall be done at the expense of the Contractor.

8.2.3.1 Driveway Restoration

Existing asphalt in driveways removed in the work shall be restored with 75 mm thick of Type D Asphalt. Crushed rock base for asphalt driveway restoration shall conform to Section 7.5, Driveway Restoration – Crushed Rock, of these Specifications.

When repairing existing asphalt driveways, the edge of existing asphalt to be restored shall be cut in a straight line to full depth using a cutting saw. This cut shall be parallel to the roadway unless otherwise directed by the Engineer. Tack coat shall be applied to the full-face edge of the asphalt cut and over the surface of any existing asphalt requiring paving. The surface of the existing asphalt adjacent to the cut shall be swept clean in areas requiring paving. The edges of the asphalt shall match the original alignment of the driveway surface. Existing lawns, plantings, fences, etc., shall be protected throughout this work.

Restoration is to be completed as soon as possible at each individual property and not be left to the end of the project. The driveways are to be accessible at the end of each day.

Immediately after completion of the work or any portion of it, the Contractor shall remove from the site all unused material or waste placed by him on or in the vicinity of the site to leave the driveway in a neat and clean condition.

8.2.3.2 **Preparation for Driveway Restoration**

If the base granular material is excessively wet and/or does not meet minimum compaction requirements, the areas so affected shall be excavated, filled with new granular material and compacted all as per Section 7.0, Roadbed Construction of these Specifications.

Disposal of the excavated material shall be in accordance with the General Requirements. Thickness of asphalt placed shall be in accordance with the standard drawings.

Where asphalt repair is made, the edges of existing asphalt shall be cut, removed, cleaned thoroughly and tack applied on the full face of the area where new asphalt will be placed before new asphalt is placed. (The use of brooms for manual application on patching contracts is acceptable. Tack coat shall not be applied in wet weather or at an ambient temperature lower than 10^{o}C.) The cuts shall be made with a cutting saw, giving a straight vertical face through the full thickness of the pavement to provide a smooth butt joint.

Temperature of the tack coat when applied shall be between 38°C and 66°C.

The Contractor shall protect or cover concrete walks, curbs, walls, adjacent structures manhole covers, catch basin grates, and other appurtenances, prior to spraying bituminous tack coat, to avoid over-spray of these sites. Any tack coat adhering to concrete walks, curb or adjacent structures along the street shall be removed at the Contractor's expense.

The Contractor shall be responsible to reinstate, at no expense to the Owner, any bituminous tack-coated surface which becomes fouled due to weather and/or traffic.

Placing Asphalt Concrete

Asphalt concrete binder and surface courses shall be placed to proper line and grade to give the compacted depth, crown, profile and cross section as per these specifications and detail drawings.

In order to bring the existing sub-base surface to proper shape and crown, patching, padding and/or leveling courses of asphalt shall be placed as required or directed. This work shall be considered as being incidental to the job and no additional payment or allowance will be made over and above the rate of payment for the type of asphalt used, as per the Schedule of Quantities and Prices.

Temperature of mixture shall not exceed 165°C. Temperature of mixture shall not be less than 118°C immediately after spreading and prior to initial rolling.

Mixture which does not comply with specifications and mixture which cannot be incorporated in the work shall be rejected.

For patching operations and driveway restoration, a minimum of one Class "B" steel-tired tandem roller weighing at least eight (8) tonnes must be used with each patching crew.

Along curb and gutter, headwall structures, sluice boxes, manholes and similar structures and places not accessible to roller, the mixture shall be thoroughly compacted by means of hot hand tampers and effectively sealed.

Each course after final compaction shall be smooth and true to required crown and grade. It shall have average thickness specified and shall vary no more than 6 mm from specified thickness.

The surface of finished pavement shall be free from depressions exceeding 3 mm as measured with a 3 m straight edge.

Any part of pavement not meeting the requirements of the Specifications shall be removed by the Contractor and replaced with acceptable fresh, hot mixture compacted to conform to surrounding area and thoroughly bonded to it.

Weather Conditions: When paving on aggregate base, the base must be free from standing water. Asphalt concrete shall not be placed when weather conditions of fog or rain prevail, nor when the pavement surface shows any signs of moisture. Mixes placed on existing paved surfaces shall be laid upon a dry tack-coated base.

Asphalt seal mixture shall not be placed unless air temperature at surface of road is 7°C and rising.

Transportation of Asphalt Mix: Trucks for transporting asphalt mixtures shall

have tight, metal boxes free of foreign materials. Loads shall be covered with tarpaulins of sufficient size to overhang the fully loaded boxes and be tied down on three sides and the front shall be tight to the box of the truck or shielded to prevent air infiltration. Tarpaulins shall be rolled back and the hot mix uncovered immediately prior to dumping the load into the paver. Trucks may be lightly lubricated with an approved release agent, as required, but must be raised and drained after each application and before loading.

Placing Asphalt Concrete: No traffic shall be allowed on newly placed asphalt concrete until finish rolling is completed and the finished mat has been permitted to cool to 60°C. Where a driveway must be re-opened to traffic immediately and natural cooling of the asphalt would delay this, water required to lower the mat temperature shall be supplied by equipment capable of applying the water at a uniform and evenly distributed rate in such amounts as required and/or as the Engineer may direct. Heavy applications of water that result in water running off the asphalt shall not be permitted.

Finish rolling will be carried out with a steel drum roller, without vibration and exerting a contact pressure on compression roll of at least 3.0 kg/mm of drum width.

Final Clean-Up

Immediately after the completion of the work, or any consecutive portion of it, the Contractor shall remove from the street all unused material refuse and dirt placed by him on or in the vicinity of the work and leave the street in a neat and clean condition.

8.3 CONSTRUCTION OF SUBSTRUCTURES

The right is reserved by the Owner during the progress of the work to construct, rebuild or replace with as little inconvenience to the Contractor as possible any structures such as manholes, inlets, valve boxes and to make any necessary connections or renewals with sewers, water mains or gas pipes lying within the limits to be paved and the Owner reserves the right to suspend the work at any time for the purposes above stated, without compensation to the Contractor other than extension of time for the completion of the work equal to the delay thereby caused.

8.4 MEASUREMENT

Asphalt Concrete Paving and Resurfacing

This work shall be measured in tonnes of asphalt concrete of the appropriate type in place, square units of tack coat applied, square units of pavement reinforcement, square units of fine grading, square units of subbase preparation, tonnes of base material in place, and square units of asphalt pavement cut and removed. Any asphalt quantity placed in excess of 110% of the theoretical quantity, based on the specified

thickness, shall not be included for payment.

Asphalt Concrete Patching

The work shall be measured in tonnes of asphalt concrete of the appropriate type in place.

8.5 PAYMENT

Asphalt Concrete Paving and Resurfacing

Payment for asphalt concrete paving and resurfacing shall be at the contract unit price for asphalt concrete of the appropriate type in place, for tack coat applied, for pavement reinforcement, for fine grading (when pre-existing granular base was placed by others), for subbase preparation, for base material and for asphalt cutting and removal.

Asphalt Concrete Patching

Payment for patching tenders shall be at the contract unit price for asphalt concrete of the appropriate type in place.

The cost of supplying and placing of tack coat shall be considered incidental to the work and shall be included in the supplying and spreading of asphalt.

The cost for cutting, excavation and preparation of the area in and around the hole to be patched and for overhaul and disposal of all excavated materials shall be considered incidental to the work and shall be included in the supplying and spreading of asphalt.

Excavation in excess of that normally required for the preparation of the area to be patched shall be paid for as subgrade preparation.

Asphalt Driveway Restoration

Payment shall be at the contract unit price for asphalt driveway restoration. This shall include the supply and transportation of all equipment, labour and materials, fine grading, cutting, construction joints, asphalt concrete supply, placement and compaction, protection of structures, clean-up and all work incidental thereto all as specified or as shown on the Drawings or as laid out by the Engineer. Sub-base and base material for driveway restoration work shall be measured and paid as provided under Section 7.0, Roadbed Construction.

General

The cost of supplying water shall be considered incidental to the work and shall be included in the supplying and spreading of asphalt.

All the work to be done by the Contractor for which specific unit prices are not named in the contract, as well as any minor details or work not specifically mentioned in the

specifications but obviously necessary for the proper completion of the work, shall be considered as incidental and as being a part of and included with the work for which prices are named in the contract. The Contractor will not be entitled to any extra or additional compensation thereof.

A slip must be received from each truck at the time of delivery, showing the weight and identifying the truck and driver. Only one load shall show on each slip. Any slips not received and signed by the Engineer or his representative at the time of delivery will not be included in the weight for payment.

8.6 COLD MILLING OF ASPHALT CONCRETE

8.6.1 Scope

This section governs the removal, haulage and stockpiling or disposal of existing asphalt concrete pavements by cold milling.

8.6.2 Construction Methods for Cold Milling of Asphalt Concrete

The Contractor shall provide equipment specifically designed for the controlled removal of existing asphalt concrete pavements. The equipment shall have controls for the control of longitudinal grade and transverse slope as well as depth of removal. The equipment shall permit care to be used in full depth removal to not contaminate the material being removed, and to limit the depth of removal in partial depth removal. The milling equipment shall collect and direct milled material to a conveyer loading system for immediate placement in trucks for transportation of the material.

During the asphalt concrete milling process, the Contractor shall provide traffic control and signage to protect the public and ensure the work is carried out in a safe manner. Barricades and warning signs shall be placed around the work area in accordance with Clause 2.8 Safety, Clause 2.37 Public Convenience, and Clause 2.47 Barricades and Warning Signs.

The Contractor shall use care during the milling process not to damage existing structures including but not limited to manholes, catch basins, valve boxes and chambers, and curbing. Any existing structures damaged during the work shall be repaired to the Engineer's satisfaction at no cost to the Owner.

In full depth removal, care shall be taken not to contaminate the milled material with underlying aggregate material.

All loose material remaining after partial-depth cold milling shall be swept to a granular shoulder or picked up from paved shoulders or gutters before re-opening the roadway to traffic. Any loose material from milling that enters catch basins or other structures shall immediately be removed by the Contractor, incidental to the work.

At all transverse vertical cuts milled in the existing pavement at the limits of the work area the Contractor shall immediately construct a temporary smooth taper with hot-mix asphalt concrete to a minimum slope of 25H:1V. The Contractor shall place signs at all such surface transitions to advise the public. Transitional edges around structures such as manholes and valve boxes shall be marked with fluorescent orange paint.

When partial depth removal is performed on a roadbed with paved shoulders, and some or all of the shoulder is to remain, the Contractor shall provide for drainage.

The Contractor shall remove all asphalt concrete from the faces of gutters, catch basins or manholes and other structures abutting the work in such a manner that the structures are not damaged, and the area after removal matches the grade of the adjacent removal area.

The Contractor shall continuously maintain the work site, in a condition to provide for the safe and efficient flow of traffic, free of potholes and any sharp transitional edges from the time of removal until such time as the new asphalt concrete is placed.

8.6.3 Removal and Stockpiling Materials from Cold Milling of Asphalt Concrete

Material resulting from the cold milling of asphalt concrete shall be collected and loaded for transportation without contamination from other materials. It shall be stockpiled or transported to the asphalt plant site to be utilized as reclaimed asphalt product [RAP]. RAP remains the property of the Owner.

If stockpiled, the RAP shall be placed using proper procedures for protecting this material from contamination or compaction. The height of RAP stockpiles shall not exceed 3 m, and no equipment or other traffic shall be permitted to travel on the RAP once stockpiled.

If RAP is transported directly to an asphalt plant site for use in a hot recycled asphalt mix, each load shall be weighed prior to depositing the material at the stockpile. The scale used must be acceptable to the Engineer. For any work to be weighed, a slip must be received from each truck at the time of delivery showing the net weight of the material carried, identifying the specific material carried, the truck and driver. Only one load shall show on each slip.

8.6.4 Measurement

The work shall be measured as the number of square metres of asphalt concrete acceptably milled to the depth specified and transported and stockpiled or disposed.

8.6.5 Payment

Payment for the work shall be at the contract unit price for milling of asphalt concrete surfaces.

Milling of asphalt concrete shall include the supply and transportation of all labour, equipment and materials, milling to the depth specified, loading, transportation, stockpiling, weighing, temporary surface transitions, drainage, protection of structures, signage, traffic control, safety, clean-up and all work incidental thereto, all as specified or as shown on the Drawings, or as directed by the Engineer.

ASPHALT CONCRETE PAVING, RESURFACING, PATCHING AND RESTORATION

SECTION No.9 – CONCRETE CURB & GUTTER AND SIDEWALKS

9.1 CONCRETE CURB & GUTTER AND SIDEWALKS

9.1.1 Scope

This section governs the supply of all labour, equipment and materials necessary for construction of Portland Cement concrete curb & gutter and sidewalks in accordance with the plans and specifications.

9.1.2 Materials

All Materials shall be supplied by the Contractor.

Aggregate Base

The Aggregate Base Material shall be an approved sound crushed rock conforming to NBDTI Specifications 201.2 and 201.4, latest version.

Geotextile

Geotextile fabric shall be as per Section No. 6 Roadbed Construction of these Specifications.

Portland Cement

Portland cement shall conform to the requirements for normal Portland cement, Type 10, CAN/CSA-A5.

Water

Water used in mixing or curing shall be potable water and meet the requirements of CAN/CSA-A23.1.

Fine and Coarse Aggregate

Fine and coarse aggregate for concrete shall conform to the requirements of CAN/CSA-A23.1. Coarse aggregate shall be 20 mm - 5 mm in nominal size.

Air-Entraining Admixture

Air-Entraining admixture shall conform to the requirements of ASTM Standard C 260.

Concrete

Concrete shall conform to the requirements of CAN/CSA-A23.I for Class C-2 exposure unless these or supplemental specifications provide otherwise. All ready-mixed concrete shall be supplied from plants certified by the APRMCA (Atlantic Provinces Ready Mixed Concrete Association) Concrete Production Facilities Certification Program. A copy of the certification of conformance shall be provided to the Engineer prior to start of delivery under the proposed contract.

Materials for curing concrete shall meet the requirements of CAN/CSA-A23.1. They shall be moisture proof paper (Orange Label Fibreen as manufactured by Domtar), or approved equal, or white liquid membrane forming curing compound, ASTM C309 (latest edition) or approved equal.

Forms
Forms shall conform to the requirements of CAN/CSA-A23.1 and shall produce a final cross-section in compliance with the detail drawings.

Expansion Joint
Expansion joint material shall be pre-moulded, asphalt, saturated, cane fibreboard - "Flexicell" as manufactured by Sternson Limited or approved equal. Thickness shall be 13 mm and shape shall conform to the section of the curb and gutter with which it is to be used.

Curb Drain and Fittings
Perforated Flexible Curb Drain and fittings shall be 100 mm Solflow by Soleno, Boss 1000 by Armtec, or approved equal, complete with factory-installed filter sock. This pipe must have a minimum 300 kPa stiffness at 5% deflection. All couplings shall be made with approved connectors. Filter sock shall be white polyester, needle punched, non-woven continuous tubular knit, regular tenacity filament of 4.0 – 5.5 grams/dernier, micro mesh, run-resistant, rot-proof, and inert to most soil chemicals.

Structural Soil
"Structural Soil" is to be used wherever possible around trees to allow for root growth while still allowing for compaction to create sidewalks, curbs or roadways. Mixture is as follows:

- 5 parts 12 mm – 40 mm washed stone
- 1 part sandy loam soil
- 30 grams Agrigel or Hydrogel or equivalent (e.g. Soil Moist)

Example Mix: 500 kg stone, 100 kg soil, 30 grams Agrigel

9.2 CONSTRUCTION METHODS

9.2.1 General
Concrete curb & gutter and sidewalk shall be constructed to the lines and grades as staked and in accordance with the typical cross sections shown on the drawings. Unless modified by these specifications, construction methods shall conform to the requirements of CAN/CSA-A23.I.

9.2.2 Preparation

9.2.2.1 Subgrade

Excavation for curb & gutter and sidewalk shall be to the depth and width shown on the plans or drawings. Disturbed material in the bottom of excavations shall be compacted to at least 95% of the maximum density as determined by ASTM D-698. Where existing curb & gutter or sidewalk is to be removed, the removal shall be done in a manner which leaves the subbase undisturbed in so far as possible.

The subgrade shall be excavated or filled to proper line, grade and cross section to provide a firm, smooth surface compacted to at least 95% of the maximum density as determined by ASTM D698.

All soft, yielding material or other portions of the subgrade that will not compact readily when rolled or tamped shall be removed and replaced with approved granular material and compacted to 95% of the maximum density as determined by ASTM D698.

9.2.2.2 Disposal of Excavated Material

Excavated materials, where suitable, shall be used as backfilling material for the works included in the contract. Excavated material shall be considered in the custody of the Contractor until delivered at the place designated.

Surplus excavated material, after all backfilling is complete, shall be disposed off site by the Contractor, at no cost to the Owner.

9.2.2.3 Perforated Flexible Curb Drain

Perforated Flexible Curb Drain shall be installed as per the construction drawings. Care shall be taken during placement to prevent damage or collapse of the drain pipe. Each successive length will be connected using approved couplings. The ends of the drain pipe shall extend into each catch basin and the annular space sealed with grout.

9.2.2.4 Placement of Sub-base and Base Materials

The Contractor shall supply and place sub-base and base material below the curb to the depth as shown on the Drawings. Sub-base and base material shall be compacted to 95% of maximum density as determined by ASTM D698.

The final surface after placement and compaction of base material shall be smooth and firm and permit the immediate placement of curb.

9.2.3 Concrete

9.2.3.1 Mix Design

Concrete shall be proportioned and have the uniformity of production, in accordance with the requirements of CAN/CSA-A23.1 for Class C-2 exposure.

Concrete shall have the following properties:

Maximum Water/Cement Ratio by Mass:	0.45
Minimum Cement Content:	400 kg/m^3
Minimum Strength at 28 Days:	32 mPa
Slump (See Note Below):	80 mm +30 mm
Air Content:	5% - 8%

The cement content of 400 kg/m^3 shall have a minimum of 360 kg/m^3 of Portland cement.

Slump may be reduced when an approved slip-form machine is employed for placing.

Failure to meet the requirements for slump and air content shall be cause for immediate rejection of concrete supplied in accordance with the General Requirements.

If at any time the design mix deviates from the 400 kg/m^3 of Portland cement, or there is any change of the components of the mix, a trial mix and 28 day strength of concrete cylinders must be submitted.

9.2.3.2 Placing and Finishing

9.2.3.2.1 General

Concrete shall be placed to proper line and grade to give the section required by the plans and typical sections. The time between batching and complete discharge shall not exceed 120 minutes.

Immediately prior to placing concrete the subbase shall be thoroughly moistened but with no puddling of water. Water to be supplied by the Contractor as incidental to the work.

Concrete shall be placed as close to its final position so as to minimize re-handling. It shall be placed and struck off in a manner which does not result in segregation. When required, hand spreading of concrete shall be done with shovels, not rakes.

Concrete shall be thoroughly consolidated against and along the face of all

forms and into the face of previously placed concrete to eliminate voids.

After placing, the concrete shall be leveled or screed to proper grade, then floated using an aluminium or magnesium float to eliminate unevenness. Floating is to be completed before bleed water accumulates on the surface.

Edging is required along all edge forms and at isolation/ expansion and construction joints. Edging shall begin after evaporation of bleed water. Wood floats are not permitted. Steel trowel is not allowed. A final light broom texture shall be applied to create a slip-resistant finish for sidewalks.

Adding water to the surface of the concrete to assist in the finishing operation is not permitted.

Adequate material and labour shall be at the site prior to placement to carry out finishing and curing, including material to protect the concrete from damage by rain. These shall include waterproof paper or plastic sheeting. The plastic sheeting shall not be left to continue as the curing material.

Approval for the use of a slip-form machine may be given by the Engineer providing the cast section conforms to the Standard Section. The Engineer may request the casting of a trial section at no cost to the Owner to verify the casting characteristics of the machine.

Placement of the slip-form machine guide markers shall be the responsibility of the Contractor. Any adjustment required prior to placement shall be carried out at no cost to the Owner.

Pedestrian traffic shall not be allowed on newly placed concrete for a minimum of twenty-four (24) hours. Light passenger vehicular traffic shall not be allowed on newly placed concrete for a minimum of seven (7) days. Truck traffic shall not be allowed on newly poured concrete for a minimum of twenty-eight (28) days.

9.2.3.2.2 **<u>Curb & Gutter</u>**

Control joints shall extend completely through the curb height and 1/4 into the gutter section and have a width not greater than 6 mm. They shall be spaced at intervals of 3 meters along the length of the curb and gutter.

Expansion joints shall be formed using expansion joint material at locations where the curb and gutter abuts structures.

If an approved slip form machine is used, control joints shall extend completely through the curb height and 1/4 into the gutter section and have a width not

greater than 6 mm. They shall be spaced at intervals of 3 meters along the length of the curb and gutter.

9.2.3.2.3 **Sidewalks**

The depth of lumber forms shall be at least 125 mm and not less than the thickness of any other concrete sidewalk required.

Control joints having a depth of not less than one quarter (1/4) that of the slab and width not greater than 6 mm shall be constructed at intervals of 1.5 meters along the length of the sidewalk.

Expansion joints shall be formed using expansion joint material at locations where the sidewalk abuts curb and gutter, buildings, or other objects and at 15 meter intervals. Joints and edges shall be tooled to give a radius of 6mm.

Following floating, the slab shall be given a skid-resistant texture by lightly scoring it in the transverse direction using a broom. Broom finish shall be at 90^{o} to curb at wheelchair ramps. The spacing of control joints shall vary to coincide with the centre of manholes or other box-outs.

9.2.3.2.4 **Curing**

As soon as practical after the texturing operation is completed, the entire surface, including exposed sides shall be protected against loss of moisture, rapid temperature change and mechanical injury, in accordance with the requirements of CAN/CSA A23.1.

Control joints by saw cuts are to be done 12 to 24 hours after pouring.

The surface must be protected from damage by traffic for a period of at least seven (7) days. The period for which moisture is applied or retained in the concrete surface shall be not less than seven (7) days immediately following the placing of the concrete.

The Contractor must use moisture proof paper or curing compound. Paper shall be a minimum width of 2 meters for both sidewalk and curb & gutter applications.

Polyethylene is not permitted as a substitute for moisture proof paper.

Edges of the curb and gutter or sidewalk shall be covered to prevent evaporation and all joints lapped 300 mm and adequately weighed to prevent displacement or billowing due to wind. Material folded down over the edges shall be secured by a continuous bank of earth. Tears or holes appearing in the curing paper during curing period shall be repaired immediately. Curing paper

shall not be reused once it has been installed.

Approved curing compounds shall be applied to the exposed surface and edges of the concrete immediately following the final texturing operation. Complete and uniform coverage shall be at the rate specified by the manufacturer. The compound shall be kept agitated to prevent pigment from settling. It shall be applied to the edges of formed concrete immediately following the removal of the forms. Membrane forming curing compound shall not be permitted following October 1, after which time moisture-proof paper shall be used.

9.2.3.3 Defective Concrete

If the concrete has been damaged in any way before complete set has taken place, or if any defects are discovered at any time prior to final acceptance of the work, i.e. cracking, vandalism, footprints, etc. or if samples taken from the work fail to meet specifications, the defective concrete shall be entirely removed to subgrade and replaced by new concrete at the expense of the Contractor. Concrete not placed to the required minimum thickness or width shall be removed and replaced at the contractor's expense.

9.2.3.4 Cold Weather Requirements

Moisture-proof paper shall be used when the forecasted nightly low temperature is at or below 5°C. When the outside air temperature is at or below -5°C, the concrete must be protected by adequate insulation or supplementary heating for a minimum of 7 days. To protect the concrete from cold weather, the Contractor shall provide fiberglass batt insulation over the surface of the concrete to produce a minimum R value of 10. The insulation shall be placed over the moisture proof paper and be covered by 6 mil polyethylene. Care shall be taken to lap all joints and secure all edges from heat loss. The Contractor shall prevent any removal of the completed system and shall replace at no extra cost all uncovered areas regardless of the cause of removal.

The placing temperature of concrete shall be between 10 and 35°C. To avoid cracking of the concrete due to sudden temperature change near the end of the curing period, the protection shall not be completely removed until the concrete has cooled to a permissible temperature differential.

No ice or snow shall be permitted on the placing surface. Concrete shall not be placed on, or against any surface that will lower the temperature of the concrete in place below 10°C. Under no circumstances shall concrete be placed over frozen ground.

9.2.4 Restoration

All properties within or adjacent to the construction area affected by the Contractor's

operations shall be restored to their original or better condition as per Section 12 of the Technical Specifications.

Immediately after completion of the work or any consecutive portion of it, the Contractor shall remove from the site all unused material, refuse and dirt placed by him on or in the vicinity of the work and leaves the site in a neat and clean condition.

9.2.5 Catch Basin Adjustment

Catch basins in the boulevard area shall be adjusted with appropriate precast concrete sections and be set at the elevation of the finished top of curb.

9.3 MEASUREMENT

9.3.1 General

Excavation for curb and gutter or sidewalk shall not be measured for payment but shall be included in the unit bid prices for installation of curb and gutter or sidewalk.

Excavation for Curb and Gutter RENEWALS shall not be measured for payment, but shall be included in the unit bid prices for removal and replacement of curb and gutter.

Perforated curb drain and its connection to the catch basin shall be measured by the lineal meter measured along the centerline of the pipe.

9.3.2 Curb and Gutter

This work shall be measured in linear meters of concrete curb and gutter in place including perforated flexible curb drain, curing, protection with insulation, cubic meters of extra excavation, cubic meters of borrow material if required, and tonnes of crushed rock in place.

9.3.3 Sidewalk

This work shall be measured in square meters of sidewalk in place, including curing, protection with insulation, cubic meters of extra excavation, cubic meters of borrow material if required, and tonnes of crushed stone in place.

Felts used for expansion joints at 15 meter intervals along the sidewalk and for isolating the curb and gutter at corners will not be measured for payment but will be considered as incidental to the work. Extra felts used for isolating fixed structures, buildings etc. will be measured in linear meters for payment.

9.4 PAYMENT

9.4.1 General

All the work to be done by the Contractor for which specific unit prices are not named in the contract, as well as any minor details or work not specifically mentioned in the specifications, but obviously necessary for the proper completion of the work, shall be considered as incidental and as being a part of and included with the work for which prices are named in the contract. The Contractor will not be entitled to any extra or additional compensation thereof.

9.4.2 Curb and Gutter

Payment for this work shall be at the contract unit price for concrete curb and gutter in place and shall include protection with insulation when required for borrow material and for crushed rock.

9.4.3 Sidewalks

Payment for this work shall be at the contract unit price for concrete sidewalk in place includes sidewalk protected with insulation when required for borrow material and for crushed rock.

9.4.4 Catch Basin Adjustment

Payment for structure adjustments shall be at the contract unit price for structure adjustments. Payment shall include the supply and installation of the pre-cast concrete sections, excavation, dewatering, backfilling and all incidental items.

9.4.5 Reduced Payment Schedule - Concrete Strength

The Owner will reduce payment on the unit bid item of concrete if the 28 day compressive strength of test cylinder(s) is less than the minimum 32 MPa. In assessing if the strength of the concrete used fails to meet the specified requirement, the Engineer will use the average of all test cylinders broken at 28 days for sections where that concrete was used. The limit of each section shall be defined as the point halfway from the point where the samples were taken to the next point [in each direction] where samples were taken. If only one set of cylinders was taken for a project, the section shall be defined as the entire work.

The Owner will not accept any concrete that has a compressive strength less than 24.0 MPa. All such work done utilizing such concrete as identified by the Engineer must be removed and replaced at the Contractor's cost, including all work incidental to its replacement.

The Table below lists the reduction in unit rates that the Owner will pay for strength reductions based on the compressive strength from concrete test cylinders at 28 days. If the Contractor has been paid for the work at the full Unit Bid Price, the reduction in payment due to sub-standard concrete strength shall be deducted from the amount

otherwise due on subsequent Progress payments, or from Holdback monies otherwise due.

	COMPRESSIVE STRENGTH RANGE	PAYMENT % OF UNIT BID PRICE
i)	Less than 32.0 MPa Equal to or greater than 28.0 Mpa	90% of unit bid
ii)	Less than 28.0 MPa Equal to or greater than 24.1 Mpa	75% of unit bid
iii)	Less than 24.0 Mpa	Total replacement at the Contractor's expense.

9.4.6 Reduced Payment Schedule – Scaling/Spalling of Surfaces

Individual concrete sidewalk blocks and curb sections showing evidence of scaling or spalling during the warranty period shall be noted according to severity of premature surface deterioration. This deterioration shall be as determined by the Engineer.

The Table below lists the reduction in Contract unit price rates that the Owner will assess against the Contractor for prematurely deteriorated concrete. Where the Contractor may have been paid for the work at the full Unit Bid Price, the reduction in payment due to sub-standard concrete strength shall be deducted from Holdback monies otherwise due. If the Contract unit price has already been reduced in whole or in part under Clause 9.4.5 - Reduced Payment Schedule – Concrete Strength, the reduction will be based on the weighted average of the unit prices paid to arrive at a net unit price.

In the event that total replacement is required, it shall be done by the Contractor under the same standards required by these Specifications as soon as site and weather conditions permit.

	% OF SECTIONS SHOWING SURFACE DAMAGE	PAYMENT % OF ITEM UNIT PRICE
i)	Less than 10%	100
ii)	10% – 25%	75
iii)	25% – 50%	50
iv)	More than 50	Total replacement at the Contractor's expense.

SECTION No.10 - ELEVATION ADJUSTMENT OR REPLACEMENT OF MUNICIPAL STRUCTURES

10.1 ELEVATION ADJUSTMENT OR REPLACEMENT OF MUNICIPAL STRUCTURES

10.1.1 Scope

This section governs the supply of all labour, equipment and materials for the adjustment or replacement of structures such as manholes, catch basins, inlets and valve boxes to the proper elevation in accordance with the plans and specifications or as directed.

10.1.2 Materials

10.2 CONSTRUCTION METHODS

All materials shall be supplied by the Contractor.

Portland Cement

Portland cement and water for concrete shall conform to the requirements of CAN/CSA A5 and CSA A23.I respectively.

Concrete

Concrete shall conform to the requirements of CSA A23.1 unless these specifications provide otherwise.

Valve Box Sections

Where existing valve boxes or portions thereof are not being reused, the valve box shall conform to this specification and to the Owner's standards.

Each valve will be complete with approved three piece cast iron screw type valve box adjustable (as manufactured by Bibby Ste. Croix or approved equal) or composite valve box (as manufactured by Mueller MVB or approved equal) complete with 686 mm ductile iron adjustable top and guide plate.

Valve boxes are to be supplied with proper range as shown on the Drawing and as required at the point of installation. Valve boxes will have a minimum base diameter of 350 mm. Top section will have two lugs for turning. Valve boxes will be adjustable from 1.8 m to 2.1 m unless otherwise required.

Covers must have an appropriate opening to allow for insertion of a pick for removal of the cover. Acceptable covers: Bibby Ste. Croix VB-825 (112 mm depth) or Mueller AJBV-5C when using the self-adjusting Mueller valve box top section, or approved equal and will be marked "Water". The Mueller adjustable valve box top (AJBV-5D), or equivalent will be accepted under certain conditions, to be determined by the Engineer or his designate, providing that the top bell section of the cast iron valve box

has been properly cut off to allow for fit. All valve box covers and adjustment units shall be of the long neck design.

Water Service (Curb) Boxes
Corporation service boxes for 19 mm and 25 mm diameter services shall have a 25 mm upper section and be adjustable for a depth of bury 1.8 m - 2.1 m and shall be Mueller Type A-726, Clow D1, or approved equal, with stainless steel stationary rods and stainless steel cotter pins, or standard rod with properly sized zinc anode, and Type A-800 cover. Curb boxes and stem for 38 mm and 50 mm diameter services shall meet the above requirements except that the model shall be Mueller Type A-728, Clow D2, or approved equal.

Precast Manhole and Catch Basin Sections
Minor changes in manhole or catch basin elevation can be done using the appropriate pre-cast concrete spacer section. Major changes to the depth of installation of a manhole or catch basin may require the use of precast manhole sections prior to using extensions for setting final grade.

Major adjustments of manholes shall be done using pre-cast concrete sections which will meet the requirements of the latest CSA A257.4 and ASTM C478 for pre-cast reinforced concrete manhole sections.

Joints between sections will be rubber gasket and Ram-Nek and will meet the requirements of the latest CSA A257.3.

Adjustment units for final height shall be with 150 and 300 mm concrete riser sections, as per detail drawings.

Manhole and catch basin sections shall be L.E. Shaw Ltd., Strescon or approved equal.

Frames and Covers
Where existing manhole or catch basin frames and covers are not being re-used, the following specification requirements shall apply.

All off-road manhole frames and covers shall be Pamrex by CertainTeed c/w SCS locking kit installed. Ductile iron shall meet the requirements of the latest ASTM A536.

Adjustable manhole frames and covers shall be used in roadway driving surfaces and shall be Laperle C-50 M1 or approved equal, shall be ductile iron and shall meet the requirements of the latest ASTM Standard A536 for ductile iron castings. Adjustable frames and covers are to be used where manholes are installed within a street driving surface. Units for final height adjustment may be cast iron manhole and catch basin

extension rings from Central Casting Ltd. of Amherst or approved equal. The 40 mm adjustment unit may NOT be used.

Catch basin frames and grates shall be cast iron meeting the requirements of the latest ASTM A-48.

Mortar and Grout

Mortar and grout shall conform to CSA Standard A179 - latest edition. Mortar shall be only Type M having a compressive strength of 14.0 MPa mortar when cured for 28 days. Grout shall be a non-shrink cementitious concrete grout having a maximum nominal aggregate size of 5.0 mm and have a compressive strength of 30 MPa at 3 days such as Sika 212 or equivalent. Materials and methods for construction shall conform to CSA Standard A179 - latest edition.

Mix proportions of grout shall be one part Type 10 Normal Portland cement to 2.5 parts concrete fine aggregate. Water shall be added to produce dry pack consistency. Dry pack is defined as a moist mix of 0% slump with enough water to form a ball when the mortar is squeezed gently in the hand. Mix portions of masonry mortar shall be one part type 10 Normal Portland cement, one part type N masonry cement, and six parts concrete fine aggregate.

Backfill

Backfill shall be as per Section 6.0 - Trenching, Bedding, Backfilling, Restoration and Maintenance of these Specifications. Where work is done in a new or existing roadway, roadway base and sub-base granular materials shall conform to 7.5.2 - Aggregate Base, and Clause 7.5.3 - Aggregate Sub-base Material. Where asphalt paving is required, asphalt materials shall meet the specifications of Clause 8.1.3 - Materials of Section 8.0 - Asphalt Concrete Paving, Resurfacing, Patching and Restoration.

10.3 CONSTRUCTION METHODS

10.3.1 General

Manholes, catch basins, sluice boxes, valve boxes and curb boxes requiring adjustment shall be raised or lowered in order to match the proposed finish grade of the sidewalk, curb and gutter, roadway or finished surface as per the Drawings.

10.3.2 Preparation

Barricades and warning signs shall be placed around the work area in accordance with Clause 2.8 - Safety, Clause 2.37 - Public Convenience, and Clause 2.47 - Barricades and Warning Signs. All materials and equipment required shall be brought to the site so there is no delay in the completion of the work. Cutting of adjacent asphalt shall be carried out so as to leave a vertical edge. The material immediately surrounding the

structure to be adjusted shall be carefully excavated and if to be reused shall be piled neatly nearby so as to cause minimum interference with vehicular and pedestrian traffic.

10.3.3 Adjustment

The structure, once uncovered, shall be adjusted up or down so as to have the top of the structure 10 mm below the finished grade level. If new components are required, they shall be in accordance with Clause 10.1.3 - Materials. However, existing materials shall be reused wherever directed by the Engineer.

If it is found that the lower portion of a structure is damaged or should otherwise be removed from use, additional excavation shall be done in order to allow its removal and replacement.

Existing pre-cast concrete catch basins and manholes shall be adjusted to finished grade levels with rings and covers sloped to match the crown of the road. Pre-cast sections if required shall be joined or replaced with rubber gasket and Ram-nek gasket or approved jointing compound. Cement mortar will not be allowed for jointing concrete sections.

Manholes and catch basins shall be lowered by removing the top section and replacing it with a shorter section. The minimum section height will not be less than 150 mm.

Final height adjustment shall be with a single cast iron manhole or catch basin extension ring laid on the concrete flat-top manhole section. The manhole frame or adjustment ring shall be separated from flat-top concrete risers and sealed with Ram-nek gaskets.

Water valve boxes and curb boxes shall be adjusted to the required elevation. If it is found that valve boxes are filled with debris such that they cannot be operated, the Engineer is to be advised so it may be cleaned out while the adjustment is being done.

10.3.4 Valve and Curb Box Repair or Extension

Should the Contractor encounter a valve or curb box requiring repair or extension the box will be excavated and the repair or extension performed using materials and methods conforming to these specifications. Upon completion of the repair, the box will be properly adjusted and backfilled with granular material compacted to 95% of maximum dry density as determined by ASTM D698. No separate payment shall be made for final height adjustment.

10.3.5 Backfilling

Backfilling shall be carried out as soon as the work permits. The use of vibratory rollers near and around the manholes shall be carried out carefully during this work.

Backfilling shall be carried out using the materials as shown on the Drawings.

Roadway material excavated from around the structure shall be replaced in uniform layers not exceeding 300 mm in thickness and shall be compacted using suitable vibration compactors to 95% maximum dry density as determined by ASTM D698.

If the excavated material is unsuitable for use as backfill, granular sub-base material shall be supplied by the Contractor and the unsuitable material removed and disposed of. This material shall be in accordance with Clause 7.1.3 - Materials. It shall be placed in uniform layers not exceeding 300 mm in thickness and shall be compacted using suitable vibration compactors to 95% maximum dry density as determined by ASTM D698.

10.4 MEASUREMENT

Each manhole, catch basin, sluice box, valve box and curb box that is adjusted shall be measured as a single unit.

Manual adjustments to curb boxes not requiring excavation will be considered incidental to the work and shall not be measured for separate payment.

10.5 PAYMENT

Payment for this work shall be at the contract unit price for the adjustment of valve boxes, for the adjustment of curb boxes, for the adjustment of manholes and for the adjustment of catch basins, acceptably done.

This shall include the supply and transportation of all labour, materials and equipment, barricades and signs, excavation, dewatering, protection of structures, adjusting the finish elevation of the structure, reuse of existing components and materials where approved by the Engineer, replacement of damaged or unsuitable materials, backfilling, base and sub-base materials, asphalt patching, compaction, disposal of surplus and unsuitable material, traffic control, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as directed by the Engineer.

All work done or materials supplied by the Contractor for which specific unit prices are not named in the contract, as well as any minor details or work not specifically mentioned in the Specification but obviously necessary for the proper completion of the work, shall be considered as incidental and part of the work for which prices are named in the contract.

REMOVAL AND DISPOSAL OF EXISTING ASPHALT AND CONCRETE

SECTION No.11 - REMOVAL AND DISPOSAL OF EXISTING ASPHALT AND CONCRETE

11.1 REMOVAL AND DISPOSAL OF EXISTING ASPHALT AND CONCRETE

11.1.1 Scope

This section governs the removal, haulage and stockpiling or disposal of existing asphalt or concrete.

11.1.2 Materials

Not applicable.

11.1.3 Construction Methods for Cut and Removal

The Contractor shall cut and remove all asphalt or concrete as marked or specified, within the limits of the proposed work. In order to facilitate removal and prevent lifting or damage to adjacent asphalt, concrete or structures during excavation, vertical cuts shall be made with cutting saws, in a manner so as to provide a straight line and proper transition between material that is to remain and what is to be removed. This work must be done in a manner which leaves the subbase undisturbed insofar as possible. Under no circumstances will the cutting of asphalt be allowed by the use of excavators or backhoe buckets, etc.

Where concrete sidewalk has been overlayed by a layer of asphalt, the removal will be considered as removal of concrete only.

Removed materials are will become the property of the contractor and may be used or disposed of as the contractor sees fit, respecting all regulations, by-laws, etc., pertaining to these materials and shall be disposed of in accordance with the General Requirements.

11.2 CONSTRUCTION METHODS FOR COLD MILLING OF ASPHALT CONCRETE

All loose material remaining after cold milling shall be swept to a granular shoulder or picked up from paved shoulders or gutters before re-opening to traffic.

At all transverse vertical cuts milled in the existing pavement at the limits of the work area, the Contractor shall immediately construct a temporary smooth taper with hot-mix asphalt concrete to a minimum slope of 25:1.

When partial depth removal is performed on a roadbed with paved shoulders, and some or all of the shoulder is to remain, the Contractor shall provide for drainage.

The Contractor shall remove all asphalt concrete from the faces of gutter, catch basins or manholes and other structures abutting the work, in such a manner that the structures are not damaged, and the area after removal matches the grade of the adjacent removal area.

The Contractor shall continuously maintain the work site, in a condition to provide for the safe and efficient flow of traffic, free of potholes and any sharp transitional edges, from the time of removal until such time as the new asphalt concrete is placed.

11.3 REMOVAL AND STOCKPILING OF MATERIALS

Removed materials will become the property of the contractor and may be used or disposed of as the contractor sees fit, respecting all regulations, by-laws, etc., pertaining to these materials and shall be disposed of in accordance with the General Requirements.

11.4 MEASUREMENT

The work shall be measured in square meters of asphalt cut and removed (for repairs, driveways and structures; lineal meters of asphalt cut for all other instances), square meters of asphalt cold milling, linear meters of curb and gutter removed and square meters of sidewalk removed.

11.5 PAYMENT

Payment for the work shall be at the contract unit price for asphalt cut and removal, for asphalt planning, for curb and gutter removal and for sidewalk removal.

Removed material becomes the property of the Contractor, payment for overhaul and disposal at the Contractor's site will be included in the price for removal.

11.6 CONSTRUCTION METHODS FOR PULVERIZING EXISTING SURFACE

The Contractor will pulverize the area for the streets shown on the accompanying drawings or as staked out by the Engineer on the ground.

Before any street work is undertaken by the Contractor, the Engineer will take all necessary levels and measurements for use in calculations of pulverize quantity. If the Contractor does not allow sufficient time for this to be done, the pay lines as shown on the drawings will be used to calculate the pulverization quantities.

Pulverizing work shall be carried out to the full width of the street, excluding shoulders. The Contractor shall carry out the work such that the pulverizing extends to a minimum depth of 100 mm but no greater than 150 mm into the aggregate base/sub base layer.

The Contractor shall ensure that this pulverized region is in a completely mixed and loosened condition, with all material sized such that 100% of the material passes the 75 mm sieve, when measured in accordance with ASTM C136. Oversize pieces remaining after pulverizing shall become the property of the Contractor and shall be disposed of outside the work site.

The re-graded surface material shall be compacted to a minimum of 95% of the maximum dry density, as determined by ASTM D698. Final shaping of the sub-grade surface will be obtained by means of a blade grader (other than a tractor) and will not vary by more than 19 mm from the lines and grades shown on the drawings or staked by the Engineer. The shaped and compacted surface must be smooth, hard, free from waves and undulations and competent in the opinion of the Engineer to provide adequate support for the street construction. All loaded earth-hauling equipment will be routed uniformly over the entire width of the section. Final shaping of the pulverized surface shall provide a 3.00% cross-slope.

The cost of pulverizing, shaping and compacting of the pulverized material will be included in the price tendered for pulverizing.

11.7 MEASUREMENT

The work shall be measured in square meters, measured before the start of the work, of surface properly pulverized.

11.8 PAYMENT

Payment for the work shall be at unit price for surface properly pulverized.

This includes supply and transportation of all labour, equipment, pulverizing, shaping and levelling of pulverized material, compacting, grading, shaping, traffic control, dust control, removal and disposal of unsuitable material, clean-up, and all work incidental thereto, all as specified or as shown on the drawings, or as laid out by the Engineer.

REMOVAL AND DISPOSAL OF EXISTING ASPHALT AND CONCRETE

SECTION No.12 - PROPERTY RESTORATION

12.1 PROPERTY RESTORATION

12.1.1 Scope

This section governs the supply of all labour, equipment and materials necessary for property restoration within or adjacent to the construction area as shown on the plans or as directed.

12.1.2 Materials

All materials shall be supplied by the Contractor.

Asphalt Concrete

Asphalt concrete shall be as per Section 8 of these specifications.

Crushed Rock

Crushed rock for driveway restoration shall be 19 mm minus (unless otherwise directed), but in all cases driveway restoration materials must match as closely as possible to the existing driveway materials.

Hydro-seeding

Hydro-seeding, topsoil and seeding shall be as per Section 13.

12.2 CONSTRUCTION METHODS

Where it is necessary to place sidewalk or curb and gutter adjacent to a paved area, the pavement shall be repaired following construction. Pavement repairs shall be accomplished using New Brunswick Department of Transportation and Infrastructure mixes of asphalt material to meet the sidewalk or curb and gutter and restore the area to its original condition.

The edge of existing asphalt to be restored shall be cut in a straight line to full depth using a cutting saw. The surface of the existing asphalt adjacent to the cut shall be swept clean in areas requiring paving. Tack coat shall be applied to the edge of the sidewalk or curb and gutter where the asphalt concrete will abut and to the edge of the asphalt cut and over the surface of existing asphalt requiring paving.

Where it is necessary to place sidewalk or curb and gutter adjacent to crushed stone driveways or walkways, they shall be repaired following construction. Such repairs shall be accomplished using a matching gradation and colour of existing crushed stone to meet the sidewalk or curb and gutter and to provide a proper grade for pedestrian and vehicle traffic and proper drainage. The standard material, where the existing is not obvious, shall be 19 mm minus crushed stone.

Restoration is to be completed as soon as possible at each individual property and not be left to the end of the project.

Where it is necessary to do restoration of driveways that are constructed of crushed stone not readily available at local quarries because of the type, gradation and colour, the contractor must retain and stockpile the stone in the individual owner's driveway for use in driveway restoration.

12.3 MEASUREMENT

The work shall be measured in tonnes of asphalt concrete in place and tonnes of crushed stone in place.

Each driveway that requires retention of existing stone, brick pavers or non-standard materials for restoration shall be considered individually.

12.4 PAYMENT

Payment for this work shall be at the contract unit price for asphalt concrete in place including tack coat and for crushed stone in place.

Payment for non-standard driveway restoration will be based on a negotiated price prior to work being done and paid for under contingency allowance, if not listed in tender items.

Where proper restoration requires cutting back embankments or slopes on private property to obtain proper grade, the excavated material shall be classified as extra excavation and paid by cubic measure.

All work to be done by the Contractor for which specific unit prices are not named in the contract or not specifically mentioned but obviously necessary for the proper completion of the work, shall be considered as incidental and as being a part of and included with the work for which prices are given in the contract.

SECTION No.13 – IMPORTED TOPSOIL AND HYDROSEEDING

13.1 IMPORTED TOPSOIL AND HYDROSEEDING

13.1.1 Work Under Other Sections

Section No.6 - Trenching, Bedding and Backfilling, Restoration and Maintenance.

13.1.2 Scope

This section governs the supply of all labour, equipment and materials for topsoiling and seeding of property for the purposes of establishing or restoring ground cover. Property shall be restored immediately following the installation of the pipe systems, road construction, curb and gutter or sidewalk or other portions of the work, as determined by the Engineer.

13.1.3 Materials

All materials are to be supplied by the Contractor. Prepared materials such as seed, fertilizer, lime, binder, dyes, etc., brought to the site shall be brought to the site in their factory containers/bags clearly marked as to material and mix components.

The Engineer shall be informed of proposed source of topsoil and sod and samples shall be provided before work begins. Basic soil tests will be done for N.P.K. (nitrogen/phosphorous/potassium) and pH. If test results indicate amendments are required, work will not commence until corrected and accepted by the Engineer.

Topsoil

Topsoil shall be friable loam and shall contain a minimum of 4% organic matter for clay loams and 2% for sandy loams to a maximum of 20% by volume, and having a pH of 6.0 to 7.0. Topsoil shall be free of admixture of subsoil, refuse, roots, stumps, sod, and stones larger than 20 mm.

Topsoil may be salvaged and stockpiled from other Contract work if approved by the Engineer. If screening is required to remove objectionable material this shall be done incidental to the work. Topsoil recovered from other Contract work shall not be measured for separate payment.

Fertilizer

Fertilizer shall be complete commercial, specially blended for promoting root development of newly seeded or sodded areas, Scotts Turfbuilder, Nutrite Nutri S Starter Fertilizer, Nu-Gro Turf Starter or approved equivalent, with a formulation ratio of:

2:4:1 80% SCU for spring until early fall planting (6-12-3)
1:4:1 l00% SCU for late fall planting (6-24-6)

Lime

Agriculture grade dolomitic limestone containing total 85% carbonates and graded as follows is to be applied at the rate as determined by the pH test results as determined by soil analysis:

Sieve Designation	Percent Passing
No. 10	100%
No. 100	50%

Hydraulic Mulch
Hydraulic mulch shall be a product specifically made for use in hydroseeding applications. It shall consist of shredded wood fibers, shredded newsprint coloured green with an environmentally acceptable dye, or shredded straw mixed with raw cotton fibers or shredded newsprint, also dyed green.

Seed and Hydraulic Seed for Municipal Mix
Canada #1 lawngrass mixture shall be to Government of Canada Seeds Regulations having a minimum germination of 75% with a purity of 95%. The following mix shall be used:

% By Weight	
60%	Kentucky Bluegrass (min - 3 varieties) equal % by weight
20%	Fescues (80% Creeping Red 20% Tall)
20%	Nurse Grasses (100% Perennial Rye) or (80% Perennial Rye + 20% Red Top)

Hydroseed slurry application per hectare shall be as follows:

Seed:	200 kg [minimum] or as recommended by seed Manufacturer
Fertilizer:	375 kg
Hydraulic Mulch:	500 kg
Erosion Control Agent:	As recommended by Manufacturer
Water:	Minimum 1000 liters

Adhesives [tackifier] for hydroseeding shall be commercial type in powder form and are to be used when slope or site conditions necessitate.

Erosion Control Agent
Emulsified asphalt to CAN/CGSB-16.2, Type 2 or polyvinyl acetate polymer.

Water
Clean, fresh and free from impurities that inhibit plant growth. Water will not be

provided by the Owner.

Sod
Commercial Grade Turfgrass Nursery Sod- Commercial turfgrass nursery sod is grass that has been seeded and cultivated in nursery sod fields as a turfgrass sod. At the time of sale, Commerical Grade Turfgrass Nursery Sod should be in healthy condition. Sod this quality may contain up to 5 broadleaf weeds per 40 square meters and up to 20% native grasses. Sod should be of sufficient shoot density that no surface soil will be visible from a standing position when mowed to a height of 4 cm. The mowing height range should be 7 to 10 cm, with the exception of creeping bentgrass sod, where mowing height is determined by the end use. The thickness of the soil portion of the sod should not exceed 1.5 cm (thickness of the soil portion of the sod may vary with field and environmental conditions at time of harvest). Note that the soil portion is generally composed of at least 50% volume of grass roots.

Commercial Grade Turfgrade Nursery Sod is suitable for erosion control, roadsides, boulevards, and minimum maintenance areas.

Accessories
Pegs – Wood 25 mm x 25 mm x 200 mm nominal size
Mesh – 37 mm chicken wire or plastic

13.1.4 Construction Methods

13.1.4.1 Field Conditions

Work shall not be performed under adverse field conditions, such as frozen ground or ground covered with snow, ice, standing water or very wet and soft conditions, without prior approval.

For hydraulic seeding (hydroseeding), reasonable care shall be taken to prevent spraying items outside the work area and various structures (buildings, fences, signs, etc). Hydraulic seeding shall not be performed in wind speeds over 20 km/hour. Any overspray on other facilities shall be cleaned up immediately, or it will be cleaned up at the Contractor's expense.

13.1.4.2 Preparation

Subgrade to be graded to eliminate uneven areas and rough spots, and to ensure positive drainage. All debris, roots, branches, stones in excess of 50 mm diameter, and other deleterious materials shall be removed, as well as any subsoil that has been contaminated with toxic materials. Contaminated material shall be properly disposed of off site. Grading adjacent to existing finished areas shall be graded to make a smooth connection with these areas and to ensure proper drainage across finished surfaces.

When topsoil is not required, following grading the area shall be cultivated or tilled to a depth of 50 - 75 mm.

Cultivation is to be repeated in those areas where equipment used for hauling and spreading has compacted the soil.

13.1.4.3 Placing Topsoil

Topsoil shall not be spread until the subgrade has been inspected and test results of the soil being placed have been given to and accepted by the Engineer.

Topsoil recovered from other Contract work and approved by the Engineer shall be used before any imported topsoil material is brought to the site.

Spread topsoil in a uniform layer over dry subgrade where seeding is to be done. Topsoil shall not be placed on frozen subgrade.

For seeded areas bring topsoil to finished grade by applying topsoil to a minimum depth of 100 mm then lightly roll to give a final minimum depth of 75 mm.

Fine grade topsoil to lines and elevations indicated, leaving surface smooth and uniform with a fine loose texture. Obtain approval of topsoil grade and depth before proceeding with seeding.

13.1.4.4 Application of Lime and Fertilizer

Lime shall be applied at rate of 2,200 kg/ha or at a rate determined with pH test results as determined by soil analysis. Lime shall be uniformly applied and mixed thoroughly into full depth of topsoil prior to application of fertilizer.

Fertilizer, when an area is being dry seeded, shall be uniformly applied at a rate of 375 kg/ha.

13.1.4.5 Dry Seeding

Seeding shall be completed during local growing season when natural moisture is available to ensure germination and growth (April – June, September – October).

Seed shall be applied with mechanical spreader at a rate 200 kg/ha or as recommended by seed manufacturer, then covered and rolled with a roller having a mass of 50 kg/m of width. The roller shall be pulled by equipment with high flotation tires so that no ruts, depressions, or other damage to the work surface results.

13.1.4.6 Sodding

Sod shall be placed as soon as possible after lifting to ensure proper establishment.

Sod shall be placed in rows perpendicular to the slope, smooth and even with adjoining areas, and with joints staggered. Sections to be butted closely without overlapping or gaps between sections. Irregular or thin sections shall be cut out. Where necessary, existing lawn or adjoining areas shall be cut out to accommodate sod and provide an acceptable seam with existing lawns. Sod shall never be placed over existing grass or lawn.

Sod shall be rolled with roller having a mass of 50 kg/m of width. Repeated rolling to correct irregularities in grade or surface profile is not permitted.

Sod shall be watered within 4 hours of placing to obtain moisture penetration through sod into top 100 mm of topsoil. The Contractor is responsible for the first full watering when the work has been completed directly in front of a residential property within the Owner's Title right-of-way, e.g. in the boulevard area or directly behind the curb or sidewalk fronting a residence. The landscaping company completing the sod work shall provide a letter (on their letterhead) to every affected homeowner/resident requesting their support and help in continuing the maintenance of the property fronting their home. This letter shall be approved by the Engineer prior to delivery.

For slopes steeper than 2 horizontal to 1 vertical (2:1), mesh shall be placed over topsoil and secured in place with pegs, then covered lightly with topsoil. Sod shall be placed next, secured with pegs. Pegs shall be placed at 100 mm below the top edges, spaced at 3 pegs per meter and flush with surface of root mat.

13.1.4.7 Hydraulic Seeding

Seeding shall be done during local growing season when natural moisture is available to ensure germination and growth. No hydroseeding shall be done after September 30th without the prior approval of the Engineer.

Charge seeder with water, and while agitating slowly add hydraulic mulch, seed, fertilizer, and lime until all components are thoroughly mixed.

When required add erosion control agent/binder to seeder and mix thoroughly to complete seeding slurry.

Apply uniformly at the rate as specified in Clause 13.3.1, Materials, blending into adjacent grassed areas.

After hydroseeding has been applied, the area shall be rolled with a roller having a mass of 50 kg/m of width. The roller shall be pulled by equipment with high flotation tires so that no ruts, depressions, or other damage to the work surface results.

In making up hydroseeding mixes, all quantities of materials used shall be confirmed by being measured by weight or by weight-calibrated volume measurement.

13.1.4.8 Maintenance : All Seeding

Grassed and seeded areas shall be watered adequately to assure continued growth. Watering shall be controlled to prevent washouts. Water will not be provided by the Owner.

Grass shall be mowed to height of 60 mm when it first reaches a height of 80 mm. Clippings which could smother grass shall be removed.

Cutting shall not be done when the site is so wet that mowing will cause ruts in the soil.

Grassed areas shall be fertilized after first mowing using a turf starter type fertilizer, at the manufacturer's recommended rate.

Subsequent cuttings of the seeded areas shall be done by the Contractor under the maintenance requirements of this contract until the work has been accepted by the Owner ["Date of Substantial Completion"].

The Contractor shall monitor all seeded areas during the maintenance period and if natural conditions do not provide sufficient moisture to maintain healthy growth of the sod, these areas shall be adequately watered. Water will not be provided by the Owner.

If, within eight (8) weeks of placement, any seeded areas fail to grow acceptable in the opinion of the Engineer, they shall be re-seeded by the Contractor under the maintenance requirements of this Contract.

13.1.4.9 Acceptance

Grassed or sodded areas will be accepted upon completion of second mowing provided that growth is properly established, and the area is free of bare and dead spots and without weeds.

Areas seeded in the fall will be accepted the following spring, one month after start of growing season, providing that acceptance conditions are fulfilled.

13.1.5 Measurement

The work will be measured in square metres of imported topsoil and seeding acceptably done; square metres of seeding acceptably done [including reuse of topsoil from the site where applicable]; square metres of topsoil and sod acceptably placed; square metres of sod acceptably placed [including reuse of topsoil from the site where applicable]; or square metres of hydroseeding acceptably done. The areas measured for payment shall be the on the pay lines as shown on the Drawings unless directed otherwise by the Engineer.

Reuse of existing topsoil from other areas of the work site, including screening, stockpiling, disposal of unsuitable or excess material, loading, transportation and spreading and clean-up of storage sites shall not be measured for separate payment but shall be considered as incidental to the work to strip and excavate this material.

13.1.6 Payment

Payment for this work shall be at the contract unit price for topsoil and seeding, for seeding, for topsoil and sod, for sod, and for hydro-seeding, all acceptably done.

Imported Topsoil and Seeding

Payment for imported topsoil and seeding shall include the supply and transportation of all labour, equipment, and materials, preparation, soil amendments, mixing, grading, imported topsoil, distributing, seed, fertilizer, rolling, maintenance including cutting and watering, re-seeding as directed, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as laid out by the Engineer.

Seeding

Payment for seeding shall include the supply and transportation of all labour, equipment, and materials, preparation, soil amendments, mixing, grading, reuse of topsoil recovered from the work where specified, distributing, seed, fertilizer, rolling, maintenance including cutting and watering, re-seeding as directed, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as laid out by the Engineer.

Imported Topsoil and Sod

Payment for imported topsoil and sod shall include the supply and transportation of all labour, equipment, and materials, preparation, grading, soil amendments, mixing, distributing, imported topsoil, sod, cutting and trimming, mesh and pegs where required, rolling, maintenance including cutting and watering, re-sodding as directed, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as laid out by the Engineer.

Sod

Payment for sod shall include the supply and transportation of all labour, equipment, and materials, preparation, grading, soil amendments, mixing, distributing, reuse of

topsoil recovered from the work where specified, sod, cutting and trimming, mesh and pegs where required, rolling, maintenance including cutting and watering, re-sodding as directed, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as laid out by the Engineer.

Hydroseeding
Payment for hydroseeding shall include the supply and transportation of all labour, equipment, and materials, preparation, soil amendments, mixing, distributing, rolling, maintenance including cutting and watering, re-hydroseeding as directed, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as laid out by the Engineer.

All work to be done by the Contractor for which specific unit prices are not named in the contract or not specifically mentioned but obviously necessary for the proper completion of the work, shall be considered as incidental and as being a part of and included with the work for which prices are given in the Contract.

13.1.7 Straw / Hay Mulch Erosion control

13.1.7.1 Scope

This section governs the supply and application of straw and/or hay mulch on exposed ground or newly seeded areas as a form of erosion control and to minimize the siltation of watercourses. The requirement for this will be determined by the Engineer.

13.1.7.2 Timing of Application

Mulching of seeded areas shall be completed within forty-eight [48] hours of the seeding having been placed. Mulching of unseeded areas when directed by the Engineer shall be carried out within forty-eight [48] hours of being directed by the Engineer to do so.

13.1.7.3 Materials

All mulching shall require binder, except mulching placed by hand or applied very late in the year when ground conditions or freezing temperatures inhibit the application of binder.

All materials, binders/tackifiers and equipment for this item shall be supplied by the Contractor and shall conform to the following.

Mulch for use over Municipal Hydroseeding Mix or Residential Seeding shall be processed [shredded] straw mulch. Mulch for use over Rural or Roadside Hydroseeding Mix or in bare soil areas shall be in unprocessed form.

Mulch shall be either straw or hay supplied in the following forms:

- an unprocessed form such as bales or rolls free of noxious weeds and other undesirable material. Bales or rolls are to be dry and free of decayed or compacted materials that will inhibit uniform spreading;
- a processed form such as shredded straw, newsprint, and/or cotton fibers; or,
- an approved equivalent

Binders/Tackifiers shall be a biodegradable adhesive capable of securing the mulch particles together and adhering them to the ground for a period of not less than sixty (60) days from the time of application. They shall not form impervious seals that prevent percolation of rainwater into the under-laying soils. Binders/tackifiers shall be supplied in liquid, flake or powder form.

Water shall be contaminant-free and obtained from a source approved by the Engineer.

13.1.7.4 Construction Methods

Mulch shall be uniformly applied to the designated areas at a rate of 4500 kg/ha (± 15%). Lumps and thick clumps of mulch shall be thinned or broken apart and dispersed.

Binder shall be applied in accordance with the manufacturer's recommendations. Sufficient environmentally acceptable green dye shall be added to the mixture to confirm application.

Mulch may be combined with the other materials and distributed in a single operation using a hydroseeding unit, or the mulch may be applied separately and the coloured binder solution sprayed on the placed mulch within 48 hours of its placement.

Rough ground and/or steep slopes require more mulch and binder per hectare than finished and/or flatter ground. Therefore, material application quantities shall be adjusted as required to ensure that the specified application rates are achieved. The additional quantities of mulch and binder shall be taken into account in the unit price tendered for this work, based on the site conditions.

The Contractor shall take reasonable care to prevent application of overspray onto structures or unintended areas. The Contractor shall immediately remove any overspray applications on structures or areas not intended for coverage, in a method approved by the Engineer.

13.1.7.5 Maintenance

The Contractor will maintain the mulched area under the maintenance requirements of this contract until the work has been accepted by the Owner

["Date of Substantial Completion"] or until no longer required as determined by the Engineer. It will be monitored and maintained by repairing all damaged mulch and by re-mulching bare spots resulting from the wind, water or other causes. This will include adding additional mulch as required, using the procedures as specified herein.

13.1.7.6 Measurement

The work shall be measured in square metres of mulch acceptably applied in accordance with this Section. The area shall be measured along the slope of the ground.

13.1.7.7 Payment

Payment for work will be at the contract unit price for straw or hay mulch erosion control acceptably applied. This shall include the supply and transportation of all labour, equipment and materials, site preparation, mulch, binder, dye, water, distribution, maintenance including re-mulching, clean-up and all work incidental thereto, all as specified or as shown on the Drawings, or as directed by the Engineer.

SECTION No.14 – CULVERT PIPES AND RIP-RAP EROSION CONTROL

14.1 WORK UNDER OTHER SECTIONS

Section 6.0 - Trenching, Bedding, Backfilling, Restoration and Maintenance
Section 7.0 – Roadbed Construction

14.2 CULVERT PIPES

14.2.1 Scope

This section governs the supply of all labour, materials and equipment and incidentals necessary for the complete installation of all culvert pipes as shown on the drawings and herein specified.

14.2.2 General

New Culverts, Culvert Replacement, Culvert Upgrades

Where it is specified that new culverts are to be supplied and installed as part of new roadway construction, or existing culverts are to be removed and replaced with new or larger culvert pipe because of condition or capacity issues, this work will be constructed, measured and paid in accordance with this Section.

Removal and Replacement of Existing Culverts

Any culverts shown on the Drawings and required to be removed for the purpose of accommodating pipeline installation shall be removed and reinstalled in accordance with the requirements of this Section. Where the condition of an existing culvert [including headwalls] is deemed by the Engineer to be acceptable for re-installation, the existing culvert shall be re-installed by the Contractor. There will be no separate payment for such culvert pipe removals and replacements as this will be considered incidental to the work. Where a culvert pipe or headwall that would have been acceptable for re-installation is damaged by the Contactor and cannot be re-used, the Contractor will replace the culvert pipe with a new culvert pipe meeting this specification at no cost to the Owner.

Where the condition of an existing culvert and/or headwall is deemed by the Engineer to not be acceptable for re-installation, a new culvert pipe and/or headwall meeting this specification will be supplied and installed at the tendered price for culvert pipe and/or headwall.

14.2.3 Materials

The latest revisions of all CSA and ASTM specifications are considered as part of this Specification.

Minimum size of culvert pipes shall be 450 mm, unless otherwise noted on the drawings.

Culvert pipes will be supplied by the Contractor except where existing culvert pipes are to be re-used.

Culvert pipes shall be:

Polyethylene pipe (R320, NBDTI grade) and shall be high-density non-perforated polyethylene corrugated plastic pipe with smooth integral PVC lining meeting the requirements of the latest CSA B182.6 standard, size as indicated on the drawings or as directed in the field. Couplers used shall be of the same specifications as the pipe. Gaskets at joints shall be as supplied by the pipe manufacturer to make a watertight joint.

OR

Reinforced concrete pipe shall conform to CSA A257.2, Class 65D (ASTM C76 Class III), 100D (ASTM C76 Class IV), or 140D (ASTM C76 Class V) for reinforced concrete pipe (pipe class to be as indicated on the drawings). Joints to be bell and spigot type with rubber gasket meeting the requirements of CSA A257.3 for concrete pipe. This is a push-on joint and must be watertight.

OR

Corrugated metal pipe shall be round 16 gauge double zinc dipped galvanized and meet the requirements of the latest CSA Standard G401. Steel coupling bands with rubber seals will be used to join corrugated steel pipe and shall be of the same specifications as the pipe.

14.2.4 Equipment

The Contractor will utilize laser beam instrumentation and techniques to determine intermediate line and grade for all culvert pipes except where and when the Engineer may allow other methods to be used.

14.2.5 Construction Methods

Where existing culvert pipes and headwalls exist and are to be re-used in the work, the Contractor shall use appropriate care to excavate, remove, clean, and store the culvert to prevent damage to the material. When multiple culverts are removed prior to being re-installed, shall be properly marked for re-installation in the correct location. Re-installation shall follow the same procedures as required herein for new culvert pipe.

Where existing culverts and headwalls are being re-installed, the Contractor shall provide and use new connectors, gaskets, etc.

New culvert pipes shall be installed according in the sizes, in the locations, and to the

grades as indicated on the drawings.

Prior to placing the pipe in the ditch or trench, each pipe shall be inspected for defects. All defective pipes shall be removed from the site and replaced with sound material. All dirt and gravel must be kept out of the joint and all gaskets kept clean.

Culvert pipes will be laid in the trench so after the culvert is completed the interior surface will conform accurately to the grades and the alignment of the ditch or other location. All adjustments of line and grade of pipes laid directly upon the bottom must be done by scraping away or filling in the backfill under the body of the pipe and not by blocking or wedging up. Any pipes which have a bell end of larger diameter than the pipe shall have the bed of the trench dug out at the bell to conform to this shape and avoid any point loadings of the pipe on the trench.

Where existing culvert pipe is being extended, the new pipe shall be installed as described herein. This work shall include preparations of the existing pipe as required for the connection, connection to the existing pipe, re-bedding under the existing pipe at the point of connection, and removal of debris.

The existing headwalls to be re-used are to be adjusted or reinstalled as required with the same materials as on site, or materials to match the existing.

New headwalls are to be constructed of the materials and to the dimensions as shown on the Drawings. This shall include connection to the culvert pipe to make a tight connection that will not permit soil or debris to wash into the pipe behind the headwall.

Installation of all culvert pipes shall be according to recommendations of the pipe manufacturer and in accordance with recognized good practice. Proper implements, tools and facilities shall be provided and used by the Contractor for safe and efficient execution of the work. Bedding and backfilling of culvert pipe trenches shall be as shown on the Drawings or as laid out by the Engineer.

Culvert pipes shall be carefully lowered into trench in such a manner as to prevent damage to them. Under no circumstances shall culvert pipes be dropped into a trench. All culverts are to be installed with gaskets at the joints, installed according to the pipe manufacturer's recommendations.

Culvert pipes shall be thoroughly inspected in the field before and after laying. Any defective or damaged culvert pipe shall be immediately removed from the site and replaced with new sound material at the Contractor's expense.

Culvert pipes shall be laid true to line and grade with uniform bearing under the full length of the barrel of the culvert pipe. Any culvert pipe, which is not in true

alignment or shows any undue settlement after laying shall be taken out and re-laid at the Contractor's expense.

Until there is at least 300 mm of cover over new or re-installed culvert pipes, no walking on or working over them will be allowed, except as necessary for backfilling the trench and compaction of the bedding material.

Temporary watercourse diversions and silt fencing related to culvert installations shall be incidental to the work.

14.2.6 Cleaning of Existing Culvert Pipes

Culvert pipes marked to be cleaned shall be done with high water pressure equipment. Work to be done by Contractor specializing in this type of work.

Material removed during the cleaning operations shall be disposed of off-site by the Contractor and will not be allow to flow in the ditch; incidental to the work.

14.2.7 Measurement

Measurement of new culvert pipes shall be in linear metres (installed) measured along the center line of the pipe for each type and size acceptably installed.

Measurement of new headwalls shall be as the number of units of each type and size, acceptably installed.

Removal and re-installation of existing culverts and headwalls for the purpose of permitting the installation of other infrastructure will not be measured for payment but shall be considered incidental to the infrastructure installation work.

Measurement of existing culvert pipes to be cleaned shall be by the number of units acceptably cleaned.

14.2.8 Payment

Payment for work under this section shall be at the contract unit price for the appropriate size and type of pipe, and at the contract unit price for each type and size of headwall.

New Culvert Pipe

Payment for new culvert pipe shall include the supply and transportation of all labour, equipment and material, excavation, dewatering, bedding, supply, installation and joining of the pipe, couplings and gaskets, connections to existing pipe where required, connections to headwalls, backfilling, compaction, the removal and disposal of excess or unsuitable materials, traffic control, watercourse diversions and silt fencing, maintenance, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as directed by the Engineer.

New Culvert Headwalls

Payment for new culvert headwalls shall include the supply and transportation of all labour, equipment and material, excavation, dewatering, bedding, supply, installation of headwalls, connection of the headwall to the culvert pipe, backfilling, compaction, the removal and disposal of excess or unsuitable materials, traffic control, watercourse diversions and silt fencing, maintenance, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as directed by the Engineer.

Cleaning of Existing Culvert

Payment for cleaning of existing culvert shall include the supply and transportation of all labour, equipment and material, high pressure cleaning including water, excavation of both culvert ends as required, disposal of material following cleaning of the pipe, traffic control, watercourse diversions and silt fencing, maintenance, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as directed by the Engineer.

General

There shall be no separate payment for imported bedding material, in accordance with Section No. 3 - Trenching, Bedding, Backfilling, Restoration and Maintenance.

Payment for imported granular backfill shall be according to Section No. 3 - Trenching, Bedding, Backfilling, Restoration and Maintenance. However, there will not be an additional payment for backfill material where it is paid as part of other work including roadway construction, dike construction, or other site work.

14.3 RIP-RAP AND GEOTEXTILE FILTER FABRIC

14.3.1 General

Rip-Rap will be placed as shown on the drawings or as directed by the Engineer in the field. The contractor shall carry out the work to the grade and dimensions as shown on the drawings or as laid out by the Engineer. If this requires excavation of material to achieve the grades and dimension required, this work shall be incidental to this item and not measured for separate payment.

14.3.2 Materials

14.3.2.1 Rip-Rap

Rip-Rap will consist of hard, durable quarry stone, free from seams, cracks or other structural defects. Distribution of rock per size and minimum thickness shall be in accordance with NBDTI Standard Specifications Item 608, Table 608-1. The rock size shall be as shown on the drawings.

14.3.2.2 Geotextile Fabric

Prior to the installation of the rip-rap material, a non-woven geotextile fabric

shall be installed unless otherwise noted on the drawings. Geotextile Fabric will be installed to provide a separation between the sub-grade soils and the rip-rap and protect against the migration of fine particles. The filter fabric shall be non-woven type.

Geotextile fabrics shall meet the following minimum requirements:

PROPERTY	UNIT	ASTM TEST	NON-WOVEN
Mullen Burst Strength	KPa	D3786	1110
Tearing Strength (Trapezoid Method)	N	D4533	160(N1)
Grab Tensile Strength (Both Directions)	N	D4632	400(N1)
Elongation at Break	%	D4632	50
Apparent Opening Size	Um	D4751	50-250
UV Degradation	% Ret.	D4355	
Permittivity	Sec – 1	D4491	1.75 – 3.50

Property values are Minimum Average Roll (MAR) values. A specification based upon minimum roll average ensures that over 95% of the fabric in a lot will meet or exceed minimum requirements.

Acceptable product: Terrafix 270R as manufactured by Terrafix Geosynthetics, Geotex 501 as manufactured by Propex Geosynthetics or approved alternate.

Filter fabric to be used under rip-rap material will not be measured for payment but shall be considered incidental to the tendered price for rip-rap material.

14.3.3 Construction

Rip-rap shall be placed in the locations and to the dimensions and thickness as shown on the Drawings.

The Contractor shall as part of the work dewater the site to permit this work to be carried out.

The site for placement of rip-rap shall be graded and compacted as required. Compaction shall be to 95% of maximum dry density as determined by ASTM D698.

Rip-rap of the correct size shall be transported to the site and carefully placed using appropriate equipment. Placement shall be done without damaging any adjacent structures or geotextile material and shall result in the specified area and depth of rip-rap coverage as shown on the Drawings.

14.3.4 Measurement

The quantity to be measured for payment will be the number of tonnes of rip rap complete with geotextile acceptably installed.

14.3.5 Payment

Payment for work under this section shall be at the contract unit price for the appropriate size of rip-rap including geotextile filter fabric.

Payment for rip-rap shall include the supply and transportation of all labour, equipment and material, site preparation, placement of geotextile where required, transportation, placement of rip-rap, the removal and disposal of excess or unsuitable materials, environmental protection, clean-up and all work incidental thereto, all as specified or as shown on the Drawings or as directed by the Engineer.

A slip must be received from each truck at the time of delivery, showing the weight, type of rip-rap being delivered, and identifying the truck and driver. Only one load shall show on each slip. Any slips not received and signed by the Engineer or his representative at the time of delivery will not be included in the weight for payment.

SECTION No.15 – SECURITY FENCING

15.1 SECURITY FENCING

15.1.1 Scope

The work under this section consists of the supply of all labour, materials, equipment and incidentals necessary to complete the installation of chain link fence and gates in accordance with the standard drawings.

15.1.2 General

All materials shall be supplied by the Contractor. The Contractor shall submit, in advance of the commencement of the work, the manufacturer's certification that the materials supplied meet the specified requirements, and the manufacturer's recommended procedures for installation and instructions for handling.

The Contractor is to install new fencing, single vehicle entrance gate and man gate in locations as indicated on the drawings, or as directed by the Engineer. The fence shall be protected from damage during the construction period, and any required repairs will be the Contractor's responsibility throughout the warranty period, at no additional cost to the Owner.

15.1.3 Materials

15.1.3.1 Chain Link Fence

Fence material and appurtenances shall meet the requirements of CAN/CGSB 138.1 Class A, Grade 2 and 138.2 (frame work), unless stated otherwise. Chain link fence gates and fittings shall meet the requirements of CAN/CGSB 138.4.

15.1.3.2 Fabric

The fabric shall be chain link, 50 mm diamond mesh pattern, 1800 mm high, constructed of #9 gauge steel wire. The fabric shall be hot-dipped galvanized after fabrication or woven from electro galvanized wire with an average weight of zinc coating not less than 366 gm/sq.m. (1.2 oz/sq. ft.) of uncoated surface, Type 1, Class A or B, Style 2, 3.5 mm (9ga.) medium.

If barbed wire is not required, the top selvedge of the fabric shall be twisted and the bottom selvedge shall be knuckled. The fabric shall be woven from electro-galvanized wire, or hot dipped galvanized after weaving.

If barbed wire is required, top of fabric shall be barbed, bottom knuckled and reinforced with #9 gauge steel wire.

The fabric shall be hot-dipped galvanized after fabrication or woven from electro galvanized wire with an average weight of zinc coating not less than 366 gm/sq.m. (1.2 oz/sq. ft.) of uncoated surface, Type 1, Class A or B, Style 2, 3.5 mm (9ga.) medium.

15.1.3.3 **Line Posts**

Line posts shall be 60 mm OD schedule 40, 4.0 mm wall thickness, minimum mass of 5.45 kg/m, scale-free, hot-dipped galvanized tubular steel pipe.

15.1.3.4 **Terminal Posts**

The fence shall have end and corner posts of 89 mm OD, schedule 40, 5.5 mm wall thickness, minimum mass of 11.28 kg/m, scale free, hot-dipped galvanized steel pipe, complete with stretching bands and bars for attaching fabric to the post and bands for attaching the brace equipment. They shall be provided with caps without projections to match the overhand tops.

If barbed wire is required, fence is to be equipped with barbed wire; gate, straining and end post shall be 280 mm higher than the line post and corner posts, and shall have bands for attaching the barbed wire.

Note: For gate panels over 8.4 sq. m., a 114 mm OD Schedule 40 post is required. For gates over 13 sq. m., a 168 mm OD Schedule 40 post is required.

15.1.3.5 **Top Rails**

The fence shall have a top rail 43 mm OD, schedule 40, 3.6 mm wall thickness, minimum mass of 3.38 kg/m, scale free, hot-dipped galvanized steel pipe connected at the joints with sleeves that allow for construction and expansion.

Barbed Wire (If Required)

Fence is to be equipped with barbed wire where all posts excepting gate posts shall be fitted with a high strength aluminum alloy top, having an eye to hold the top rail, and an outward projection to hold a barbed wire overhang. This projection shall be provided with slots to hold 3 bands of barbed wire spaced 100 mm apart. The projections shall be approximately 300 mm long and shall be project away from the fence at an angle of 45 degrees above the horizontal.

15.1.3.6 **Braces**

End and corner posts shall be braced by a diagonal brace, of the same material as the top rail, between the gate or corner post and the next post, as shown on drawings.

15.1.3.7 **Gates**

Gates shall be made to match the fence with minimum 43 mm OD, scale-free, hot dipped galvanized steel pipe, electrically welded at all joints. Fabric shall

be fastened to the frame with galvanized steel bands and tension bars. All gates shall have vertical and horizontal bracing.

Vehicle gates shall have a diagonal brace extending from the top corner on the hinged end to the bottom corner on the free end. The bracing shall be of 33 mm OD, scale-free, hot dipped galvanized steel pipe, electrically welded at all joints. Diagonal bracing shall be 27 mm OD galvanized steel pipe.

Gate shall be fitted with malleable iron hinges and shall have latches to hold the gate closed with fittings provided for padlocks. Gates shall be topped with 3 strands of barbed wire to match fence.

All gates are to be provided with a galvanized steel post to anchor gate when open and complete with galvanized anchor pin on gate. Galvanized steel post shall match the requirements of line posts.

15.1.3.8 Barbed Wire Overhang (If Required)

The overhang shall be outward and shall consist of 3 strands of 4 point barbed wire with barbs at max 150 mm spacing. The barbed wire shall have a minimum galvanized coating of 244 gm/squ.8 (.8 oz/sq. ft.).

15.1.3.9 Fittings

All parts, fittings, wire clips, nuts, bolts, etc, shall be hot-dipped galvanized steel, or aluminium.

15.1.3.10 Padlocks

The Contractor shall supply with each gate assembly, one (1) weatherproof padlock. Padlock shall be long style weather resistant pad locks keyed to the Owner's master key system. Two keys for each new lock shall be provided.

15.1.4 Installation

15.1.4.1 General

Exact location of the fence and gates will be determined in the field by the Engineer. Details of construction are to be in accordance with the standard drawing, which forms part of this specification. All phases of the work shall be performed to the satisfaction of the Engineer. The Contractor is responsible to verify all dimensions, details and requirements of the work prior to installation, in order to provide a quality finished fence.

15.1.4.2 Grade and Line

The bottom of the fence fabric after erection shall be not more than 75 mm above finished grade elevation and compaction must be completed before fence erection starts.

Prior to the construction of the fence, the Contractor shall remove any debris and correct any minor ground elevation problems which would interfere with the proper construction of the fence in its designated location. All fence grades and line shall be subject to the approval by the Engineer.

15.1.4.3 **Post and Spacing**

The locations of end posts and gate and corner posts are fixed by the site plan; nominal gate width is the distance between the inside faces of the gate posts. Corner posts shall be installed wherever the fence line changes direction by more than 1 in 10 or changes elevation by more than 1 in 3. Line posts spacing shall be uniform and shall not exceed 3000 mm.

If an end or gate post adjoins a building wall, the post shall be set as close to the wall as possible. If an obstruction or major ground elevation difference prevents placing a post at 3 m from an adjacent post, the post may be placed not less than 2.4 m from the next post and in no case more than 3 m.

Straining posts are required in stretches over 150 m long.

Top rails, braces and appurtenances shall be installed in accordance with the manufacturer's recommendations.

Terminal posts shall be braced in accordance to clause 15.1.3.6.

Footings

Concrete footings shall be provided for all corner, end gate posts and diagonal brace post only. Footings may be poured to earth, except in granular soils where forming tubes will be required.

Concrete footings will have a minimum depth of 1500 mm. Concrete footings for gate end and corner posts will have a minimum diameter of 300 mm.

Footing excavations shall be dewatered before concrete is placed. Form tubes shall be used in granular soils.

Backfill shall be excavated material except in clay or rock where the footing shall be backfilled with gravel.

All backfill shall be tamped in not more than 200 mm layers.

15.1.4.4 **Installation of Posts**

Only end posts, corner posts, brace post and gate posts shall be set in concrete. Gate and corner posts shall be set to a depth of 1440 mm. Line posts shall be set to a depth of 915 mm.

The posts shall be centered in the concrete and shall be plumb and in line within 6 mm. Gate posts shall be set at the same elevation regardless of ground contour.

When the concrete in the footings is set, the post bands shall be installed from the top without spreading. The barbed wire bracket shall extend outside the fence unless otherwise specified.

15.1.4.5 Installation of Fabric

Fence fabric shall be installed on the outside of the line posts and top rail barbed edge at the top, knuckled edge at bottom. The fabric shall be continuous between 89 mm dia. posts. If necessary to join two (2) lengths of fabric, they shall be spiced using the existing fabric wires without altering the diamond mesh pattern. Splicing by overlap will not be permitted.

The fabric shall be broken at each end, gate and corner post, and secured to the post by a draw bar and a minimum of 6 evenly spaced offset bands.

The top of the fabric shall not be below the top of the top rail. Fabric shall be secured to the line posts and top rail with wire clips at 500 mm intervals on the top rail and 400 mm intervals on line posts.

15.1.4.6 Installation of Bottom Tension Wire

The tension wire shall be strung tight, on the outside of the line posts, inside the fabric, at the mid-level of the bottom diamond. It shall be fastened to the fabric by a closed wire ring or twisted wire tie.

15.1.4.7 Installation of Barbed Wire (If Required)

The three (3) stands of barbed wire shall be strung tight above the fence fabric. Each strand shall be continuous around corners and shall be fastened to each end and gate post by a center band. The strands shall be inserted in the slots of the brackets in line and corner posts.

15.1.4.8 Installation of Gates

Gates shall be hung to swing out unless otherwise specified by the Engineer. The clearance between the gate and the crown of the roadway when closed shall not exceed 75 mm to 125 mm.

15.1.5 Measurement

The quantity to be measured for payment for chain link fence installed shall be the number of lineal meters of chain link fencing, including gates, padlocks, supplied and installed in accordance with this item. Measurement shall be taken along the top of the fence from the terminal post to terminal post of each section of fence.

15.1.6 Payment

Payment for work under this item shall be at the contract unit price for security fencing. This includes the supply of transportation of all labour, equipment and material, posts, concrete, fencing, access gate, padlock with keying to the Owner's master key system, removal of any debris and correction of any minor ground elevation problems, and complete site clean-up after work is complete and all work incidental thereto, as specified/shown on the contract drawings, or as laid out by the Engineer.

15.2 VEHICLE GATES

15.2.1 Scope

The work under this section consists of the supply of all labour, materials and equipment and incidentals necessary to complete the installation of the vehicle gates in accordance with the drawings.

15.2.2 General

All materials shall be supplied by the Contractor. The Contractor shall submit, in advance of the commencement of the work, the manufacturer's certification that the materials supplied meet the specified requirements, and the manufacturer's recommended procedures for installation and instructions for handling.

The Contractor is to install new vehicle gate in locations as indicated on the drawings, or as directed by the Engineer. Vehicle gates will be installed in accordance with the drawings.

Vehicle gate shall be protected from damage during the construction period, and any required repairs will be the Contractor's responsibility throughout the warranty period, at no additional cost to the Owner.

15.2.3 Materials

All materials and dimensions are to be in accordance with the drawings.

15.2.3.1 Posts

Gate posts shall be anchored in a 300 mm dia. sonotube filled with 20 MPa concrete.

Steel Posts shall be 150 mm diameter, Schedule 40 hot dipped galvanized steel pipe filled with 30 MPa concrete.

15.2.3.2 Gates

Vehicle gates shall be constructed with 73 mm OD, hot dipped galvanized Schedule 40 steel pipe.

Solid shaft plug shall be constructed with 62 mm OD, hot dipped galvanized Schedule 40 steel pipe.

Latch shall be constructed with 6.35 mm thick, hot dipped galvanized steel plate, with provisions to accept padlock.

15.2.3.3 Reflective Signs

Plates for reflective signs shall be constructed with 3.175 mm thick, hot dipped galvanized steel plate and sized in accordance with the drawings. One reflective sign shall be installed over each plate (same size). Reflective signs shall be installed on both sides of each gate.

15.2.3.4 Fittings

All parts, fittings, wire clips, nuts, bolts, etc, shall be hot-dipped galvanized steel.

15.2.3.5 Padlocks

The Contractor shall supply with each vehicle gate assembly, one (1) weatherproof padlock. Padlock shall be long style weather resistant pad locks keyed to the Owner's master key system, complete with two (2) keys per lock.

15.2.4 Installation

15.2.4.1 General

Exact location of the vehicle gates will be determined in the field by the Engineer. Details of construction are to be in accordance with the standard drawing, which forms part of this specification. All phases of the work shall be performed to the satisfaction of the Engineer. The Contractor is responsible to verify all dimensions, details and requirements of the work prior to installation, in order to provide a quality finished vehicle gate.

15.2.4.2 Grade and Line

Road construction shall be completed including final compaction and grading prior to the installation of the vehicle gate.

15.2.4.3 Footings

Concrete footings shall be provided for all gate posts. Footings may be poured to earth, except in granular soils where forming tubes will be required.

Concrete footings will have a minimum depth of 1800 mm and will have a minimum diameter of 300 mm.

Footing excavations shall be dewatered before concrete is placed.

Backfill shall be excavated material except in clay or rock where the footing shall be backfilled with gravel.

All backfill shall be tamped in not more than 200 mm layers.

15.2.4.4 Installation of Posts

Gate posts shall be set to a depth of 1500 mm. The posts shall be centered in the concrete and shall be plumb and in line within 6 mm. Gate posts shall be set at the same elevation regardless of ground contour.

15.2.4.5 Measurement

The quantity to be measured for payment for vehicle gates installed shall be the number of units, including gates, padlocks, supplied and installed in accordance with this item.

15.2.4.6 Payment

Payment for work under this item shall be at the contract unit price for vehicle gates. This includes the supply and transportation of all labour, equipment and material, posts, galvanized steel pipes and plates for gate construction, concrete, reflective sign, fittings, padlocks clean-up, an all work incidental thereto, all as specified/shown on the contract drawings, or as laid out by the Engineer.

Payment shall include all incidentals such as removal of any debris and correction of any minor ground elevation problems, and complete site clean-up after work is complete.

15.3 BOLLARDS

15.3.1 Scope

The work under this section consists of the supply of all labour, materials and equipment and incidentals necessary to complete the installation of protection bollards in accordance with the drawings.

15.3.2 General

All materials shall be supplied by the Contractor. The Contractor shall submit, in advance of the commencement of the work, the manufacturer's certification that the materials supplied meet the specified requirements, and the manufacturer's recommended procedures for installation and instructions for handling.

The Contractor is to install new bollard in locations as indicated on the drawings, or as directed by the Engineer. Bollards will be installed in accordance with the drawings.

Bollards shall be protected from damage during the construction period, and any

required repairs will be the Contractor's responsibility throughout the warranty period, at no additional cost to the Owner.

There are two [2] types of bollards. "Heavy bollards" are constructed from 150 mm diameter pipe and are used to protect buildings and major structures. "Light bollards" are constructed from 100 mm diameter pipe and are used to provide local protection of smaller structures.

15.3.3 Materials

All materials and dimensions are to be in accordance with the drawings.

15.3.3.1 Posts

Bollard shall be anchored in a 300 mm dia. sonotube filled with 20 MPa concrete. Steel Posts shall be 150 mm diameter, Schedule 40 galvanized steel pipe and will be filled with 20 MPa concrete.

For heavy bollards, steel posts shall be 150 mm diameter, Schedule 40 galvanized steel pipe and will be filled with 20 MPa concrete. The steel post shall be set 1500 mm in the concrete and extend 1500 mm above the surface.

For light bollards, steel posts shall be 100 mm in diameter, Schedule 40 galvanized steel pipe and will be filled with 20 MPa concrete. The steel post shall be set 1500 mm in the concrete and extend 1500 mm above the surface.

15.3.3.2 Covers

Bollards shall be covered with PVC Cover and be Safety color yellow with minimum of one (1) reflective band. Acceptable cover: "Bollardguard" by Thermoprene.

15.3.4 Installation

15.3.5 General

Exact location to install the bollards will be determined in the field by the Engineer. The Contractor is responsible to install the bollards in accordance with the Specifications and the drawings.

Bollard covers to be installed as per the manufacturer's recommendations.

15.3.6 Measurement

The quantity to be measured for payment for bollards installed shall be the number of complete units including cover guard supplied and acceptably installed.

15.3.7 Payment

Payment for work under this item shall be at the contract unit price for bollards of each type. This includes the supply and transportation of all labour, equipment and

material, excavation, sonotubes, posts, concrete, backfill, compaction, Bollardguard, clean-up, and all work incidental thereto, all as specified/shown on the contract drawings, or as directed by the Engineer.

SECTION No.16 – SANITARY LIFT STATION

PART 1: GENERAL AND PRE-CAST WET WELL

16.1 GENERAL

Sanitary Lift Station will be divided in the following two (2) categories:

- Sanitary Lift Station Category 1: Design Peak Flow below 15.77 L/s (250 USgpm) (see standard drawings)
- Sanitary Lift Station Category 2: Design Peak Flow above 15.77 L/s (250 USgpm) (see standard drawings)

The design of the Lift Station shall be based on the following design criteria and presented to the GSSC for review and approval prior to tendering:

- Wet Well: Pre–cast concrete chamber in accordance with the Standard drawings and as specified herein.
- Wet Well Diameter: Minimum = 2,134 mm (7 ft.)
  Maximum = 3,048 mm (10 ft.)
- Wet Well Active Volume: Maximum active volume shall be 1.0 m from pump stop level to high water alarm. In the event that the design peak flows cannot be retained within the wet well (maximum of 3,048 (10 ft.) dia.) using a maximum height of 1.0 m from pump stop level to high water alarm and a maximum of 6 start/stop cycle per hour, a cast–in–place wet well will be required. Special design considerations will be required in the event that a cast–in–place wet well is needed and will be provided by the GSSC.
- Lift Stations will be constructed to allow the easy integration of the GSSC SCADA system components.

16.2 SCOPE OF WORK

The work to be performed under this section consists of the construction of the Lift Station. This includes excavation and backfilling, pre-cast concrete wet well chamber, form work, supply and placing of reinforced concrete, and all work required to construct the foundation of the sanitary lift station all in accordance with the lines and dimensions shown on the drawings and as described in these specifications. All work described herein is to be completed in accordance with all applicable local Municipal By-Laws, NBC, CSA, and applicable authorities.

16.3 EXCAVATION

The excavation and backfill will be carried out to the lines and grades as shown on the drawings, or as laid out in the field or as directed by the Engineer.

All unsuitable material from the excavation will be removed from the site and

disposed of at a site provided by the Contractor. Disposal of surplus material will not be measured for separate payment and shall be included under the building structure.

However, if unsuitable material from the excavation is found it will be removed from the site and disposed of under the contract. Where suitable material from the excavation is encountered, in the opinion of the Engineer, it will be stockpiled for later use either for backfilling, or for other uses on the site as designated by the Engineer. Excess material will be disposed of by the Contractor off site.

If the Contractor has any doubts as to the bearing capacity at the bottom of the footing, he will obtain instructions from the Engineer and failing this he will be responsible for any damage to the structure.

Unsuitable material encountered in the work and deemed by the Engineer not suitable for use shall be excavated, loaded, hauled, and disposed of by the Contractor at a site provided by the Contractor. Unsuitable material is that which, in the opinion of the Engineer, cannot be used in the work or will not allow proper construction of the work. Removal and disposal of unsuitable material shall not be measured for separate payment, but shall be considered incidental to the work.

Three (3) days notice must be given to the Engineer before beginning the actual excavation so that all necessary measurements can be taken.

The Contractor will make ample provision for dewatering all excavations as required. This is to be taken into account in the calculation of his price for individual concrete structures. No additional payment will be made due to the presence of ground water.

The Contractor will use proper and acceptable methods for excavation for which will at all times be subject to the Engineer's approval and will employ such safe slope angles, shores, piling, bracing, etc., as may be necessary for the protection of workmen. Earth slides or slips and over excavation together with any subsequently required fill attributable to the negligence or carelessness of the Contractor will not be considered as part of the work. Over excavated areas will be filled with concrete or crushed rock as the Engineer may elect at no additional cost to the Owner.

Rock excavation shall be paid as described in Section 6 of the specifications. Calculations for rock excavation quantities for the wet well excavation will be based on a circular trench equivalent of the outside diameter of the wet well plus one (1) meter in total and on a trench depth of 150 mm below the bottom of the wet well up to the top of the rock surface.

16.4 DEWATERING

The Contractor is required to maintain the site and all excavations in a dewatered condition to enable the work to be done properly and without delay. This includes

dewatering of water from all sources, including precipitation, runoff, snowmelt, groundwater, etc. This also includes maintaining the site properly dewatered for the pouring of concrete as required for the foundations.
The Contractor will be required to provide pumping during the concrete work and no claim will be entertained for wet site conditions. The environmental protection including the erosion control structures, sediment control ponds and silt fencing is also to be included in the price for dewatering.

The Contractor is to construct any temporary ditches, berms, sumps, etc. required and to provide any pumps, flumes, piping, hoses, etc. necessary to accomplish this. All flows resulting from dewatering operations shall be directed to sedimentation ponds prior to discharge to adjacent ditches and watercourses. Site work and site ditching shall be done to maintain continuous drainage.

16.5 BACKFILLING

After the construction has essentially been completed and all piping is in place and has been tested as specified, the area around the concrete structures will be backfilled with granular fill in accordance with the drawings.

Backfilling will be carried out in such a way that relatively equal soil pressures will be exerted to all parts of the structure at all times. The material will be placed in layers of not more than 300 mm in thickness and compacted to a minimum of 95% of the maximum Dry Density, as determined by ASTM D698.

16.5.1 Backfill Material

If suitable to the Engineer, material previously excavated may be used to backfill the exterior side of the wet well and frost walls. Material shall qualify as Borrow "A" material as described in Item 121 of the NB Department of Transportation and Infrastructure Standard Specification (January 2015). However, material larger than 100 mm dia. will not be accepted as backfill material under the slab.

If material previously excavated does not meet the requirements of Item 121 of the NB Department of Transportation and Infrastructure Standard Specification (January 2015) or is larger than 100 mm dia., the Contractor will have to import material to backfill the interior and exterior side of the foundation wall. Imported material must qualify as Borrow "A", pit-run, crushed rock or crushed gravel.

The crushed rock, crushed gravel or Pit Run when tested in accordance with the N.B. Department of Transportation and Infrastructure's method with standard laboratory sieves, will conform to Table 201-2 (Crushed Rock, 75 mm % Passing gradation), Table 201-3 (Crushed Gravel, 75 mm % Passing gradation) and Table 201-4 (Pit Run) of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015).

Material used to backfill on the exterior side of the wet well and frost walls will be placed in successive uniform layers not exceeding 300 mm and compacted until a minimum of 95% of maximum dry density is achieved, as determined by ASTM D698.

Backfill material (from previous excavation or imported, as required) used to backfill will not be measured separately for payment, but shall be considered incidental to the work.

16.5.2 Backfill Material – Wet Well Top Section:

Granular backfill material (crushed rock or crushed gravel) to be used under the wet well top section shall consist of clean, hard, sound and durable particles free from soft or disintegrated pieces, mud, dirt, organic or other deleterious materials as described in Item 201 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015).

Granular material (crushed rock or crushed gravel) properties shall meet the requirements of Table 201-1 of the N.B. Department of Transportation and Infrastructure Standard Specifications (January 2015). **Under no circumstances will Pit Run material be accepted under the pre-cast wet well top section.**

The crushed rock or crushed gravel, when tested in accordance with the N.B. Department of Transportation and Infrastructure's method with standard laboratory sieves, will conform to the following table:

Grading Limits for 19mm Crushed Rock or Crushed Gravel

Sieve Size (mm)	Percentage of Weight Passing
28	100
20	85-100
14	50-90
10	25-60
5	0-10
2.5	0-5

Granular material used under the wet well top section shall be placed in successive uniform layers not exceeding 150 mm across the entire slab and compacted until a minimum of 95% of maximum dry density is achieved, as determined by ASTM D698. Backfill material used under the pre – cast wet well top section will not be measured separately for payment, but shall be considered incidental to the work.

16.6 PRE-CAST WET WELL CHAMBERS FOR SANITARY LIFT STATIONS

16.6.1 Scope

This section governs the supply of all labour, materials and equipment necessary for the complete installation of all pre-cast wet well chambers for sanitary lift stations, as

shown on the drawings and herein specified.

It is the Contractor's responsibility to approve all Shop Drawings and verify their correctness. Review of the Contractor's drawings by the Engineer shall not relieve the Contractor of the responsibility for the correctness thereof, nor from the results arising from any error or omission in details of design.

Six (6) sets of Shop Drawings shall be submitted to the Engineer for review.

16.6.2 Location

Exact location of pre-cast wet well chambers for sanitary lift stations will be determined by the Engineer. A stake will be installed in the field to locate the center of the chamber.

16.6.3 Materials

Pre-cast wet well sections and access hatches shall be supplied by the Contractor.

Wet well shall be of pre-cast concrete sections, which will meet the requirements of the latest CSA A257.4 and ASTM C478 for pre-cast reinforced concrete manhole sections.

Joints between all sections will be rubber gasket, Ram-nek gasket and water proofing membrane as indicated on the detail drawings, and will meet the requirements of the latest CSA A257.3. Waterproofing membrane to be Bakor Blueskin WP 200 c/w Aquatac Primer, Colphene 3000 by Soprema c/w Elastocol Stick Primer or approved equal.

Base sections shall be of pre-cast concrete with reinforced concrete slabs within. Bases will also have cast in rubber gaskets to suit the inlet and outlet pipes and factory installed benching. The benching in wet well is to be done to minimize hydraulic losses through chamber.

Internal drop shall be used when the difference between the invert elevation of the inlet and the bottom of the chamber pipe is greater than 600 mm (for each inlet pipe). Internal drops shall be made of pre-cast concrete or shall be RELINER, by RELINER – Duran Inc., complete with drop bowl assembly, PVC DR-35 pipe, PVC band and S.S. clamp with maximum spacing of 0.5 meters. Anchoring systems is to be in accordance with the standard drawings.

Pre-Cast wet well chamber for sanitary lift stations sections shall be L.E. Shaw Ltd., Strescon or approved equal.

16.6.4 Wet Well Benching Requirements

Benching in the bottom of the wet well shall be concrete with a 28 day compressive strength of 25 MPa and shall be placed at a 1:1 slope around the perimeter of the wet well walls. In lieu of benching the Contractor may use the FRP Sump Liner as manufactured by ITT Flygt, if adaptable to the specific pump model.

16.6.5 Wet Well Pipe Penetration Seal

As shown on the standard drawings, where cast in rubber gaskets cannot be installed and core drilling is required, suitable pipe penetrations seal is to be installed to ensure that the hole is watertight. All core drilling pipe perforations shall be sealed with Proco Pen-Seal or Link-Seal for a watertight seal. **Size of the core drilling holes shall be in accordance with the manufacturer's recommendations. All Bolts to be treated with Locktite to prevent bolts becoming loose.**

16.6.6 Flat Top Section for Wet Well – Category 1

Wet well flat top cover for Category 1 shall be cast-in-place as shown on the standard drawings and in accordance with Part 2 (Buildings). Opening will be provided in location and size as shown on the drawings or as directed by the Engineer, based on approved hatch shop drawings. The hatch frame shall be cast into the flat top.

16.6.7 Flat Top Section for Wet Well – Category 2

Wet well flat top cover for Category 2 shall be pre-cast as shown on the standard drawings and shall meet the requirements of Clause 16.6.3. Opening will be provided in location and size as shown on the drawings or as directed by the Engineer, based on approved hatch shop drawings. The hatch frame shall be cast into the flat top.

16.6.8 Wet Well Locking Hatches Requirements

The hatch assemblies shall be checkered aluminum designed to withstand a live load of 1,464 kg/m^2 (300 lb/ft^2) minimum and shall be securely anchored to the concrete flat top cover. The frames shall be pre-cast into the wet well top slab.

Covers shall be suitable for a 90^o minimum opening and equipped with an automatic hold-open arm and safety grating as supplied with the ITT Flygt Safe-Hatch system or equal.

Hatch to be installed in accordance with the Manufacturer's instructions using an approved water tight sealing compound between hatch curb flange and concrete wet well flat top cover. This hatch shall be properly sized for removal of the pumps but in any case not less than the dimensions shown on the drawings.

16.6.8.1 Pad Locks

The Contractor shall supply with each assembly a weatherproof padlock. Padlock shall be long or short style (as required for proper installation) weather resistant pad locks keyed to the Owner's master key system.

16.6.9 Construction Methods

Pre-cast wet well chambers shall be constructed of pre-cast concrete sections according to the details indicated on the drawings.

Proper implements, tools and facilities shall be provided and used by the Contractor for safe and efficient execution of the work. Manhole base sections shall be set on a 150 mm layer of bedding material conforming in all respects to the requirements for pipe bedding. Manholes shall be constructed plumb. Additional material under the base section may be required. Refer to construction drawings for additional requirements.

Joints in pre-cast manhole sections shall be in accordance with Section 16.6.3.

Pre-cast wet well flat top cover shall be set 150 mm above finished grade or as noted on the construction drawings.

16.6.10 Testing of Pre-Cast Wet Well Chambers for Lift Stations

One hundred percent (100%) of all pre-cast wet well placed shall be tested.

The Contractor shall notify the Engineer at least forty-eight (48) hours in advance of performing pre-cast wet well ex-filtration tests.

Should the sanitary sewer main ex-filtration tests prove unsatisfactory, the Contractor shall excavate to determine the cause, make repairs, backfill and retest at his own expense.

16.6.11 Wet Well Water Ex-filtration Test

Pre-cast wet well will be tested separately by plugging all inlets and outlets and filling with water to 2.4 meters above the lowest joint.

The test wet wells will be allowed to stand full of water for a period of 22 hours to ensure that absorption into the wall is complete.

The allowable ex-filtration is 25 liters per millimeter of wet wells diameter per kilometer per day.

It should be noted that water for ex-filtration tests will not be provided by the Owner. The Contractor will be responsible to provide his own water for testing, at no extra cost to the Owner.

16.6.12 Clean-up

The Contractor shall at all times keep the premises free from accumulation of waste

material or rubbish caused by his employees or work, at the completion of the work he shall remove all his equipment, tools, scaffolding, surplus materials, temporary protection, etc., and shall leave his work in a neat and orderly condition. All clean up shall be to the satisfaction of the Engineer.

16.6.13 Measurement

This work shall be measured as the total number of wet wells installed of the appropriate size.

16.6.14 Payment

Payment for work under this section shall be at the contract unit price for the appropriate size and type of wet wells.

This includes supply and transportation of all labour, equipment and material, excavation, installation, wet well, flat top section, access hatch, cutting of pipes, gaskets, pipe penetration seal, couplings, grout, connections, dewatering, bedding, compaction, backfilling, leakage testing, adjustments, benching, inside drop bowl assembly with pipe, trench restoration and maintenance, clean-up and all work incidental thereto, all as specified or as shown on the drawings, or as laid by the Engineer.

PART 2: BUILDINGS

16.7 GENERAL

This section will describe the construction methods and materials to be used for each Lift Station Building in accordance with the standard drawings. The following type of Building shall be used:

- Sanitary Lift Station Category 1 <15.77 L/s (<250 USgpm): Building installed on top of cast-in-place wet well flat top section.
- Sanitary Lift Station Category 2 > 15.77 L/s (>250 USgpm): Pre-cast wet well with slab on grade, brick building.

16.8 SCOPE OF WORK

The work to be performed under this section consists of the construction of the Sanitary Lift Station Building required on top of the wet well (Category 1) or slab on grade (Category 2) to house the mechanical components of the sanitary sewer Lift Station in accordance with the Standard drawings. This includes rough carpentry and framing work, roof, interior and exterior finishes, and all work required to construct the building in accordance with the lines and dimensions shown on the drawings or as described in these specifications.

16.9 CONCRETE FORMWORK

Contractor shall provide all items, articles, materials, operations or methods listed, mentioned, scheduled on drawings and/or herein, including all labour, materials, equipment, incidentals necessary, required for their completion. This shall include construction and removal of formwork required in connection with installation of cast-in-place concrete.

Build forms with sufficient strength and rigidity to carry weight or fluid pressure of concrete and of any equipment or runways which might be placed upon them. Contractor solely responsible for design and construction of formwork and safety of structure before and after forms are removed.

16.9.1 Shop Drawings

Submit six (6) sets of shop drawings for formwork for review prior to start of work.

Indicate method and schedule of construction, stripping, materials, arrangement of joints, ties, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.

Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms. Indicate sequence of erection and removal of formwork as directed by the Engineer.

Each shop drawing submitted to bear the stamp and signature of a qualified professional Engineer registered in the province of New Brunswick.

A copy of the formwork drawings shall be kept at the contractor's work area during construction.

16.9.2 Materials

Formwork Materials

Use plywood and wood formwork materials to CSA-0121, CSA-086 and CSA-0153. For exposed to view flat surfaces use medium density overlay plywood 19mm thick.

Form Ties

Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25mm diameter in concrete surface.

Form Release Agent

Form release agents that contain chemically active compounds will react with free lime in concrete resulting in water insoluble soaps, preventing concrete from sticking to forms.

16.9.3 Fabrication and Erection

Fabricate and erect formwork in accordance with CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1.

Formwork and all supporting or bracing members shall be designed such that they will not deflect noticeably under the weight or pressure of the concrete and other loadings incidental to construction. The maximum deflection of facing materials in concrete surfaces exposed to view shall be 1/360 of the span between supporting members.

16.9.4 Construction

Forms shall be so constructed that finished concrete will conform to shape and dimensions specified. All formwork shall conform with C.S.A. Standard A23.1, Section No. 14 "Formwork". Forms are to be erected, joined, braced, so as to produce smooth, even concrete surfaces.

Before concrete is placed all forms are to be inspected by Contractor's superintendent to ensure that they are properly placed, sufficiently rigid and tight enough to prevent leakage of water from concrete.

Forms shall be thoroughly cleaned, properly surface treated and free from ice, snow or other foreign materials. Provide temporary openings for clean out purposes at bottom of all deep units.

Prior to placing concrete, suitable means for checking alignment and elevations of forms during concrete placement operation shall be devised. Checks shall be made frequently during placement. Corrective wedging or shoring carried out both horizontally and vertically as required, until all concrete is in place. Tolerance of error in alignment or elevation shall be at the discretion of the Engineer.

16.9.5 Tolerances

Variation from plumb: in the lines and surfaces of walls: 6 mm per 3 m but not more than 20 mm.

Variations from the level or from the grades indicated on the drawings: in 3 m – 6 mm.

Variations in the sizes and locations of sleeves, floor openings and wall openings: plus or minus 6 mm.

Variation in the thickness of slabs and walls: minus 6 mm, plus 12 mm.

Footings: variations in dimensions in plan: minus 12 mm, plus 50 mm.

Misplacement or eccentricity: plus or minus 30 mm.

16.9.6 Stripping

Forms shall not be disturbed until the concrete has cured and hardened adequately and until concrete has reach 80% of the 28 day capacity. The proper time of form removal shall be determined by the Engineer. As a guide, the stripping time for all formwork, except slabs, will in general be seven (7) days;

Forms shall be removed progressively and with care so that corner of concrete members are not damaged.

16.10 REINFORCED CONCRETE

The Contractor is responsible in the furnishing of all labour, materials, equipment and services necessary for and incidental to the proper placing of all cast-in-place concrete to the full extent of the drawing or as directed by the Engineer. Special care shall be taken when concrete is to be poured below the specified temperature in accordance with C.S.A. Specifications and as directed in the field by the Engineer. Concrete must be protected and insulated during the curing period.

16.10.1 Materials for Concrete

Cement

Cement shall be type GUb conforming to A23.1.

Aggregate
Concrete aggregates shall conform to the Standard Specifications for Concrete Aggregates outlined in CSA A23.2.

Maximum stone size in footings shall be 38 mm. In walls and columns, beams, slabs, pipe caps, stairs, etc., the maximum stone size shall not exceed 19 mm.

Air Entrainment
Air entraining admixture will be to CSA/CAN A266.1. The quantity of entrained air in the mixture, as determined by the standard test or samples taken at the point of delivery of the concrete to the forms, shall be 5% + 1% by volume.

Air entrainment shall be used in all concrete except the floors and footings.

Water Reducing Agent
A water reducing agent may be used subject to the Engineer's approval.

16.10.2 Design of Concrete Mix

Provide certification indicating the concrete supplier is certified in accordance with the Atlantic Provinces ready mix concrete association program or equivalent. Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1.

All concrete shall be proportioned, mixed, transported, placed, tested, consolidated, finished and cured in accordance with CSA Specification A23.1, and as amplified by this Section. Class of exposure for walls and footings shall be F2 and Class of exposure for interior floor slab shall be N. All concrete shall be ready-mix and conform to CSA A23.1, latest edition.

Concrete shall be composed of blended Portland Cement, fine aggregate and course aggregate; the water/cement ratio for exterior walls and footings and slabs shall not exceed the amount specified in the mix design. The air entrainment agent is to be mixed in the proportion recommended by the manufacturer.

The consistency of the concrete before vibration shall be such that it will produce a maximum slump as noted in Clause 8.2.3/3.5.3 (lift) when tested per ASTM Design C94.

The concrete mixture shall be designed and proportioned to give the concrete durability, plasticity and workability and to yield a minimum compressive strength as noted in the specification for footings, walls, pads, floor slab, etc., as measured from the cured test specimens made according to CSA Specifications.

The Engineer shall be provided with a copy of the concrete mix design, clearly marked for its intended type of service.

16.10.3 Concrete Specifications

The following specifications shall be met in the design of the concrete mix:

1. Minimum Compressive Strength @ 28 days: 30 MPa
2. Air Content:
    1. Walls: 5.0 % to 8.0 %.
    2. Slabs: 3%.
3. Concrete slump: 80 mm (+-20mm)
4. Max. Aggregate: 19 mm
5. Water Cement Ratio: 0.45
6. Admixtures:
    1. Obtain Engineers Approval Before Using Admixtures.
7. No concrete shall be placed without prior knowledge and approval of the Engineer and the Structural Consultant.
8. Reinforcing steel, embedded parts, anchor bolts, dowels, water stops, etc., shall be secured in position prior to placing concrete.

16.10.4 Reinforcing Steel

The work under this heading includes the furnishing of labour, material, equipment and services necessary for cutting, bending, tagging and supply of reinforcing steel, as shown on the drawings and as hereinafter specified.

Reinforcing steel shall be new billet stock, Grade 400 deformed bars, conforming to Standard Specifications of the CSA G30.18 latest edition.

All bars shall be free from loose rust or scale, oil, structural defects, and shall be unpainted and uncoated. Bars shall be bent cold and accurately shaped as required.

Hooks are to be standard unless noted otherwise. All splice shall be Class “B” tension lap splices. No more than 50% of the reinforcing shall be spliced at any given location. Provided corner bars in wall to match the spacing and size of the main reinforcing. All openings in wall shall have 2-15M additional bars each in top, bottom and sides unless otherwise noted on the drawings.

16.10.5 Concrete Protection for Reinforcement

Reinforcing steel shall be detailed so that distance from face of steel to nearest face of concrete is not less than one diameter, nor in any case less than the following: (unless noted otherwise on drawings).

75 mm, for footings and other principal structural members in which the concrete is deposited on the ground.

38 mm, for walls which are exposed to the exterior or are in contact with the ground and in which bars are 16 mm or less in diameter.

50 mm, for walls which are exposed to the exterior or are in contact with the ground and in which bars are more than a nominal 16 mm diameter.

19 mm, for slabs and walls not exposed directly to the ground and weather.

16.10.6 Adhesive Anchorage for Re-Bar Dowels

Acrylic adhesive for dowel and anchor rod anchorage: to ASTM C881-90, Type IV, Grade 3, Class A, B and C.

Acceptable Materials:

1. Sika Power Fix 4 Anchoring Resin as supplied by Action Fasteners.
2. Epcon Acrylic 7 by ITW Ramset/Red Head.
3. HIT HY150 Injection Adhesive System by HILTI.
4. Acrylic-Tie Anchoring System by Simpson Strong-Tie.

16.10.7 Bonding Agent

Bonding agent for bonding new concrete to in-place concrete: High modulus, high strength, epoxy bonding adhesive, Sikadur 32 Hi-Mod, or approved alternate.

Clean and prepare existing surfaces at interface of all new concrete work in accordance with manufacturer's written directions.

16.10.8 Anchor Rods

Anchor rods shall meet the requirements of CAN/CSA-G40.20/G40.21-01. Anchor rods shall be supplied and installed by the concrete foundation contractor and shall be placed with templates and shall be held rigidly during placement of concrete.

16.10.9 Placing Reinforcing Steel

All reinforcing steel shall be placed in accordance with C.S.A. Specification A23.1. All steel is to be placed as indicated and securely wired in place before any concrete is poured. The Contractor shall inform the Engineer the day before the concrete is to be poured and no concrete is to be poured until the Engineer is satisfied that the reinforcement is correctly placed.

Reinforcing shall be fabricated and placed in accordance with the standards set out by the American Concrete Institute in the current standard Detailing Manual. All reinforcing shall be accurately placed and secured against displacement by ties or clips and shall be supported by concrete or metal supports, spacers, etc.

Placing accessories shall be provided in such spacing as to adequately support the reinforcing in its designated position.

Straightening or re-bending shall not be allowed to any extent which will injure reinforcement. Bars with kinks or bends not shown on the plans shall not be used.

Necessary splices not shown on the drawings shall be lapped sufficiently to develop strength of bars by bond and securely wired. Splices in adjacent bars shall be staggered.

16.10.10 Placing of Concrete

Forms shall be clean before concrete is placed. **Placing of concrete is not to be commenced in any section of the work until the formwork is complete and the Engineer has checked and approved the placing and fastening of reinforcing steel, inserts and devices.**

Concrete shall be conveyed from the mixer to the point of deposit using equipment and means that will prevent the separation or loss of materials. The sequence of placing concrete in the work shall be so arranged that no partially set or green concrete will be subject to vibration or shock.

The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms.

Vibrators shall not be continued at any one point to the extent that localized areas of grout are formed. Vibrators shall not be used to make concrete flow in the forms over distance so great as to cause segregation.

Concrete shall be deposited in forms as close as practicable to its final position. The vertical height of free fall of concrete shall not exceed 1500 mm. For falls greater than 1500 mm, chutes or spouts shall be used.

Concreting for any section shall be continuous. The size of the section is to be established or the equipment is to be provided, of sufficient capacity that succeeding layers of concrete will bond to the previous portion and will not be placed on concrete where preliminary set has taken place. This interval must not exceed 30 minutes.

16.10.11 Rejected Materials

The Owner will engage and pay for the services of an independent testing company on a full time basis for the duration of concrete slab construction. The independent company is to conduct on a continuous basis all necessary tests and provide field inspection services to ensure the quality of material and workmanship meet the specified requirements.

Materials, whose test specimens fail to meet specified requirements and materials rejected upon inspection, shall not be permitted on the work, and if rejected after delivery shall be immediately removed from the site.

Should the strength of concrete already poured, as shown by job cured test cylinders, fall below the required strength at 28 days, or at 7 days test fail to reach a minimum of 70% of 28 days strength, the Engineer shall have the right to require changes in mixing proportions for the remainder of the work so as to attain these strengths. He shall also have the right to require additional curing of these portions of the work represented by test specimens not meeting the herein quoted strength criteria.

Should such additional curing not produce the required strength, the Engineer shall have the right to require strengthening or replacement of the portions of work in question at no additional cost to the Owner.

The Engineer reserves the right to reduce the amount of payment for all concrete which failed to meet the requirements of the drawings and this specification, where the defect is such as to permit leaving the concrete in question in place.

16.10.12 Concrete Floor Finish

Floor finish shall be done only by those experienced in such work. Finish concrete floors to CSA A23.1 and as follows:

- Float surface with wood or metal floats and power finishing machine and bring surface to true grade.
- Steel trowel to smooth and even surface.
- Slope floors to drains as directed by Engineer.

16.10.13 Finish for Exposed Concrete, Other Than Floors

Concrete surfaces exposed to view, whether exterior or interior shall have forms removed when concrete is fully cured. Fins shall be removed, ties cut back and surface repairs made as required.

16.10.14 Curing and Sealing

All floor slabs will be finished with an odourless, transparent curing and sealing compound formulated from acrylic polymers in a water base carrier. Curing and sealing compounds shall confirm to ASTM C-309, Type 1, Class B and shall be compatible with specified floor finish.

16.11 WALL INSULATION AND PROTECTION – LIFT STATION CATEGORY 2 ADDITIONAL REQUIREMENTS

16.11.1 Wall Insulation and Protection

The inside of the foundation walls will include 50 mm rigid insulation. The insulation will extend as shown on the drawings, or as otherwise specified by the Engineer.

The insulation will be placed on the foundation wall prior to backfilling and will have the following minimum characteristics:

- compressive strength - 275 Kpa
- water absorption (% by volume) - Max. 0.7%
- capillarity - none
- shear strength - 275 Kpa

The foundation wall insulation shall be Styrofoam HI-40, or approved equal.

16.11.2 Foundation Wall – Floor Slab Expansion Joint

16.11.2.1 Expansion Joint

As shown on the drawings, an expansion joint and sealant is required at the intersection of the concrete floor slab junction Size of the expansion joint material and installation details are to be done in accordance with the drawings and as recommended by the Manufacturer's.

16.11.2.2 Expansion Joint Filler

Separate slab-on-grade from perimeter wall with continuous strip of expansion joint filler, full depth of slab, to be bituminous impregnated fiberboard to ASTM D1751, 12.7 mm thick, unless otherwise indicated on drawings.

16.11.2.3 Expansion Joint Protector

The fibre expansion joint shall be protected with a plastic joint material prior pouring the floor slab. Plastic protector shall be installed as per Manufacturer's recommendations and be removed prior installation of the flexible sealant.

Acceptable plastic cover: W.R. Meadows Snap-Cap, or approved alternate.

16.11.2.4 Flexible Sealant

As shown on the drawings, joint between the floor slab, the fibre expansion joint and the foundation wall shall be filled with flexible sealant to prevent water infiltration. Flexible sealant shall be a one-component polyurethane self-leveling sealant. Sealant shall meet or exceed ASTM C 920 Type S, Grade P, Class 25, Use T, M, A, O and I, and CAN/CGSB 19 GP16a.

Acceptable flexible sealant: Tremco Vulkem 45, or approved alternate.

Colour: to be chosen by the Engineer.

16.12 ROUGH CARPENTRY AND INSULATION

16.12.1 Materials and Workmanship

All lumber used will be #1 construction grade of the best quality. Plywood will be eastern spruce exterior type good one side, conforming to CSA 0325-0-M92 / CSA 0151-M78 (lift), of the sizes shown on the drawings.

All wood frame construction shall be carried out in accordance with the requirements of the latest version of the National Building Code of Canada and CSA 086-01.

All timber framing shall be No. 2 Grade or better, spruce, pine, fir species. Lumber moisture content shall not exceed 19% at time of construction. Lumber in contact with the wet well flat top section to be pressure treated (Lift Station Category 1) and be sealed on the total perimeter (interior and exterior) with flexible.

Plywood to be Douglas Fir (DFP) to CAN/CSA 0325.0 construction sheathing. Sub floor adhesive to CGSB 71-GP-26M, cartage loaded.

All work will be carefully and accurately framed with trusses, joists, plates, boards, braces, etc., and all spaced in accordance with the drawings. Nails, spikes, and staples shall conform to CSA B111 galvanized for exterior work, plain finish elsewhere.

Exterior joints at jambs, heads and sills will be caulked with best quality non-drying caulking compound. Interior surfaces will be finished as shown on the drawings, or as otherwise specified by the Engineer.

All wooded frame walls insulation used will be fiberglass batt 100 mm thick with RSI of 2.3 for Category 1 Building and 150 mm thick with RSI of 3.5 for Category 2 Building. Friction fit insulation to be cut and fitted tightly in all wall cavities requiring insulation, all as shown on the drawings or as directed by the Engineer. All roof insulation will be fiberglass batt 300 mm thick with RSI of 7.0.

Vapour barrier to be 0.152mm (6mil) polyethylene. Vapour barrier to be sealed at bottom and taped with 50mm tape at all seams, electrical boxes, roof openings, etc.

16.12.2 Framing for Openings Through Walls

Openings for mechanical piping, louvres and exhausters shall be framed through the walls at the locations shown on the drawings or as indicated by the Engineer.

Metal flashing and caulking will be placed around all openings through the wall, this includes all louvres, thimble, and exhaust fan, all as shown on the drawings.
The actual sizes of openings for louvres and fans shall be confirmed by the

Contractor following approval of the shop drawings.

16.13 ASPHALT SHINGLE ROOFING

16.13.1 Scope of Work

The roof system for the Blower Building consists of pre-engineered raised heel roof trusses and 16 mm tongue and groove plywood, at a 4(V) to 12 (H) pitch.

16.13.2 Asphalt Shingles Roofing Specifications

Asphalt shingles to meet the following requirements:

1. Asphalt shingles: to CSA A123.1;
2. Rating: minimum 25 year;
3. Type: slow slope, standard, rectangular pattern;
4. Mass: 10.2 kg/m^2;
5. Colour: dual colour, to be chosen by the GSSC;
6. Acceptable products: BP Rampart, IKO Aristocrat, or approved equal;
7. Felt Paper: to CAN/CGSB-51.32 except in area where ice shied is used;
8. Nails: to CSA B111-Latest revision, of galvanized steel, sufficient length to penetrate 19 mm into deck;
9. Staples: chisel point galvanized steel 25 mm crown 1.5 mm thick, sufficient length to penetrate 20 mm into deck (tube-lock nails for soffit substrates);
10. Aluminum drip edge: minimum thickness of 0.8 mm;
11. Eavestroughing: Metal length as shown on drawings, properly mounted on building, provide slope. Eavestroughing to be on both sides of building, and include drip edge;
12. Eave Protection: Self–sealing composite membrane consisting of modified bitumimous coated material.

Ice shield material to meet the following requirements:

1. Width: Minimum 914 mm
2. Thickness: Minimum 1.0 mm (40 mil)
3. Acceptable products: Lastobond Shield 36, IKO Armourguard Ice and Water Protector, CRC Storm Tamer Ice and Water Protector or approved alternate.
4. Installation and preparation: as per manufacturers.

16.13.3 Asphalt Shingle Application

Asphalt shingle work shall be in accordance with CAN3-A123.51-M85, CAN3-A123.52-M85, and CRCA specification unless specified otherwise. All unused shingles remain the property of the Owner.

Install drip edge along eaves, overhanging 12 mm, with minimum 50 mm flange extending onto roof decking.
Install bottom step flashing (soaker base flashing) interleafed between singles at

vertical junctions.

16.13.4 Asphalt Shingle Warranty

The roof installation shall be guaranteed for a period of 5 years for workmanship and 10 years for all materials free from defects. A warranty letter from the roofing Contractor shall be submitted to the Owner at the completion of the work.

16.14 ROOF SYSTEM

The roof structure shall be constructed with pre-engineered raised heel roof trusses, spaced at 600 mm center to center, of the span shown on the drawing.

The roof system shall act as a structural diaphragm. Long dimension of roof sheathing shall be laid horizontally with ends staggered 1,220 mm. Nail all panel edges at supports with 65 mm common nails or equal spaced at maximum 150 mm on center. Nail spacing at intermediate supports shall not exceed 300 mm.

All exterior wall shall be constructed to transfer the wind loads from the roof to the foundation.

Nailing pattern for roof sheathing shall be as follows:

- Panel edges shall be nailed at max. 150 mm c/c for all supports.
- Nail panels at max. 300 mm c/c for all intermediate supports.
- Use 65 mm common nails, or equal.

16.15 WOOD FRAME CONSTRUCTION

All wood frame construction shall be carried out in accordance with the requirements of the National Building Code of Canada and CSA 086.
All timber framing shall be minimum No. 2 grade or better, spruce, pine, fir species. Lumber moisture content shall not exceed 19% at time of construction.

Plywood sheathing to be Canadian softwood plywood, (CSP), to CSA O151.

Exterior wood stud walls shall be constructed to transfer the wind loads from the roof to the foundation. Unless otherwise indicated, nail pattern for wall sheathing shall be as follows: panel edges shall be nailed at maximum 150 mm centers at all supports. Nail panels at max. 300 mm centers at all intermediate supports. Use 64 mm common nails, or equal.

Shear wall panel to be nailed as follows: panel edges shall be nailed at maximum 75 mm centers at all supports. Nail panels at max. 150 mm centers at all intermediate supports. Use 64 mm common nails, or equal.

Provide horizontal blocking in all stud walls spaced vertically at max. 1,220 mm on center.

Double top chord plate of load bearing walls shall have butt splices offset minimum 1,220 mm. Locate butt splices directly over a wall stud.

16.16 DESIGN LOADS

All design loads shall be in accordance with the latest revision of the National Building Code of Canada. The roof trusses shall be designed by the manufacturer in accordance with the specified loadings, and to the drawings. Their construction shall conform to the latest revision of all applicable CSA standards, including Standard S307 - latest revision.

ROOF LOADS: SPECIFIED DEAD LOAD (TYPICAL) = 1.00 KPa (TOTAL)

SPECIFIED SNOW LOAD Ss =	3.0 KPa
Sr =	0.6 KPa
SPECIFIED WIND LOADS q_{10} =	0.46 KPa
q_{50} =	0.64 KPa
SPECIFIED SEISMIC Sa (0.2) =	0.30
Sa (0.5) =	0.16
Sa (1.0) =	0.068
Sa (2.0) =	0.021
PGA =	0.22

MINIMUM DEAD LOADS ON ROOF TRUSS CHORDS SHALL BE AS FOLLOWS:
TC = 0.66 KPa
BC = 0.34 KPa

16.17 PREFABRICATED ROOF TRUSSES

Design of roof truss system including all connectors, wind uplift anchors, temporary erection bracing, and final permanent lateral bracing of web and chord members, shall be the responsibility of the truss manufacturer. Truss manufacturer shall provide shop drawings bearing the stamp of a professional engineer licensed to practice in the province of New Brunswick.

Shop drawings shall be submitted for review by the design Engineer prior to fabrication to ensure that the design intent and load paths have been correctly interpreted by the truss designer.

Provide truss design, layout, and incidental framing to suit roof configuration shown. Exact roof framing layout may vary slightly from that indicated, subject to the approval of the Engineer.

Truss shop drawings to be fully legible and clearly show dead and live loads, member location in work, sizes, grade, joints, splices, configuration of trusses, overhangs,

spacing, connectors and uplift anchorage, job location and all required erection and final bracing.

Live load deflection of trusses to be limited to span/360.

Roof truss uplift anchorage shall be designed for minimum 1.2 kPa uplift. Provide one uplift connector at each truss bearing point.

Coordinate supply and installation of all final permanent lateral bracing with related trades.

16.18 MISCELLANEOUS STEEL

Steel sections, (angles, and plates, etc.) and threaded anchor rods, shall be new and be to CAN/CSA-g40.21, grade 300W.

Fabricate steel components in accordance with CAN/CSA S16.1.

All framing to be welded together with continuous seal welds around all joints, minimum 5 mm, unless otherwise indicated.

All welding shall conform to the requirements of CAN/CSA W59.

All structural welding shall be performed only by companies certified to Division 1 or 2.1 of CSA W47.1. No field welding is permitted unless approved by Engineer.

Electrodes shall conform to the requirements of CSA W48.

All metal fabricated assemblies to be hot-dip galvanized to ASTM A123/A123M, specification for zinc (hot-dip galvanized) coatings on iron and steel products (minimum 600 g/m^2).

16.19 DOORS AND FRAMES

16.19.1 GENERAL

Exterior doors will be weatherproof exterior insulated metal doors as manufactured by Apex Machine Works "AHI" or approved equal. Doors will be 20 gauge. They will be complete with 16 gauge pressed steel insulated frames, Apex or approved equal.

Steel hollow metal frames shall be 16 gauge base thickness of commercial grade steel to ASTM A525 with wiped zinc finish.

Interior doors will be insulated metal doors as manufactured by Apex Machine Works "AHI" or approved equal. Doors will be 20 gauge. They will be complete with 16

gauge pressed steel insulated frames, Apex or approved equal.

All doors and frames shall be supplied, primed with one (1) coat of primer to CGSB-1.40 M89 oil alkyd type.

The doors will include all hardware, weather stripping, fasteners, etc, as shown on the drawings, or as specified.

16.19.2 FINISH HARDWARE

16.19.2.1 Door Hardware

Hardware shall conform to the following schedule:

3 ONLY HINGES FBB191 114 x 101 x NRP x C15
1 ONLY LOCKSET 7825-OB x C26D
1 ONLY DOOR CLOSER EN350-OZ x EN350-B DROP PLATE
1 ONLY HOLD OPEN DEVICE
1 ONLY OVERHEAD DOOR STOP 590S x C26D
1 ONLY DOOR SWEEP W13S x DOOR WIDTH
1 ONLY SET WEATHERSTRIP W14 x SIZE TO SUIT
1 ONLY THRESHOLD CT38 x DOOR WIDTH

16.19.2.2 Keying

Provide three (3) sets of keys for every lock in this contract, master keyed to the Greater Shediac Sewerage Commission standard and key type.

Keys shall be of nickel silver and shall be furnished by the lock manufacturer.

16.19.2.3 Installation

Furnish manufacturers instruction for proper installation of each hardware component.

Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturer's Association.

16.20 CONCRETE FLOOR FINISHES - EPOXY

The building shall have a finished concrete floor (top of pre-cast concrete top section) to CSA A23.1 and will have two (2) coats of epoxy floor coating. Acceptable product is STONKOTE GS4 as manufactured by STONEHARD Limited, or approved equal. Floor finish colour to be determined by the GSSC.

This work shall be done by those experienced in this work and shall be done in accordance with the manufacturer's instructions.

16.21 BASEBOARDS

On all floors meeting interior wall finish, a vinyl baseboard shall be installed. Baseboard shall be installed after the floor finish. Colour to be chosen by the GSSC.

16.22 GYPSUM BOARD

16.22.1 Material

Water-resistant gypsum wall board to C 1396, CAN/CSA A82.27 standard 15.9 mm thick, 1,200 mm wide x maximum practical length, ends square cut, edges square.

As shown on the standard drawings, a 1,200 mm high fibreglass sheet shall be installed on top of the gypsum wall board for the total perimeter of the building.

Fastening: nails, screws and staples to CSA A82.31.

Casing beads, corner beads fill type: 0.5 mm base thickness, commercial grade sheet steel with Z275 2MC finish to ASTM A525, perforated flanges; one piece length per location.

Cornice cap: 16.1 mm deep x partition width, of 1.6 mm base thickness galvanized sheet steel, prime painted.

Joint compound: to CSA A82.31, asbestos free.

16.22.2 Installation

Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are completed and approved by the Engineer or other applicable authorities. Apply single layer gypsum board to wood stud framing using screw fasteners.

16.22.3 Taping and Filling

Finish face panel joints and internal angle with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

16.23 PAINT WORK

16.23.1 Material

All paint will be manufactured by Laurentide Chemical Inc., Glidden, or approved equal. Follow manufacturers instructions and recommendations form diluents or thinners.

Materials will be delivered in the original unopened containers. All materials where possible are referred to therein by reference to the appropriate schedule number in the Canadian Government Specification Board Schedule of Paint Products.

Contractor to supply to the Engineer for approval lists of paints, colour charts, materials he proposes to use, naming manufacturer, grade, and brand names before starting work. The colours to be used shall be chosen by the GSSC.

16.23.2 Workmanship

Paint will not be applied to any surface that is not completed in every respect. All surfaces will be thoroughly dry before application. Paint will not be applied or left to dry in any space where temperature is, or is likely to fall below 10°C.

All paint is to be thoroughly brushed or sprayed over the whole surface to give coverage to each coat to uniform finish free from brush marks, runs, etc. Items of miscellaneous metals, steel door frames and other steel items will be primed.

If before painting begins these items develop rust spots or other surface blemishes, the Contractor shall sand off all rust and re-prime entire surface before final finishing.

Each coat must be allowed to dry thoroughly before the next coat is applied. Unless otherwise called for, all paint work must have a minimum of two (2) finish coats in addition to any priming coat.

16.23.3 Method of Application

The standard method of application is by brush, but use of spray, roller, and other methods of application acceptable to the trade will be permitted on approval of the Engineer.

16.23.4 Gypsum Wall Board

Apply one (1) coat primer - sealer CGSB.1-GP-119M, two (2) coats semigloss enamel

CGSB-1-GP-57M.

16.23.5 Exterior Metal

Paint all exterior metal work except galvanized and aluminium work primed by others. When this is not called for, the Contractor is to clean thoroughly and give one coat primer to CGSB-1.40M89 oil Alkyd type and two coats exterior gloss enamel CGSB-1.59M89.

16.23.6 Interior Metal

Apply one coat of vinyl wash primer to CGSB 1.GP-121M, one coat of enamel undercoat to CGSB 1.Gp-38M and two coats of high gloss enamel to CGSB 1.GP-60M. Stainless pipe and flanges inside the building to be cleaned and polished.

16.23.7 Interior Surfaces

Clean all surfaces and let dry. Apply one coat of CGSB-1-GP-38M, enamel undercoat, two coats paint CGSB-1.57-M90.

16.23.8 Electrical Conduits

All exposed conduit and steel used in connection with the electrical work such as supports, clamps, braces, etc., will be cleaned and spot primed, with CGSB-1.40M89 oil Alkyd type. Apply one (1) coat of CGSB-1-GP-38M enamel undercoat and two (2) coats of CGSB-1.60M89 interior Alkyd gloss enamel with colour to be chosen by Engineer.

16.23.9 Colours

Colours of all interior and exterior materials shall be as directed by the GSSC.

16.24 STEEL CLADDING

Steel cladding shall be fabricated from ASTM A653 structural quality Grade 230 galvanized steel, with Z275 zinc coating as designated by ASTM A653M. Thickness shall be 24 gauge. **Acceptable product is VICWEST profile CL 7040**.

Steel cladding shall be pre-painted with 5000 Series, one side. Colour to be chosen by the GSSC.

Fasteners will be galvanized and pre-finished in same colour as the cladding. Flashings, trim and closures will be fabricated as indicated on shop drawings to be provided by Supplier. Colour of exposed items will match cladding and in concealed areas these items will be galvanized only.

Sealants in concealed locations will be tape or compound, non-skinning, non-drying, butyl rubber. In exposed areas sealants will be acrylic co-polymer to CGSB 19GP-5M or

one part silicone to CGSB CAN2-19.13.

Installation of metal cladding and accessories will be in accordance with manufacturer's recommendations and standard practice.

16.25 LIFT STATION CATEGORY 1 ALTERNATE – PRE-FABRICATED BUILDING

A pre-fabricated building may also be supplied if meeting the requirements of the specifications.

Standard of Acceptance: Insulated Fiberglass package lift station enclosure as manufactured by DENYG Mechanical or approved equal.

16.26 MEASUREMENT

The work shall be measured by the lump sum for the building foundation, structure, and architectural work.

16.27 PAYMENT

Payment for work under this item shall be at the contract unit price for the building foundation structure and architectural work. This includes the supply and transportation of all labour, materials and equipment, excavation and backfilling, trucking material off site and stockpiling of material for re-use, dewatering, crushed rock or crushed gravel for backfilling and under concrete floor slab, concrete form work, reinforced concrete work, thrust block, concrete, foundation, concrete slab, concrete equipment pads, site work, rigid foundation wall insulation, fibre expansion joint, expansion joint protector, flexible sealant, installation of materials (pipe penetration sleeves, etc) supplied by other trades, rough carpentry, wall and attic insulation, gypsum board, roof system, trusses, strapping, doors and hardware, eavestrough, metal cladding and accessories, outside finishes, various exterior/interior metal work, floor and interior finishes, paint, vinyl/acrylic base board, clean-up, and all work incidental thereto, all as specified or as shown on the drawings or as laid out by the Engineer.

PART 3: MECHANICAL

16.28 SCOPE OF WORK

The work to be performed under this section consists of the construction of the mechanical works. This includes submersible pumps, piping, valves, flow meters and all work required to complete the mechanical systems in accordance with the lines and dimensions shown on the drawings or as described in these specifications.

16.29 GENERAL

16.29.1 Codes, Rules, Permits, Fees

The Contractor shall give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, including utility connections or extensions, in connection with his work; file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.

The Contractor shall include in the work, without extra cost to the Owner, any labour, materials, services, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.

All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of local utility companies, and with the requirements of all governmental departments having jurisdiction.

All material and equipment for the electrical portion of the mechanical systems shall bear the approval label, or shall be listed by the Underwriters' Laboratories, Canada.

The design, materials, construction, inspection and testing of all equipment covered under this specification shall comply with the latest editions of appropriate publications of the following authorities and technical organizations.

1. Federal, Provincial and Municipal Authorities;
2. American Water Works Association (AWWA);
3. Canadian Standard Association (CSA);
4. Association of Iron and Steel Engineers (AISE);
5. American National Standard Institute (ANSI);
6. American Society for Testing and Materials (ASTM);
7. American Society of Mechanical Engineers (ASME);
8. National Association of Corrosion Engineers (NACE);

9. Steel Structures Painting Council (SSPC);
10. Canadian National Plumbing Code (NPC).

16.29.2 Intent

It is the intention of these specifications and standard drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".

Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

16.29.3 Surveys and Measurements

The Contractor shall base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.

Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Owner and shall not proceed with his work until he has received instructions from the Owner.

16.29.4 Drawings

Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract.

The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, the Owner shall be notified before proceeding with installation.

If directed by the Owner, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

16.29.5 Protection

The Contractor shall protect all work and material from damage by his work or workmen, and shall be liable for all damage thus caused.

The Contractor shall be responsible for work and equipment until finally inspected, tested, and accepted; he shall protect work against theft, injury or damage; and shall carefully store material and equipment received on sites which are not immediately installed. He shall close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

The Contractor shall be responsible for all costs involved in repairing any damage caused during the course of the work, such repairs to be to the satisfaction of the Engineer.

16.29.6 Scaffolding, Rigging, Hoisting

This Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

All scaffolding, ladders, staging, rigging, equipment and tools shall bear the Contractor's identification mark and shall be checked by the Engineer before being carried on to the site.

16.29.7 Material and Workmanship

All material and apparatus required for the work, except as specified otherwise, shall be new, of first class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first class standard article as approved by the Engineer shall be furnished.

The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers, and labour required to unload, transfer, erect, connect up, adjust, start, operate, and test each system.

The Contractor shall store all materials and equipment he supplies, which might be damaged by weather, in watertight storage containers or sheds. The Contractor shall be responsible for the protection of his tools, plant, materials and equipment stored at the site.

All welding to be performed by welders certified by the New Brunswick Department of Post-Secondary Education, Training and Labour, and welder qualifications shall be in accordance with:

- Piping and piping components - ANSI B31.1
- Vessels and all other equipment - ASME VIII, Division I

Welding shall not be performed on code stamped or warranted components supplied by others without prior approval of the Engineer. Non-destructive testing shall be in accordance with the fabrication code and any additional requirements of this specification.

Unless otherwise indicated on the plans or specifications, all equipment and materials shall be installed with the approval of the Engineer in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions.

The Mechanical Contractor shall provide and locate all sleeves, piping, and inserts required for installations through the floors, walls or ceiling and shall be responsible for the cost of cutting and patching that may be required. Each Contractor shall do all drilling required for installation of pipes through walls, ceiling or floors and, for the installation of his hangers.

Where any work pierces waterproofing including building roof and waterproof concrete, the method of installation shall be as approved by the Engineer before work is done. Contractor shall finish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

16.29.8 Motors

Motors shall be built in accordance with the latest standards of NEMA and as specified on the construction drawings. Motors shall be tested in accordance with standards of ASA C50 and conform thereto for insulation resistance and dielectric strength.

Each motor shall be provided with conduit terminal box, adequate starting and protective equipment as specified or required. The capacity shall be sufficient to operate associate driven devices under all conditions of operation and load and without overload, and at least horsepower indicated or specified. Each motor shall be selected for quiet operation and of high efficiency and have sealed bearings

16.29.9 Quiet Operation and Vibration

All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable.

Sound or vibration conditions considered objectionable by the Engineer shall be corrected in an approved manner by the Contractor at his expense. Vibration control shall be by means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

16.29.10 Accessibility

The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with the General Contractor and all other contractors whose work is in the same space, and shall advise the General Contractor of his requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to, valves, traps, clean-outs, motors, controllers, switchgear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be first approved by the Engineer.

The Contractor shall provide the General Contractor the exact locations of access panels for each concealed valve, control, damper, or other device requiring service. Access panels shall be provided and installed by the General Contractor and as specified in the architectural sections of the specifications. Locations of these panels shall be submitted in sufficient time to be installed in the normal course of work.

16.29.11 Cutting and Patching

The Building Contractor shall provide all cutting and patching necessary to install the work specified in this section.

The Mechanical Contractor shall provide the Building Contractor with all information on the location of sleeves, openings, etc. required to carry out the work. The Mechanical Contractor shall also provide any equipment or materials that must be set or cast in.

16.29.12 Sleeves and Plates

This Contractor shall provide and locate all sleeves, drains, piping, cleanouts, and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching required for pipes where sleeves, inserts, etc., were not installed, or were incorrectly located. Each Contractor shall do all drilling required for the installation of his hangers.

Sleeves shall be galvanized steel with a lock ring and be provided for all mechanical piping passing through concrete floor slabs and concrete and concrete block masonry construction. Sleeves shall not be provided for piping running imbedded in concrete or insulating concrete slabs on grade.

Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe only and the insulation shall be made to butt against the construction except for pipes requiring insulation having a vapour barrier, in which case, the sleeves shall be large enough to pass the pipe and insulation. Check floor construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:

1. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor.
2. In all areas where pipes are exposed, extend sleeves 6 mm above finished floor, except in rooms having floor drains, where sleeves shall be extended 18 mm above floor.

16.29.13 Waterproofing

Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Engineer before work is done. Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

16.29.14 Ventilation System

The Contractor shall supply and install the ventilation system in the Buildings, sidewall exhaust fan, louvre, damper, actuator, damper motor actuators, flexible duct work, aluminum birdscreens, sheet metal duct transition and all related equipment and components for a complete installation, all as shown on the drawings or as specified herein.

16.29.15 Air Exhaust System

16.29.15.1 General

The opening dimensions shall be as shown on the drawings and confirmed following the approval of shop drawings.

The exhaust fan shall be complete with aluminum housing, gravity damper, birdscreen mounted to the discharge perimeter, inside wall grille, and removable mounting plate.

The Contractor shall be responsible for supporting and securing, as well as proper fastening of the ventilation system components.

The exhaust system shall be wall mounted at the location shown on the drawings or as otherwise directed by the Engineer. and shall consist of the following:

Standard of Acceptance:
Exhaust fan shall be Greenheck Model CW properly sized for the application or approved equal, complete with backdraft damper, Greenheck Model WD-323 or approved equal.

16.29.16 Air Supply System

16.29.16.1 General

The opening dimensions shall be as shown on the drawings and confirmed following the approval of shop drawings.

The intake louvers shall be complete with birdscreen mesh, wall flange louvre, baked enamel finish, or approved equal. The blades and jamb shall be completed with seals.

The louvre and damper shall be complete with all fasteners and accessories required for a complete installation and an operational system.

The air supply system shall consist of the following:

Standard of Acceptance:
Louvre shall be Airolite K-6774X, Ventex 2430 HI Pro 4 Louvre or approved equal with 100 mm thick drainable blade, properly sized for the application.

Louvre shall be supplied with Greenheck VCD-23 low leakage motorized damper, Aluma Control Dampers or approved equal. The blades and jamb shall be completed with seals.

Each motorized damper shall be complete with a 120 VAC Belimo actuator, Model AF 120, or approved equal, properly sized for this application.

16.29.17 Floor Drains and Piping

The floor drains and piping layout shall be according to the drawings. Using ABS piping and ABS solvent-weld fittings.

Floor drains shall be ANCON FD-100, or ZURN ZXN-211-A, 75 mm diameter drain, or approved equal, with 75 mm diameter P-trap with backwater valve. All floor drain piping shall be PVC pipe and sloped 1:50, sized as shown on the drawings.

All cleanouts shall be ZURN, ZN-1503, or approved equal.

16.29.18 Sewerage Pumping Station – Submersible Pumps and Accessories

15.29.18.1 General

Pumps shall be of the submersible type, specifically designed for the handling of raw, unscreened, sanitary domestic sewage.

The pumping unit shall be a duplex station complete with control panel and interconnecting piping.

Acceptable pump suppliers must have a New Brunswick service representative fully capable and experienced in the operation and maintenance of their product. This representative must be capable of troubleshooting and repairing mechanical and pump controller problems. This requirement will be considered in the evaluation of alternative products. Suppliers shall demonstrate this ability in requesting for the equipment approval.

16.29.19 Performance

Each pump must have the necessary characteristics and be properly selected to perform under the design peak flow of the system over the design period.

16.29.20 Pump Design and Approvals

The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal contact. **Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.** No portion of the pump shall bear directly on the wet well floor.

The pump/motor assembly shall have CSA approval as one unit, per CSA standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. **An approval of the motor unit only will not be acceptable.**

The pump/motor unit is to be approved by CSA for service in Class I, Zone 1, Groups C or D hazardous locations.

The following pump Manufacturers are approved for this project. However, it will be the responsibility of the Manufacturer / Supplier to confirm that the proposed selection is the most suitable for the application and will be verified during shop drawing review:

16.29.20.1 Acceptable Products Manufacturer:

- ITT Flygt;
- Hydromatic, or approved equal.

16.29.21 Construction

Openings and passages of non-clog submersible pumps shall be large enough to permit the passage of a sphere 75 mm in diameter and any trash or stringy material which can pass through the average sewage collection system. The pump must be specifically designed for this application.

The pump shall be cast iron with hermetically sealed submersible type motor, as a complete unit. **The pumping station shall include one (1) flush/mix system capable of mixing the sump contents prior to pumping.**

The duplex pumping unit shall be mounted on a rail system that permits the removal of both pumps independently through the hatch in the wet well cover. This system shall come as part of the pump supply package. The rail system shall be sufficiently rigid to operate smoothly through the depth of the wet well.

16.29.22 Motors

Pump/motor assembly shall have CSA approval as one unit per CSA Standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. The pump/motor unit is to be approved by CSA for service in Class 1, Zone 1, suitable for submersible operation, with normal starting torque and low starting current characteristics, suitable for 3 phase, 60 Hertz, 600 volts, electric current. Motors shall not be overloaded at design pump operating conditions or at any head in pump operating range as specified.

The motors shall be designed for operation up to 40^0C ambient and with a temperature rise not to exceed 80^0 C.

The power cable shall be sized according to the CEC and CSA Standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber.

The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 20 metres.

Each motor shall be of cast iron frame construction and shall be of current NEMA design. Rolled steel or aluminium frame motors shall not be acceptable.

16.29.23 Lifting Davit

One (1) lifting davit shall be sized in accordance with pump manufacturer requirements and installed as shown on the drawings.

Approved product: ITT Flygt 13-52 01 39 lifting davit complete with an ITT Flygt 13-52 01 41 mounting hot dipped galvanized steel socket or approved equal.

16.29.24 Vent Piping

A vent pipe shall be cast into the flat top wet well cover as shown on the drawings. The vent pipe shall be of the type and size shown on the drawings and shall be hot dipped galvanized, 610 g/sq.m to CSA G164 or stainless steel.

16.29.25 Spare Parts

One (1) year supply of any grease or lubricants required for the normal maintenance of the pumping station.

16.30 MECHANICAL

16.30.1 Pipe and Fittings

Piping and fittings in the wet well and lift station building shall be Schedule 10 type 304L stainless steel as shown on the drawings. The fittings shall be welded stainless steel fittings as shown on the drawings. All piping inside the building shall be cleaned, polished.

The remainder of the piping, including all buried pipes, shall be Schedule 40 type 304L stainless steel.

Gaskets will be 1.6 mm thick, rubber, and flat ring.

Stainless Steel Sch. 10 piping may also be roll-grooved for Victaulic fittings, Victaulic flanges and Victaulic Style 89 rigid coupling with ductile iron housing conforming to ASTM A-536, Grade 65-45-12. All connections shall include EPDM gaskets (printed).

All nuts and bolts will be heavy head machine bolts and nuts, stainless steel Type 316, for inside the wet well and inside the building. Use a suitable thread compound to prevent galling when tightening the bolts. All nuts shall be re-tightened after initial installation to ensure that they have not become loose.

All pipe perforations through the concrete floor or walls shall include a galvanized steel sleeve with lock ring or approved equal and they shall be sealed with Link-Seal or approved equal for a watertight seal.

This piping shall be supported as shown on the drawings.

16.30.2 Gate Valves

Gate valves for the sanitary lift station shall be sized in accordance with the drawings. Valves shall be gate valve type and complete with flange end connections with the following specifications:

- Body: Iron brass mounted O.S. & Y;
- Stem Type: Rising Type;
- Operator: Hand wheel operator;

- Standard: Latest AWWA Standard C-509 for Gate Valves for Ordinary Water Works Service;
- Opening direction: Counter clockwise;
- Flange: ANSI B16.1, Class 125;
- Nuts and Bolts: Stainless Steel 316;
- Port: Full port designed to pass spherical solids equal to the pumps capability, minimum 75 mm spherical solid;
- Coating: Epoxy coated inside and outside, color coded green;
- Acceptable Product: Valves will be Clow McAvity, AVK, Mueller or approved equal.

It should be noted that the Contractor shall be responsible for touch-ups or repainting to correct damages to the finish from shipping or installation.

16.30.3 Check Valves

Check valves for the sanitary lift station shall be sized in accordance with the drawings. Valves shall be ball-type check valve or swing flex check valve type and complete with flange end connections with the following specifications:

- Body: Ductile Iron to ASTM A536, Grade 65-45-12;
- Ball material: Aluminum core with Nitrile rubber coating and to be sinking type;
- Disc material: Buna-N to ASTM D2000-BG;
- Ductile cast iron with stainless steel 316 nuts and bolts c/w NBR rubber o-ring;
- Flange: ANSI B16.1, Class 125;
- Flange gasket: Red rubber 3.175 mm thick, F.F. 125#;
- Nuts and Bolts: Stainless Steel 316;
- Port: To pass spherical solids equal to the pumps capability, minimum 75 mm spherical solid;
- Swing check valve requirements: External lever and cushion chamber capable of passing a 75 mm spherical solid;
- Coating: Fusion Bonded Epoxy Coated inside and outside;
- Acceptable Product: AVK Ball Check Valve Type 5092, Val-Matic Swing-Flex Series 500 or approved equal.

Valves shall be equipped with removable cover plate to permit entry or for complete removal of internal components without removing the valve from the line. Valves other than full flow type or valves mounted in such a manner that prevents the passage of 75 mm spherical solid shall not be acceptable.

16.30.4 Pressure Gauges

Each pump shall be equipped with a glycerine-filled pressure gauge to monitor discharge pressures. Gauges shall meet the following specifications:

- Dual indication dial range: 270° – 0 to 65 psi (0 to 450 kPa) to be white with black figures and graduations c/w clear glass window;
- Dial size: 100 mm (4");
- Case, ring and pointer: Stainless steel;
- Accuracy: 1% percent of full scale reading;
- Acceptable Product: US Ametek or approved equal.

Gauge installations shall be complete with all tubing and fittings, and shall include a shut off valve tee and nut (clean-out) installed in each gauge inlet at the point of connection to suction and discharge pipes.

16.30.5 Flow Meter and Transmitter

An inline electromagnetic flow meter shall be sized and installed as shown on the drawings. Meter shall meet the following specifications:

- Type of metering: Electromagnetic flow meter;
- Application: Raw Sewerage;
- Flow rates: 0-50 L/s (0-800 USgpm);
- Pressure rating: 0-100 PSIG;
- Water temperature: 0-16°C;
- Flow transmitter: Wall mounted;
- Acceptable types of readout instruments: Integrators: 6-digit, 8 mm high lettering, non-reset;
- Read-out instrument display: Flow (L/s or USgpm), total flow (USGal. or m^3);
- Signal transmission between primary measuring element and signal conditioners:
  - Power: 115 VAC powered;
  - Signal: 4-20 mA;
  - Cable: colour coded, twisted and shielded pair with grounding wire.
- Locations and Installation mountings:
  - Transmitters and readout instruments: Wall mounted;
  - Signal conditioners: Integrated to flow meter or wall mounted;
  - Computing devices: Integrated to flow meter or wall mounted.
- Additional requirements - Signal Converter:
  - 115 Vac powered;
  - +/- 0.25% accuracy of rate;
  - 1 x 4-20 mA (HART) & 1 x pulse outputs;
  - 1 x status input;
  - Display of instantaneous flow and total flow, 3 line with 20 characters;
  - Complete with wall mount bracket, as required.

- Flow meter shall be CSA approved, field programmable, NEMA 7 enclosure, complete with polyurethane liner or NSF approved hard-rubber liner, designed to measure flow for raw sewerage;
- Flow meter housing to be epoxy coated;
- Flange: ANSI B16.1, Class 125 with EPDM gaskets;
- Flow meter shall be supplied with a factory calibration certificate;
- Flow meter to be supplied with grounding rings;
- Acceptable Products:
  - Siemens Magflo Mag 5100 W c/w Magflo Mag 6000 wall mounted transmitter;
  - Krohne Enviromag 2000 c/w IFC 300 W wall mounted transmitter;
  - ABB MagMaster Model MF c/w wall mounted transmitter or approved equal.

16.30.6 Level Controllers

Pumps will be controlled with the water level in the wet well. A submersible pressure transmitter / transducer will be used to transmit levels to the PLC and control panel. The pressure transmitter shall be installed in a PVC pipe, as shown on the drawings.

In addition, Two (2) float type level regulators shall provide the signals for a high water level (alarm) indication and for low water alarm and pump shutdown redundancy.

16.29.15.1 Pressure transducer

Pressure transducer shall be installed as shown on the drawings and in accordance with the manufacturer's recommendations. Pressure transducer shall meet the following specifications:

- Type: Submersible type complete with clamp and nut;
- Material: Stainless steel 316;
- Voltage: 24 VDC;
- Output signal: 4-20 mA;
- Control cable length: As required and noted on the drawings;
- Pressure range: 0-15 psi;
- Acceptable Products (suitable for wastewater application):
  - Ametek /PMT Model 575SB0015RLS;
  - Druck Level PTX/PMP1290 Series, or approved equal.
- Spare parts: One (1) complete pressure transducer unit.

Two (2) floats are to be placed at each lift station, indicating low water and high water alarm.

16.29.15.2 Float Type Level Controller

Float type level controller shall be installed as shown on the drawings and in accordance with the manufacturer's recommendations and supplied with required length of control cable. Support bracket to be installed to allow for manual adjustments as required. Each cable run shall be long enough to allow for additional loops.

- Acceptable Products:
  - Float: ITT Flygt ENM 10SG or approve equal;
  - Support: Stainless steel single support type, ITT Flygt 13-52-01-08, or approved equal;
  - Cable hook: Stainless steel cable hook, ITT Flygt 13-50 70 07.
- Spare parts: Two (2) complete float switches.

16.30.7 OPERATING AND MAINTENANCE MANUALS (O & M)

Installation of lift station and related appurtenances shall be done in accordance with written instructions provided by the manufacturer. Three (3) sets of these instructions shall be delivered to the Engineer not less than four (4) weeks prior to the delivery of the equipment to the job site. Installation of lift station includes all specifications from the Blower Building above as well as the following:

1. Electrical schematic diagram of the pump station is supplied, prepared in accordance with NMTBA and JIC standards. Schematics shall show, to the extent of authorized repair, pump motor branch, control, and alarm system circuits, and interconnections among these circuits. Wire numbers shall be shown on the schematic. Schematic diagrams for individual components, the detail parts of which are not normally repairable by the station operator, need not be included, and shall not be substituted for an overall schematic diagram.
2. Copies of certified pump performance curves.

16.30.8 Start-Up

The services of a factory-trained representative shall be provided for a minimum period of one (1) day to inspect and ensure operation of the pump control panels, level regulators and other electrical and mechanical components within the panels operate according to the requirements of the contract specification. The factory-trained representatives shall also provide initial start-up assistance of the pump station and instruct the owner's operating personnel in the operation and maintenance of the equipment.

16.30.9 Clean-up

The Contractor shall at all times keep the premises free from accumulation of waste material or rubbish caused by his employees or work, at the completion of the work he shall remove all his equipment, tools, scaffolding, surplus materials, temporary protection, etc., and shall leave his work in a neat and orderly condition. All clean up shall be to the satisfaction of the Engineer.

16.31 MEASUREMENT

The work shall be measured by the lump sum for the mechanical systems for sanitary sewer lift station.

16.32 PAYMENT

Payment for work under this item shall be at the contract unit price for the mechanical systems for systems for sanitary sewer lift station. This includes the supply and transportation of all labour, materials and equipment, installation of all plumbing, backwater valves, floor sleeves, floor drains and piping, ventilation system, submersible pumps and motors, pumping unit installation, pump lifting system, lifting davit and electric hoist, pump heat sensors, vent piping, spare parts, pipe and fittings, valves, gauges, flow meter and transmitter, level controllers, start-up, testing, O & M manuals, clean-up, and all work incidental thereto, all as specified or as shown on the drawings or as laid out by the Engineer.

PART 4: ELECTRICAL

16.33 SCOPE OF WORK

The work covered by this specification will include the furnishing of all labour, materials, not listed as supplied by others, tools and services to construct and install a complete and working electrical system as shown on the accompanying drawings, specified herein, or both.

Without in any way limiting the foregoing, the work in general will include the following:

Service Entrance
Metering
Distribution Equipment
Motor Control Equipment
Control Panel
Heating
Lighting
Wiring of electrically operated equipment and controllers
Grounding and Bonding

16.34 CODES, PERMITS CERTIFICATES, FEES & INSPECTION

The work will be tendered on and will be carried out in accordance with these drawings and specifications and to meet the essential requirements of the Canadian Electrical Code C22.1-2009 or the latest edition thereof, and any special requirements of the New Brunswick Electric Power Commission and the New Brunswick Electrical Inspection Department.

In no instance, however, will the standard established by the drawings and specifications be reduced by any of the codes referred to above. In no instance will a standard be accepted lower than that established by the Electrical Code.

The Electrical Contractor will obtain and pay for all permits in order that the work herein specified will be carried out.

On, or before the completion of this contract, this Contractor will obtain, at his own expense, the necessary certificate of inspection from the Electrical Inspection Department of the Province of New Brunswick and will forward same to the Engineer.

16.35 DRAWINGS

The electrical drawings, which constitute an integral part of this contract will serve as the working drawings. They indicate the general layout of the complete electrical system, arrangement of feeders, circuits, outlets, switches, controls, panel boards, service equipment, fixtures and other work.

The field verification of scale dimensions on plans is directed since actual locations, distances and levels will be governed by actual field conditions.

This Electrical Contractor will check architectural, structural and mechanical plans, to avert possible installation conflicts. Should drastic changes from original plans be necessary to resolve such conflicts, this Contractor will notify the Engineer and secure written approval and agreement on necessary adjustments before the installation is started.

Discrepancies shown on different drawings or between drawings and actual field conditions, or between drawings and specifications will promptly be brought to the attention of the Engineer, for a decision.

The drawings may be superseded by later revised or detailed drawings or Specifications Addenda provided by the Engineer, and this Contractor will conform to all reasonable changes without extra cost to the Owner.

All items not specifically mentioned in the Specification or noted in the drawings but which are obviously necessary to make the complete working installation will be included.

16.36 PLANS FOR RECORDING CHANGES

The Electrical Contractor will obtain one set of white prints and keep them on the job for the exclusive purpose of recording changes of any deviations of the routing of piping, ducts, conduit, etc., to that shown on the contract drawings. These drawings will be kept up to date and turned over to the Engineer at the completion of the contract.

16.37 SUBMISSIONS

All submissions are to be made through the General Contractor only; the Electrical Contractor will, therefore, submit all information, drawings, inquiries, etc., to the General Contractor for such submission.

16.38 TESTS

All systems and equipment covered by this specification will be thoroughly tested in the presence of a duly authorised representative of the Engineer before final acceptance of the work, such tests to be to the complete satisfaction of the Engineer. All costs in connection with the tests are to be borne by this Contractor, including the supplying of any equipment necessary for such testing as is required.

16.39 PROTECTION

The Electrical Contractor will be responsible for the complete and proper protection of all equipment, apparatus and fixtures during construction and will be turned over free from damage.

16.40 EXTRA WORK

For any extra electrical work that may be proposed, the Electrical Contractor will furnish to the Engineer an estimate of the cost of such work. The electrical Contractor will proceed only after receiving written permission from the Engineer or his authorised representative, establishing the agreed price and describing the work to be done.

16.41 SUPERVISION

The Electrical Contractor will provide adequate supervision and direction to the work and will keep a competent foreman in charge until the job is completed.

The Electrical Contractor will remove from his work any foreman or workmen to whom the Engineer or his representative may object, on the ground of carelessness or incompetence.

16.42 WORKMANSHIP AND GUARANTEES

All workmanship will be of the best quality and subject to approval by the Engineer or his representative. The Electrical Contractor will, before final payment is made, guarantee all materials and workmanship by him in the performance of his Contract for a period of one (1) year from the date of acceptance by the Engineer and will agree to replace within that period of time, without extra cost to the Owner, all materials or workmanship proven defective. He will before final payment is made, test and operate all equipment installed by him, and make all necessary adjustments and replacements and demonstrate to the Engineer that all equipment is operating as intended.

The Electrical Contractor will, before final payment is made, guarantee all materials and workmanship by him in the performance of his Contract for a period of one (1) year from the date of acceptance by the Engineer and will agree to replace within that period of time, without extra cost to the Owner, all materials or workmanship proven defective. He will before final payment is made, test and operate all equipment installed by him, and make all necessary adjustments and replacements and demonstrate to the Engineer that all equipment is operating as intended.

16.43 CO-OPERATION WITH OTHER TRADES

The Electrical Contractor will co-operate with the other Contractors doing work in the building and will familiarise himself with the drawing issued on the other trades and will coordinate with the various foremen, so that their work will not conflict with his, and that, it will not be necessary to move or change any piping, wiring, etc. When interference exists, they will notify the Engineer before installing the work.

16.44 LOCATION

This Contractor will provide sufficient, safe and proper facilities necessary for inspection of the work by the Engineer, the Owner, any legally authorised Government, Insurance or Municipal Inspector, and the representative of the Manufacturer or suppliers of any special device or devices used. This Contractor will give the Engineer due and reasonable notice when the work is ready for inspection.

16.45 PROGRESS OF WORK

Work is to be started as soon as conditions will permit and will be carried on continuously as not to interfere or delay the work of other Contractors or completion of the project.

16.46 OPERATION, MAINTENANCE & INSTALLATION INSTRUCTIONS

This Contractor will preserve all operation, maintenance and installation instructions supplied with equipment and will secure further information about all or any of the equipment, if desired by the Owners. The instructions will be neatly bound in an Acco Press No. BF2507 brief binder and presented to the Owners at the time of substantial completion of the work. In addition, this Contractor will instruct the Custodian or other Owner's representative in the proper operation and maintenance of the various pieces of equipment installed by him.

16.47 CLEAN-UP

Upon completion of the Contract, the Electrical Contractor will remove all debris from the construction site created by his work, clean and polish all equipment and repair all damages to the work, in readiness to turn the building over to the Engineer.

16.48 GROUNDING

Grounding will be in accordance with the latest regulations of the Canadian Electrical Code.

16.49 INTENT

It is the intent and purpose of the specification and accompanying drawings to include the labour and materials necessary for the proper completion of the work. Any labour or material not specifically mentioned, but which may be found necessary to complete same, will be furnished by this Contractor to the satisfaction of the Owners and the Engineer.

16.50 MATERIALS

16.50.1 Conduit

.1 All wiring is to be installed in conduit.
.2 Surface mount conduits on ceilings or wall.
.3 Use rigid PVC conduit unless indicated otherwise.

.4 Use liquid tight flexible metal conduit for final connection to motors and vibrating equipment.
.5 Use rigid galvanized steel conduit for conduit run to the wet well. Install EYS sealing fittings in the conduits.
.6 Run conduits parallel or perpendicular to building lines.
.7 Support conduits in accordance with the requirements of the Canadian Electrical Code. Do not use wire lashing or perforated strap to support or secure conduits.
.8 Install a green insulated bonding conductor in all conduits used for power.
.9 Use bushings and connectors with nylon insulated throats.
.10 Install "O" ring expansion joints where rigid PVC underground conduit rises above ground for termination in an enclosure or LB Fitting.

16.50.2 Outlet Boxes

.1 Use surface mounted rigid PVC type FS boxes with conduit hubs as required.
.2 Use flush mounted metal box for the exterior receptacle.
.3 Support boxes independently of connecting conduits.

16.50.3 Junction and Pull Boxes

.1 All panels to be separated and not in one panel.
.2 Use surface mounted rigid PVC moulded junction boxes with blank screw on cover and gasket unless indicated otherwise.
.3 Exterior junction and pull boxes for pump power and control cables shall be NEMA 4X single door, stainless steel enclosures with continuously hinged cover, door latch, padlock adaptor and inner panel.
.4 Support boxes independently of connecting conduits.

16.50.4 Conductors

.1 Use copper conductors with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90XLPE.
.2 Use stranded conductors for 10 AWG and larger.
.3 Use stranded conductors for 14 AWG control wiring.
.4 Minimum size of conductors for lighting and power: 12 AWG.
.5 Minimum size of conductors for control: 14AWG.

16.50.5 Light Fixtures

.1 Interior Ceiling Mounted
  .1 Surface mounted 1321 mm long enclosed fluorescent luminaires with one piece fibreglass reinforced polyester housing and smooth virgin acrylic lens with crepe pattern inner surface lens.
  .2 Lamps: 2-32W, T8, 4100 ^{0}K.
  .3 Ballast: 120 V instant start electronic with less than 20% THD.
  .4 CSA listed for wet locations.
  .5 Acceptable Material: CFI cat no. VTN4232ST – 120S0 or equivalent.

.2 Exterior Wall Mounted For Category 2 Lift Station
  .1 Wall mounted high pressure sodium wall cube with dark bronze die cast aluminium housing and borisilicate glass lens.
  .2 Polycarbonate shield.
  .3 Lamp: 70 W, ED17, clear.
  .4 Ballast: 120 V high power factor.
  .5 Mini photocontrol.
  .6 Acceptable Material: Keene cat no. 313070LXL-335-P105A-1 or equivalent.
.3 Exterior Wall Mounted For Category 1 Lift Station
  .1 Wall mounted high pressure sodium wall prism contructed of durable vandal proof resistant polycarbonate with non-yellowing UV stabilized polycarbonate optics.
  .2 Finish: Bronze.
  .3 Lamp: 50 W, E17, clear.
  .4 Ballast: 120 V high power factor.
  .5 Built in photocontrol.
  .6 Acceptable material: Stonco cat no. TLW050HLXLPC-1 or equivalent.

16.50.6 Emergency Lighting Unit

.1 12 volt industrial emergency lighting unit with a long life, maintenance free, sealed lead acid battery and two fully adjustable lamp heads.
.2 Cabinet: fully gasketed cast aluminum back plate with clear polycarbonate cover, NEMA 4X certified.
.3 Charger: Automatic solid state power boost auto equalize charger with ambient temperature sensing and compensation.
.4 Battery: Long life, maintenance free, hermetically sealed, lead-acid battery.
.5 Sealed dust proof transfer circuit with brownout protection.
.6 Low voltage disconnect circuit for lamps.
.7 Controls and Indicators: Test switch, service required lamp and four LED diagnostic display.
.8 Input: 120 volt AC.
.9 Lamps: Two 12 watt mini halogen, MR16.
.10 Wattage Capacity: 72 watts for 0.5 hours.
.11 The unit shall self test for one minute every 30 days, 10 minutes on the 6th month and 30 minutes every 12 months.
.12 CSA C22.2 no. 141 certified.
.13 Acceptable Material: Lumacell model no. RG12NX722M12W or equivalent

16.50.7 Light Switches

.1 15 A, 120 V, single pole, toggle operated with ivory handle.
.2 Industrial specification grade.
.3 PVC wall plate with vinyl gasket for surface mounted FS Box.

16.50.8 Receptacles

.1 15 A, 125 V, duplex receptacles with ivory face.
.2 Industrial specification grade.
.3 PVC weatherproof covers with gasket.

16.50.9 Electric Heaters

.1 Use slope top convection heaters with front air inlet with front and top constructed of extruded aluminium equivalent in strength to 14 gauge steel.
.2 Heating element: stainless steel sheath with aluminium fins encloses a nickel chromium element compacted in mineral insulation.
.3 Finish: Almond hybrid polyester epoxy powder coat.
.4 Rating: As required.
.5 Controls: Built-in 24 V low voltage relay and transformer.
.6 Acceptable material; Chromalox AS12 series or equivalent.

16.50.10 Heating Thermostat

Low Voltage Thermostat:

.1 Rating: 30 volts, 1.5 amps.
.2 Temperature range: 10^{o} C to 30^{0} C.
.3 Acceptable material: Honeywell cat no. T822K1018 or equivalent.

16.50.11 Disconnect Switches

.1 Heavy duty single throw fusible disconnect switche with 3R enclosure.
.2 Solid neutral block for service switch.

16.50.12 Fuses

.1 Class "J", time delay fuses.
.2 Provide three spare fuses for each size of fuse used.
.3 Acceptable Material: Ferraz Shawmut Type AJT or equivalent.

16.50.13 Instrumentation Cable

.1 Two conductor no. 18 AWG shielded instrumentation cable.
.2 Construction: no. 18 AWG stranded thinned copper conductors with 300 volt, 105^{0} C flame retardant PVC insulation, outer jacket of 105^{0} C flame retardant PVC, aluminium foil/polyester shield with tinned copper drain wire.
.3 Type CIC to CSA C22.2 no. 239.

16.50.14 Ground Rods

.1 Ground rods shall be 19mm diameter, 3.0 meter long copper clad ground rods.
.2 Connection to ground rods shall be made using Cadweld welded cable to

ground rod connections.

16.51 MEASUREMENT

The electrical system to be measured for payment will be by lump sum including the installation, materials, variable frequency drives, execution, electrical supply, telephone system, .

16.52 PAYMENT

Payment for work under this item shall include the supply and transportation of all labour, programmable logic controller (PLC), manual transfer switch and connection for mobile generator, UPS and surge suppressor, wiring, rigid conduit, excavation, bedding material, backfilling, connectors, wiring and programming of level controllers, control cables, padlocks, seals, junction boxes, fittings, aluminium cover plates, coordinating connections with NB Power, commissioning, PLC programming, clean-up and all work incidental thereto, all as specified or as shown on the drawings or as laid out by the Engineer.

PART 5: POWER GENERATION DIESEL

16.53 SCOPE OF WORK

The work covered by this specification will include the furnishing of all labour, materials, not listed as supplied by others, tools and services to construct and install a complete and working backup Generator system as shown on the accompanying drawings, specified herein, or both.

16.54 REFERENCES

.1 American Petroleum Institute (API)
  .1 API Std. 650-[2007(A2008)], Welded Steel Tanks for Oil Storage 11th Edition.
.2 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-3.6-[2000, Amend. 2], Regular Sulphur Diesel Fuel.
.3 Canadian Environmental Protection Act (CEPA)
  .1 CCME PN 1326-[2008], Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.
.4 CSA International
  .1 CSA-B139-[09], Installation Code for Oil Burning Equipment.
.5 International Organization for Standardization (ISO)
  .1 ISO 3046-1-[2002], Reciprocating Internal Combustion Engines - Performance - Part 1: Declarations of Power, Fuel and Lubricating Oil Consumptions, and Test Methods - Additional requirements for engines for general use.
.6 National Electrical Manufacturers Association (NEMA)
  .1 NEMA MG 1-[2006(R2007)], Motors and Generators.
.7 Underwriters' Laboratories of Canada (ULC)
  .1 CAN/ULC-S601-[07], Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.
  .2 ULC-S603-[00], Standard for Steel Underground Tanks for Flammable and Combustible Liquids.

16.55 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit submittals in accordance with Section 2 -General Requirements

.2 Product Data:

  .1 Provide manufacturer's printed product literature, specifications and data sheets for power generators and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

  .1 Submit drawings stamped and signed by professional engineer registered or licensed in [Province] [Territory] of Canada, and include:

    .1 Engine: make and model, with performance curves.

.2 Alternator: make and model.
.3 Voltage regulator: make, model and type.
.4 Automatic transfer switch: make, model and type.
.5 Manual bypass switch: make and model.
.6 Battery: make, type and capacity.
.7 Battery charger: make, type and model.
.8 Alternator control panel: make and type of meters and controls.
.9 Governor type and model.
.10 Automatic engine room ventilation system.
.11 Cooling air requirements in m^3/s.
.12 British standard or DIN rating of engine.
.13 Flow diagrams for:
    .1 Diesel fuel.
    .2 Cooling air.
.14 Dimensioned drawing showing complete generating set mounted on steel base, including vibration isolators, exhaust system, drip trays, and total weight.
.15 Continuous full load output of set at 0.8 PF lagging.
.16 Description of set operation including:
    .1 Automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit reaches rated voltage and frequency.
    .2 Manual starting.
    .3 Automatic shut down and alarm on:
        .1 Overcranking.
        .2 Overspeed.
        .3 High engine temp.
        .4 Low lube oil pressure.
        .5 Short circuit.
        .6 Alternator over voltage.
        .7 Lube oil high temperature.
        .8 Over temperature on alternator.
    .4 Manual remote emergency stop.

16.56 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for diesel generator for incorporation into manual specified in Section 2 – General Requirements.

.2 Include in Operation and Maintenance Manual instructions for particular unit supplied and not general description of units manufactured by supplier and:

- .1 Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, manual bypass switch, battery charger, battery, fuel system, engine room ventilation system, exhaust system and accessories, to permit effective operation, maintenance and repair.
- .2 Technical data:
  - .1 Illustrated parts lists with parts catalogue numbers.
  - .2 Schematic diagram of electrical controls.
  - .3 Flow diagrams for:
    - .1 Fuel system.
    - .2 Lubricating oil.
    - .3 Cooling system.
  - .4 Certified copy of factory test results.
  - .5 Maintenance and overhaul instructions and schedules.
  - .6 Precise details for adjustment and setting of time delay relays or sensing controls which require on site adjustment.

16.57 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 2 – General Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 2 – General Requirements.

16.58 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance materials in accordance with Section 2 General Requirements.

.2 Include:

.1 [2] fuel filter replacement elements.
.2 [2] lube oil filter replacement elements.
.3 [2] air cleaner filter elements.
.4 [2] sets of fuses for control panel.
.5 Special tools for unit servicing.

16.59 SYSTEM DESCRIPTION

.1 Generating system consists of:

.1 Diesel engine.
.2 Alternator.
.3 Alternator control panel.
.4 Automatic transfer equipment.
.5 Battery charger and battery.
.6 Automatic engine room ventilation system.
.7 Fuel supply system.
.8 Exhaust system.
.9 Steel mounting base.
.10 Synchronizing panel.
.11 Manual by-pass switch.

.2 System designed to operate as [emergency standby] [prime power source] [unattended] [in remote location].

16.60 DIESEL ENGINE

.3 Diesel engine: to ISO 3046-1.

.4 [Naturally aspirated] [Turbo charged] [and after cooled], synchronous speed [1800] rpm.

.5 Capacity:

.1 Rated continuous power in kW at rated speed, after adjustment for system losses in auxiliary equipment necessary for engine operation; to be calculated as follows: Rated continuous output = Generator kW divided by Generator efficiency at full load.

.1 Under following site conditions:

.1 Altitude: [_____] m.
.2 Ambient temperature: [_____] degrees C.
.3 Relative humidity: [_____] %.

.2 Engine overload capability 110% of continuous output for 1 hour within 12 hours period of continuous operation.

.6 Cooling System:

.1 Liquid cooled: heavy duty industrial radiator mounted [on generating set base with engine driven pusher type fan to direct air through radiator from engine side] [remotely with electrically driven fan], with [ethylene glycol] anti-freeze non-sludging above [-46] degrees C.

.2 Air cooled: air cooling duct enveloping cylinder walls with pressure cooling by engine driven blower.

.3 To maintain manufacturer's recommended engine temperature range at 10% continuous overload in ambient temperature of 40 degrees C.

.4 Block heater: thermostatically controlled lube oil or liquid coolant heater connected to line side of automatic transfer switch to allow engine to start in room ambient [0] degrees C.

.1 Switch and fuse in heater circuit, mounted in engine-alternator control cubicle and fed from line side of automatic transfer switch.

.7 Fuel: to CAN/CGSB-3.6, Type A, Arctic Grade [1] [2].

.8 Fuel system: solid injection, mechanical fuel transfer pump [with hand primer], fuel filters and air cleaner, fuel rack solenoid energized when engine running.

.9 Governor: mechanical hydraulic with:

.1 Steady state speed band of plus or minus 0.5%.

.2 Speed regulation no load to full load 5% maximum.

.3 Electronic [load sharing] type, electric actuator, speed droop externally adjustable from isochronous to 5%, temperature compensated with steady state speed maintenance capability of plus or minus 0.25%.

.10 Lubrication system:

.1 Pressure lubricated by engine driven pump.

.2 Lube oil filter: replaceable, full flow type, removable without disconnecting piping.

.3 Lube oil cooler.

.4 Engine sump drain valve.

.5 Oil level dip-stick.

.11 Starting system:

.1 Positive shift, gear engaging starter 12 or 24V dc.

.2 Cranking limiter to provide [trois (3)] cranking periods of 10s duration, each separated by [5] s rest.

.3 [Lead acid], 12 or 24V storage battery with sufficient capacity to crank engine for 1 min at 0 degrees C without using more than 25% of ampere hour capacity.

.4 Battery charger : constant voltage, solid state, two stage from trickle charge at standby to boost charge after use.

.1 Regulation: plus or minus 1% output for plus or minus 10% input variation.

.2 [Automatic boost for 6 hours every 30 days].

.3 Equipped with dc voltmeter, dc ammeter and on-off switch.

.4 Minimum charger capacity: [7] A.

.12 Vibration isolated engine instrument panel with:

.1 Lube oil pressure gauge.

.2 Lube oil temperature gauge.

.3 Lube oil level gauge.

.4 Coolant temperature gauge.

.5 Coolant level gauge.

.6 Running time meter: non-tamper type.

.13 Guards to protect personnel from hot and moving parts.

.1 Locate guards so that normal daily maintenance inspections can be undertaken without their removal.

.14 Drip tray.

16.61 ALTERNATOR

.1 Alternator: to NEMA MG1.

.2 Rating: 3 phase, [_____] V, [_____] wire, [_____] kW, 60 Hz, at 0.8 PF.

.3 Output at 40 degrees C ambient:

.1 100% full load continuously.

.2 110% full load for 1 hour.

.3 150% full load for 1 minute.

.4 Revolving field, brushless, single bearing.

.5 Drip proof.

.6 Amortisseur windings.

.7 Synchronous type.

.8 Dynamically balanced rotor permanently aligned to engine by flexible disc coupling.

.9 Exciter: [rotating brushless] [permanent magnet].

.10 [EEMAC] [NEMA] class[F] [H] insulation on windings.

.11 [Thermistors] [Platinum resistance temperature transducers] embedded in stator winding and connected to alternator control circuitry.

.12 Voltage regulator: thyristor controlled rectifiers with phase controlled sensing circuit:

.1 Stability: [_____] % maximum voltage variation at any constant load from no load to full load.

.2 Regulation: [_____] % maximum voltage deviation between no-load steady state and full-load steady state.

.3 Transient: [_____] % maximum voltage dip on one-step application of 0.8 PF full load.

.4 Transient: [_____] % maximum voltage rise on one-step removal of 0.8 PF full load.

.5 Transient: [_____] s maximum voltage recovery time with application or removal of 0.8 PF full load.

.13 Alternator: capable of sustaining 300% rated current for period not less than 10 s permitting selective tripping of down line protective devices when short circuit occurs.

16.62 CONTROL PANEL

.1 Totally enclosed, [free standing] [wall mounted] [mounting base isolated from diesel generator].

.2 Instruments:

.1 [Analogue] [Digital] [100% solid state circuitry] indicating type [2] % accuracy, rectangular face, flush panel mounting:

.1 Voltmeter: ac, scale 0 to [_____] V.

.2 Ammeter: ac, scale 0 to [_____] A.

.3 Wattmeter scale 0 to [_____] kW.

.4 Frequency meter: scale 55 to 65Hz.

.5 [kVAR meter] [kW.h meter].

.2 Voltmeter selector switch, rotary, panel mounting, [round notched handle,] [four position, labelled "Off-Phase A-Phase B-Phase C"].

.3 Ammeter selector switch, rotary, maintained contacts, panel mounting, designed to prevent opening of current circuits, [round notched handle,] [four position labelled "OFF- Phase A-Phase B-Phase C"].

.4 Instrument Transformers

.1 Potential-dry type for indoor use:

.1 Ratio: [600] to 120.

.2 Rating: [600] V, 60Hz, BIL [_____] kV.

.2 Current-dry type for indoor use:

.1 Ratio: [_____] to 5.

.2 Rating: [600] V, 60Hz, BIL [_____] kV.

.3 Positive action automatic short-circuiting device in secondary terminals.

16.63 CONTROLS

.1 Engine start button.

.2 Selector switch: Off-Auto-Manual - [Test full load test no load].

.3 Engine emergency stop button and provision for remote emergency stop button.

.1 Alternator output breaker:

.1 Circuit breaker: bolt-on, moulded case, temperature compensated for 40 degrees C ambient, dual thermal-magnetic trip.

.2 Circuit breaker, solid state sensing with:

.1 Frame containing breaker contacts, arc quenchers, [manual] [motor operated] mechanism, quick- make, quick-break, spring-loaded overcenter switching mechanism, mechanically trip free from handle, [fixed] [drawout] type.

.2 Static sensor: current monitors detect overload, short-circuit and ground-fault currents, and send these signals through solid-state circuits to static sensor which acts to trip breaker. Adjustable for current values and time of tripping.

.3 Flux-transfer shunt trip- magnetic tripping device actuated by signal from static sensor to open breaker contacts. Requires no external source of power.

.2 Voltage control rheostat: mounted on inside of control panel.

.3 Operating lights, panel mounted:

.1 "Normal power" pilot light.

.2 "Emergency power" pilot light.

.3 Green pilot lights for breaker on and red pilot lights for breaker off.

.4 Solid state indicator lights for alarm with [1 set] manually reset NO/NC contacts wired to terminal block for remote annunciation on:

.1 Low fuel level.

.2 Low battery voltage.

.3 Ventilation failure.

.4 Low coolant temperature.

.5 Solid state controller for automatic shutdown and alarms with [1 set] manually reset NO/NC contacts wired to terminal block for remote annunciation on:

.1 Engine overcrank.

.2 Engine overspeed.

.3 Engine high temperature.

.4 Engine low lube oil pressure.

.5 Short circuit.

.6 AC over voltage.

.6 Lamp test button.

.7 Synchronization and load sharing.

.8 Provision for remote monitoring.

16.64 AUTOMATIC TRANSFER SWITCH

.1 See PART 6.

16.65 MANUAL BYPASS SWITCH

.1 Load break bypass and isolation switch: manually operated, double throw, to provide bypass around transfer switch to facilitate maintenance on diesel generator control panel and transfer switch. Switch lockable in bypass position.

16.66 STEEL MOUNTING BASE

.1 Complete generating set mounted on [structural] steel base of sufficient strength and rigidity to protect assembly from stress or strain during transportation, installation and under operating conditions on suitable level surface.

.2 Assembly fitted with vibration isolators [and control console resiliently mounted].

.1 Spring type isolators with adjustable side snubbers and adjustable for levelling.

.3 Sound insulation pads for installation between isolators and concrete base.

16.67 EXHAUST SYSTEM

.1 Heavy duty [residential type] [industrial] [critical] [horizontally] mounted exhaust silencer with condensate drain, plug and [flanged] [welded] couplings.

.2 Heavy duty flexible exhaust pipe with flanged couplings as required.

.3 Fittings and accessories as required.

.4 Expansion joints: stainless steel, corrugated, of suitable length, to absorb both vertical and horizontal expansion.

16.68 FUEL SYSTEM

.1 Fuel storage tanks: to API Standard 650, ULC labelled.

.1 Above ground tank: to ULC-S601.

.2 Underground tank: to ULC-S603.

.2 Aboveground fuel storage tank: [_____] L, mounted indoors on elevated stand with fill and vent lines to exterior of building, fitted with weatherhoods.

.3 Underground fuel storage tank: [_____] L, as indicated.

.1 Electrically operated fuel transfer pump with float switch.

.4 Fuel level gauge and vent alarm.

.5 Drain and end plug.

.6 [Copper] [Black iron] feed and return lines, with flexible terminations at engine.

.7 Shut-off cock.

.8 Renewable cartridge filter.

.9 Fire valve.

.10 Isolating valves on lines serving auxiliaries.

.11 Low fuel level alarm for remote indication.

16.69 COOLING AIR SYSTEM

.1 Engine ventilating system:

- .1 Recirculating damper assembly with modulating motor.
- .2 Cold air inlet damper assembly with modulating motor.
- .3 Air discharge and intake gooseneck weatherhoods.
- .4 Modulating thermostat.
- .5 Replaceable air intake filters.

16.70 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section [26 05 00 - Common Work Results for Electrical].

.2 Control panel:

- .1 Size [4] [5] nameplates for controls including alternator breakers and program selector switch.
- .2 Size [2] [3] nameplates for meters, alarms, indicating lights and minor controls.

16.71 FABRICATION

.3 Shop assemble generating unit including:

- .1 Base.
- .2 Engine [and radiator].
- .3 Alternator.
- .4 Control panel.
- .5 Battery and charger.
- .6 Automatic transfer equipment.

16.72 FINISHES

.1 Alternator control cubicle: paint inside, exterior to match engine and alternator.

.2 Exhaust and inlet air hoods [international orange].

.3 Other ducts and racks grey.

.4 Supply 0.25 L of grey touch-up enamel.

16.73 SOURCE QUALITY CONTROL

.1 Factory test generator set including engine, alternator, control panels, transfer switch and accessories in presence of [Departmental Representative] [DCC Representative] [Consultant].

.2 Notify [Departmental Representative] [DCC Representative] [Consultant] days in advance of date of factory test.

.3 Test procedure:

.1 Prepare blank forms and check sheet with spaces to record data and at top of first sheet record:

.1 Date.

.2 Generator set serial no.

.3 Engine, make, model, serial no.

.4 Alternator, make, model, serial no.

.5 Voltage regulator, make and model.

.6 Rating of generator set, kW, kV.A, V, A, r/min, Hz.

.2 Mark check sheet and record data on forms in duplicate as test proceeds.

.3 [Departmental Representative's] [DCC Representative's] [Consultant's] signature on completed forms to indicate concurrence in results of test.

.4 Tests:

.1 With 100% rated load, operate set for [23] hours, taking readings at [30] minutes intervals, and record following:

.1 Time of reading.

.2 Running time.

.3 Ambient temp in degrees C.

.4 Lube oil pressure in kPa.

.5 Lube oil temp in degrees C.

.6 Engine coolant temp in degrees C.

.7 Exhaust stack temp in degrees C.

.8 Alternator voltage: phase 1, 2, 3.

.9 Alternator current: phase 1, 2, 3.

.10 Power in kW.

.11 Frequency in Hz.

.12 Power Factor.

.13 Battery charger current in A.

.14 Battery voltage.

.15 Alternator cooling air outlet temp.

.2 At end of [23] hours run increase load to 110% rated value, and take readings every 15 minutes for 1 hour.

.3 After completion of [24] hours run, demonstrate following shut down devices and alarms:

.1 Overcranking.

.2 Overspeed.

.3 High engine temp.

.4 Low lube oil pressure.

.5 Short circuit.

.6 Alternator over voltage.

.7 Low battery voltage, or no battery charge.

.8 Manual remote emergency stop.

.9 High alternator temperature.

.4 Next install continuous strip chart recorders to record frequency and voltage variations during load switching procedures. Each load change delayed until steady state conditions exist. Switching increments to include:

.1 No load to full load to no load.

.2 No load to 70% load to no load.

.3 No load to 20% load to no load.

.4 20% load to 40% load to no load.

.5 40% load to 60% load to no load.

.6 60% load to 80% load to no load.

.5 Demonstrate:

.1 Automatic starting of set and automatic transfer of load on failure of normal power.

.2 Operation of manual bypass switch.

.3 Automatic shutdown of engine on resumption of normal power.

.4 That battery charger reverts to high rate charge after cranking.

.6 Demonstrate low oil pressure and high engine temperature shutdown devices operation without subjecting engine to these excesses.

16.74 ACCEPTABLE MANUFACTURERS

.1 Kohler, product selection as per single line diagram.
.2 Cummins Distributed by Cummins Eastern Canada.
.3 MTU Onsite by Wajax Power Systems
.4 The above list does not indicate automatic approval, model selections are to be submitted prior for approval.
.5 Diesel Generators to be one manufacturer throughout entire project.

16.75 WARRANTY

.1 Warranty shall be manufacturers and dealer's standard warranty, in no event shall be less than 1 year.

16.76 INSTALLATION

.1 Locate generating unit and install as indicated.
.2 Install ventilating air duct system as indicated.
.3 Pipe muffler drains to nearest floor drain.
.4 Complete wiring and interconnections as indicated.
.5 Start generating set and test to ensure correct performance of components.

16.77 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
.2 Notify Consultant 5 working days in advance of test date. All testing to be completed in presence of Engineer.
.3 Provide fuel for testing and leave full tanks on acceptance.
.4 Demonstrate:
    .1 Unit start, transfer to load, retransfer to normal power, unit shut down, on "Automatic" control.
    .2 Unit start and shut down on "Manual" control
    .3 Unit start and transfer on "Test" control.
    .4 Unit start on "Engine start" control.
    .5 Operation of manual bypass switch.
    .6 Operation of automatic alarms and shut down devices.
    .7 Overspeed.
    .8 Alternator over voltage.
    .9 Low lube oil pressure.
.5 Run unit on load for minimum period of 4 hours to show load carrying ability, stability of voltage and frequency, and satisfactory performance of dampers in ventilating system to provide adequate engine cooling.
.6 Next install continuous strip chart recorders to record frequency and voltage variations during load switching procedures. Each load change delayed until steady state conditions exist. Switching increments to include:
    .1 No load to full load to no load.
    .2 No load to 70% load to no load.

.3 No load to 20% load to no load.
.4 20% load to 40% load to no load.
.5 40% load to 60% load to no load.
.6 60% load to 80% load to no load.
.7 At end of test run, check battery voltage to demonstrate battery charger has returned battery to fully charged state.

16.78 CLEANING

.1 Clean in accordance with Section 2 – General Requirements.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 2 – General Requirements.

16.79 MAINTENANCE - CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and CSA-B139.

PART 6: AUTOMATIC TRANSFER SWITCHES

16.80 RELATED REQUIREMENTS

.1 Section 16 – Sanitary Lift Station

16.81 REFERENCES

.1 CSA International

.1 CSA C22.2 No.5-09, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, NMX-J-266-ANCE-2010).

.2 CSA C22.2 No.178.1-2007, Automatic Transfer Switches.

.3 CAN/CSA C60044-1-07, Instrument Transformers.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 2-1996(R2009), Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC, Part 8: Disconnect Devices for Use in Industrial Control Equipment.

16.82 MEASUREMENT AND PAYMENT

.1 Work included in this Section will be included in the Tender Form item SANITARY LIFT STATION GENERAL, COMPLETE. No separate payment will be made.

16.83 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 2 – General Requirements.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for transfer switches and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Indicate on drawings:

.1 Make, model and type.

.2 Load classification:

.1 Approximate motor load: 84 kW.

.2 Restricted use: resistance and general loads, 0.8 pf or higher 15 kW.

.3 Single line diagram showing controls and relays.

.4 Description of equipment operation including:

.1 Automatic starting and transfer to standby unit and back to normal power.

.2 Test control.

.3 Manual control.

.4 Automatic shutdown.

16.84 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 2 – General Requirements.

.2 Operation and Maintenance Data: submit operation and maintenance data for transfer switches for incorporation into manual.

.3 Detailed instructions to permit effective operation, maintenance and repair.

.4 Technical data:

.1 Schematic diagram of components, controls and relays.

.2 Illustrated parts lists with parts catalogue numbers.

.3 Certified copy of factory test results.

16.85 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 2 – General Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect transfer switches from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

16.86 SYSTEM DESCRIPTION

.1 Automatic load transfer equipment to:

.1 Monitor voltage on all phases of normal power supply.

.2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below pre-set adjustable limits for adjustable period of time.

.3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.

.4 Transfer load from standby unit to normal power supply when normal power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.

.5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

16.87 MATERIALS

.1 Instrument transformers: to CAN/CSA C60044-1.

.2 Contactors: to NEMA ICS2.

16.88 CONTACTOR TYPE TRANSFER EQUIPMENT

.1 Contact Type Transfer Equipment: to CSA C22.2 No.178.1.

.2 Two-3 pole contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked, open type with CSA enclosure solenoid operated. Coordinate with phasing and wiring as indicated.

.3 Rated: Voltage and phase as indicated, 60Hz, amperage as indicated, solid neutral.

.4 Main contacts: silver surfaced, protected by arc disruption means.

.5 Switch and relay contacts, coils, spring and control elements accessible for inspection and maintenance from front of panel without removal of switch panel or disconnection of drive linkages and power conductors.

.6 Auxiliary contact: gold plated, to initiate emergency generator start-up on failure of normal power.

.7 Fault withstand rating: 30 kA symmetrical for 3 cycles with maximum peak value of 150 kA.

.8 Lever to operate switch manually when switch is isolated.

.9 Neutral bar, solid fully rated.

16.89 CONTROLS

.1 Selector switch - 3 position "Test", "Auto", "Engine start".

.1 Test position - normal power failure simulated. Engine starts and transfer takes place. Return switch to "Auto" to stop engine.

.2 Auto position - normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.

.3 Engine start position - engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.

.2 Control transformers: dry type with 120 V secondary to isolate control circuits from:

.1 Normal power supply.

.2 Emergency power supply.

.3 Relays: continuous duty, industrial control type, with wiping action contacts rated 10 A minimum, coordinate with phasing as indicated.

.1 Voltage sensing: all phase for normal power and all phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2 V minimum undervoltage and over voltage protection.

.2 Time delay: normal power to standby, adjustable solid state, 0 to 60 s.

.3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 3 to 20 s delay.

.4 Time delay on retransfer from standby to normal power, adjustable 0 to 60 s 5 to 180 s 20 s to 10 minutes.

.5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state 20 s intervals to 10 minutes.

.6 Time delay during transfer to stop transfer action in neutral position to prevent fast transfer, adjustable, 5 s intervals to 180 s.

.7 Frequency sensing, to prevent transfer from normal power supply until frequency of standby unit reaches preset adjustable values.

.8 Neutral disconnected position delay: allow time for motors to delay between live sources, adjustable, 0 to 5 s.

16.90 ACCESSORIES

.1 Ensure pilot lights indicate power availability normal and standby, switch position, green for normal, red for standby, mounted in panel.

.2 Plant exerciser: 168 hours timer to start standby unit once each week for selected interval transfers load to emergency supply and retransfers to normal supply on standby unit shutdown. Timer adjustable 0-168 hours in 15 minute intervals.

.3 Auxiliary relay to provide 4 N.O. and 4 N.C. contacts for remote alarms.

.4 Instruments:

.1 Digital true RMS, indicating type 2 % accuracy, flush panel mounting:

.1 Voltmeter: ac, scale 0 to 1000 V.

.2 Ammeter: ac, scale 0 to 1000 A.

.3 Frequency meter: scale 55 to 65 Hz.

.5 Voltmeter selector switch: rotary, maintained contacts, panel mounting type, round notched handle, four position, labelled "OFF-Phase A-Phase B-Phase C".

.6 Potential transformers - dry type for indoor use:

.1 Ratio: As required for voltage.

.2 Rating: 250 V, 60Hz, BIL standard kV.

.3 Accuracy rating: 1%.

.7 Ammeter selector switch: rotary, maintained contacts, panel mounting type, designed to prevent opening of current circuits, round notched handle, four position labelled "OFF - Phase A - Phase B - Phase C".

.8 Current transformers - dry type for indoor use:

.1 Ratio: 200 to 5.

.2 Rating: 250 V, 60Hz, BIL standard.

.3 Accuracy rating: 1%.

.4 Positive action automatic short- circuiting device in secondary terminals.

16.91 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 16 - Common Work Results for Electrical.

.2 Control panel:

.1 For selector switch and manual switch: size 4 nameplates.

.2 For meters, indicating lights, minor controls: use size 3 nameplates.

.3 Nameplates to include: ratings.

16.92 SOURCE QUALITY CONTROL

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Consultant.

.2 Notify Consultant 5 days minimum in advance of date of factory test.

.3 Tests:

.1 Operate equipment both mechanically and electrically to ensure proper performance.

.2 Check selector switch, in modes of operation Test, Auto, Manual, Engine Start and record results.

.3 Check voltage sensing and time delay relay settings.

.4 Check:

.1 Automatic starting and transfer of load on failure of normal power.

.2 Retransfer of load when normal power supply resumed.

.3 Automatic shutdown.

.4 In-phase monitor operation.

16.93 ACCEPTABLE MANUFACTURERS

.1 Kohler KSS- ATS 1500.

.2 ASCO Series 300-P.

.3 Cummins OTPC-A078.

16.94 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for transfer switches installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

16.95 INSTALLATION

.1 Locate, install and connect transfer equipment as indicated.

.2 Check relays, solid state monitors and adjust as required to ensure correct operation.

.3 Install and connect remote alarms.

16.96 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 16 – Sanitary Lift Station.

.2 Energize transfer equipment from normal power supply.

.3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.

.4 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.

.5 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 minutes, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.

.6 Repeat, at 1 hour intervals, 2 times, complete test with selector switch in each position, for each test.

16.97 CLEANING

.1 Progress Cleaning: clean in accordance with Section 2 – General Requirements.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 2 – General Requirements.

.3 Waste Management: separate waste materials for recycling.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

APPENDIX A: LIST OF DRAWINGS

DRAWING NO. 01 – 1050 mm DIA. SANITARY MANHOLE SECTION
DRAWING NO. 02 – 1200 mm DIA. SANITARY MANHOLE SECTION
DRAWING NO. 03 – 1200 mm DIA. SANITARY DROP MANHOLE SECTION
DRAWING NO. 04 – 1500 mm DIA. SANITARY MANHOLE SECTION
DRAWING NO. 05 – TEE BASE SANITARY MANHOLE INSTALLATION
DRAWING NO. 06 – TYPICAL MANHOLE HEIGHT ADJUSTMENT
DRAWING NO. 07 – MANHOLE BASE – SECTION AND PLAN VIEW
DRAWING NO. 08 – ADJUSTABLE MANHOLE FRAME AND COVER
DRAWING NO. 09 – PAMREX FRAME AND COVER
DRAWING NO. 10 – MANHOLE FASTENING
DRAWING NO. 11 – SANITARY SEWER SERVICE CONNECTION
DRAWING NO. 12 – SEWER SERVICE CONNECTION DEEPER THAN 3.0 m
DRAWING NO. 13 – PIPE TRENCH AND ROAD RESTORATION
DRAWING NO. 14 – TRENCH DETAIL WITH TRENCH BOX
DRAWING NO. 15 – COMBINED PIPE TRENCH DETAIL
DRAWING NO. 16 – VALVE BOX FOR SANITARY PRESSURE PIPE
DRAWING NO. 17 – MANHOLE MARKER SIGN
DRAWING NO. 18 – CATEGORY 1 LIFT STATION – TYPICAL PLAN VIEW
DRAWING NO. 19 – CATEGORY 1 LIFT STATION – TYPICAL SECTION VIEW
DRAWING NO. 20 – CATEGORY 1 LIFT STATION – TYPICAL PROFILE VIEW
DRAWING NO. 21 – CATEGORY 2 LIFT STATION – TYPICAL PLAN VIEW
DRAWING NO. 22 – CATEGORY 2 LIFT STATION – TYPICAL SECTION VIEW
DRAWING NO. 23 – CATEGORY 2 LIFT STATION – TYPICAL PROFILE VIEW
DRAWING NO. 24 – CATEGORY 2 LIFT STATION – TYPICAL ELEVATION VIEW
DRAWING NO. 25 – THIMBLE DETAIL

APPENDIX B: STATUTORY DECLARATION

To be made by the Contractor **prior to payment** when required as a condition for either:

□ second and subsequent progress payments; or

□ release of holdback.

The last application for progress payment for , which the Declarant has received payment is No._____dated the day of_____in the year_____.

CONTRACT NAME: _____

CONTRACT NO.: _____

CONTRACTOR: _____

I solemnly declare that, as of the date of this declaration, I am an authorized signing officer, partner or sole proprietor of the Contractor named above, and as such have authority to bind the Contractor, and have personal knowledge of the fact that all accounts for labour, subcontracts, products, services, and construction machinery and equipment which have been incurred directly by the Contractor in the performance of the work as required by the Contract, and for which the Owner might in any way be held responsible, have been paid in full as required by the Contract up to and including the latest progress payment received, as identified above, except for:

1) holdback monies properly retained,
2) payments deferred by agreement, or
3) amounts withheld by reason of legitimate dispute which have been identified to the party or parties, from whom payment has been withheld. I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath.

Declared before me in _____ **this** _____ **day**
City/Town and Province *day*

of _____ **, In the year** _____**.**
month *year*

_____
Signature of Contractor

_____
Name (printed)

_____
Title

Affix Company Seal

_____
(A Commissioner for Oaths or Notary Public)

The making of a false of fraudulent declaration is a contravention of the Criminal Code of Canada, and could carry upon conviction, penalties including fines or imprisonment.

APPENDIX C: CLOSED CIRCUIT VIDEO INSPECTION

EQUIPMENT:

The Supplier must provide equipment meeting the following requirements:

- Self – contained monitoring unit complete with pan/tilt/zoom digital camera capability with remotely controlled lighting system capable of varying the illumination **of the interior of the sewer line for inspection and photographic purposes.**
- Minimum camera resolution must be 640 x 480 and show the entire periphery of pipe.
- CCTV video is to be recorded directly in a DVD format or USB memory stick, etc.
- Video file format must be MPEG 2 encoded, Regional Code 1 and comply with the NTSC (National Television Standards Committee).
- **Supplier must be able to video pipe sizes ranging from 150 mm diameter up to 1,800 mm diameter inclusively.**

DEFINITION OF FAULT:

- Any sewer pipe joint which displays a gap or spread, offset, gasket, or signs of infiltration.
- Any service lateral which displays water infiltrating around service connections, any service lateral exhibiting pronounced protrusion into the sewer line or any active or abandoned service lateral.
- Any section of sewer which is crushed, broken or displays longitudinal or circumferential cracks (other than hairline cracking), which displays a gap/spread, offset or signs of infiltration.
- Any variance in grade, **alignment or diameter** of sewer **line** section.
- Any gravel, roots, or foreign material which may impede flow.
- Any deformation in the shape of the pipe.
- **Any section of sewer displaying standing water.**
- **Any material change or spot repair.**

INSPECTION:

- Flush sewer lines prior to video inspection.
- Perform inspection of pipe from manhole to manhole by passing CCTV camera through sewer preferably in the direction of flow, according to line conditions at the time inspection is made.
- The inspection shall be performed on one (1) sewer line at a time by transporting the CCTV camera through the line along the axis of the pipe.
- **All fault will be inspected using the pan and tilt feature of the camera. Continuous faults shall be inspected using the pan and tilt feature at intervals so as to provide a representative of that fault.**

APPENDIX C: CLOSED CIRCUIT VIDEO INSPECTION (Cont'd)

RECORDS:

- Maintain inspection **report** during **CCTV** inspection.
- Report to include location of each fault and service laterals **with their respective** distance measured from centerline of reference manhole and clock position referenced to axis of pipe. **Report to also include pictures of significant defects (severely deteriorated pipe, severely protruding lateral, etc.)**
- **At the start of each sewer main inspection, the following information shall be recorded in the DVD or USB:**
    - **Date, time and weather conditions;**
    - **Location (street, civic address, etc.);**
    - **Pipe type (combined, sanitary or storm);**
    - **Pipe size;**
    - **Pipe material;**
    - **Pipe ID;**
    - **From Manhole ID**;
    - **To Manhole ID**;
    - **Direction of travel (upstream, downstream)**;
    - **Survey number**;
    - **Any other information that may be pertinent to the work**.
- **The pipe ID shall be displayed on the screen at all times during the inspection for quick reference.**
- **On screen display to clearly identify exact location of camera in meters.**

REPORTS:

- **The inspection report shall be in PDF.**
- **The Supplier shall provide a digital copy of the sewer defect data in an mdb (Microsoft database) format for each sewer inspection. This is possible by exporting the data from the CCTV reporting software.**
- **The inspection report and sewer defect data in mdb format shall be submitted to the GSSC by email and shall have the following file naming convention:**
    - **Street_PipeID_YYYY-MM-DD_Incremental Number (1,2,3,etc…)**
    - **The incremental number is only used if a sewer line section is inspected more than once in the same day.**

ACCURACY:

- **Pipe diameter shall be estimated within plus or minus one (1) nominal pipe size for all sizes of sewers outlined in these Specifications.**
- **Maximum permissible error in location of faults and service laterals with their respective distance measured from centerline of reference manhole to be within a one (1) meter tolerance.**

DVD'S Or USB:

- Supply a complete record of all CCTV video inspections on DVD.
- **Label all DVD's, listing streets and corresponding pipe ID's inspected.**
- **DVD shall include a main menu with a chapter for each individual inspection. Chapter to be labeled by Street and Pipe ID.**

APPENDIX D1: SEWER MAIN LEAKAGE TEST

SEWER MAIN LEAKAGE TEST

GENERAL INFORMATION			
PROJECT:		DATE:	
PROJECT No.:		CONTACTOR:	
JOB LOCATION:		CONTACTOR'S REP:	
		OBSERVER:	
TEST LOCATION:		TYPE OF PIPE:	CLASS

ALLOWABLE EXFILTRATION: AIR TEST		
D = DIAMETER OF PIPE (mm)		
F = LOSS FACTOR	0.0987 for no ground water above top of pipe 0.0900 for 1 m ground water above top of pipe 0.0827 for 2 m ground water above top of pipe 0.0765 for 3 m ground water above top of pipe 0.0711 for 4 m ground water above top of pipe	
TA = ALLOWABLE TIME:		TA = 15 D F (SECONDS)

TEST RESULTS: AIR TEST	
Tt = TIME FOR AIR PRESSURE TO DROP FROM 25 kPa (3.6 psi) to 15 kPa (2.2 psi)	
Tt =	IF Tt > TA = PASS □ IF Tt < TA = FAIL □

Conversion Factors:

1 inch = 25.4 mm
1 psi = 6.94 kPa
1 imp. Gal. = 4.54 liters

COMMENTS

OBSERVER'S SIGNATURE

FOREMAN'S SIGNATURE

APPENDIX D2: MANHOLE VACUUM TEST

MANHOLE VACUUM TEST

GENERAL INFORMATION

DATE: _____

CONTRACTOR: _____

CONTRACTOR'S REP: _____

CRANDALL INSPECTOR: _____

OTHERS: _____

PROJECT: _____

LOCATION: _____ MANHOLE No.: _____

D= MANHOLE DIAMETER _____ (m) H= HEIGHT OF MANHOLE _____ (m)

SANITARY MANHOLE VACUUM TEST - ALLOWABLE TIME

THE ALLOWABLE TIME IS A FUNCTION OF MANHOLE DIAMETER, DEPTH AND GROUNWATER. THE MANHOLE SHALL PASS IF THE TIME FOR THE VACUUM TO DROP MEETS OF EXCEEDS THE VALUES INDICATED IN TABLE 1 (*see next page*).

ALLOWABLE TIME

TALL = (Time from Table 1)

SANITARY MANHOLE VACUUM TEST RESULTS

T1 = TIME STARTED AT 33.8 kPa (4.9 psi): _____ IF TACT > TALL IF TACT < TALL

T2 = TIME STOPPED AT 30.4 kPa (4.4 psi): _____

TACT= ACTUAL TIME = T2 - T1 _____ PASS □ FAIL □

COMMENTS _____

_____

_____

_____

OBSERVER'S SIGNATURE FOREMAN'S SIGNATURE

APPENDIX D2: MANHOLE VACUUM TEST (Cont'd)

Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test ASTM C1244 – 04

- Conduct testing one manhole at a time
- All lift holes shall be plugged, pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.
- The test head shall be placed at the top of the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 30.4 kPa of HG.
- The manhole shall pass if the time for the vacuum reading to drop from 33.8 kPa of Hg to 30.4 kPa of Hg meets or exceeds the values indicated in Table 1.

TABLE 1 Minimum Test Times for Various Manhole Diameters in Seconds

	Diameter, mm								
Depth, m	750	825	900	1050	1200	1350	1500	1650	1800
	Time, in seconds								
2.4	11	12	14	17	20	23	26	29	33
3.0	14	15	18	21	25	29	33	36	41
3.7	17	18	21	25	30	35	39	43	49
4.3	20	21	25	30	35	41	46	51	57
4.9	22	24	29	34	40	46	52	58	67
5.5	25	27	32	38	45	52	59	65	75
6.1	28	30	35	42	50	58	65	72	81
6.7	31	33	39	46	55	64	72	79	89
7.3	33	36	42	51	59	70	78	87	97
7.9	36	39	46	55	64	75	85	94	105
8.5	39	42	49	59	69	81	91	101	113
9.1	42	45	53	63	74	87	98	108	121

APPENDIX D3: MANHOLE LEAKAGE TEST

MANHOLE -LEAKAGE TEST

GENERAL INFORMATION:

CONTRACT _____ DATE: _____

CONTRACT NO. _____ CONTRACTOR:_____

JOB LOCATION: _____ CONTRACTOR'S REP:_____

TEST LOCATION: _____ OBSERVER: _____

MANHOLE NUMBER:_____ WEATHER: _____

ALLOWABLE EXFILTRATION: WATER TEST

Formula for ALLOWABLE leakage: 25 litres per millimeter diameter of manhole riser per kilometer per day

NOTE: Duration of test shall be 2 HOURS

$L_{MANHOLE}$ = 25(_____mm) (_____ km) ($\frac{1}{24}$) = _____ litres

$L_{MANHOLE}$ = 25(_____mm) (_____ km) ($\frac{1}{24}$) = _____ litres

$L_{MANHOLE}$ = 25(_____mm) (_____ km) ($\frac{1}{24}$) = _____ litres

$L_{MANHOLE}$ = 25(_____mm) (_____ km) ($\frac{1}{24}$) = _____ litres

$L_{MANHOLE}$ **TOTAL = _____ litres per hour of test**

TEST RESULTS: WATER TEST

Formula for ACTUAL Leakage : $L_{ACTUAL} = \frac{\pi r^2 h}{1000}$ Where : **π** = pie (3.14)
r = radius in centimeters (cm)
h = height in centimeters (cm)

(1) Time _____ rdg. _____ cm |
| Difference (h) _____ cm
(2) Time _____ rdg. _____ cm |

$L_{ACTUAL} = \frac{\pi r^2 h}{1000} = \frac{3.14 (\_\_\_\_\_ cm)^2 (\_\_\_\_\_ cm)}{1000}$ = _____ litres

IF L_{ACTUAL} < $L_{MANHOLE}$ THEN **IF L_{ACTUAL} > $L_{MANHOLE}$ THEN**

PASS ☐ **FAIL** ☐

TEST RESULTS : AIR TEST

Tt = TIME FOR AIR PRESSURE TO DROP FROM 26.7 kPa (4.0psi) to 24.1 kPa (3.5 psi)

Tt (time in minutes) = _____ **IF Tt > 2 Minutes = PASS** ☐

IF Tt < 2 Minutes = FAIL ☐

_____
Observer's Signature

CONVERSION FACTORS:

1 inch	=	25.4mm
1 p.s.i.	=	6.94kPa
1 imp. Gal.	=	4.54 litres

APPENDIX E: CERTIFICATE OF PROVISIONAL ACCEPTANCE

CONTRACT NAME:_____

CONTRACT NO.: _____

CONTRACTOR: _____

I,_____, Project Engineer, do hereby certify that all works required under this contract are "Provisionally Accepted" as of the _____day of_____,20___. It is understood that the "Warranty and Maintenance Period" commences as of this date and that the following contract requirements have been fully met;

1. Certificate of Substantial Performance was issued on _____.
   (If not issued the following items listed below must be completed, if applicable)

   a. All sewer mains have passed sewer leakage tests which were carried out on_____ _____. (*Attach completed Appendix "D")*

   b. All required sewer video inspections were completed on_____ and the video and video reports have been distributed as required.

   c. All Forcemain's have passed water pressure tests which were carried out on _____. (*Attach completed Appendix "D"*)

   d. A Statutory Declaration dated_____, and covering all work completed to date under this contract is attached, as a requirement for the issuance of the Certificate. Declaration must state that each and every person having completed work under this contract has been paid in full, or, that a letter of agreement is attached from each and every person not paid in full, stating that arrangements have been made to their satisfaction, to be remunerated, at a later date.

2. A complete inspection of the works was carried out on _____ , and those present were:

   _____

   _____

3. A deficiency list was prepared. Yes_____ No_____ (If yes, please attach)

4. All items on the attached deficiency list have been addressed by the contractor and an additional inspection was conducted on _____, by _____ , which confirmed that all items now meet City requirements.

5. Is any part of this contract in dispute? Yes_____ No_____

6. Is this contract entirely complete? Yes_____ No_____

   If any portion of the work covered by this Certificate is in dispute or not completed, a separate written report must accompany this certificate, outlining in detail the particulars.

APPENDIX E: CERTIFICATE OF PROVISIONAL ACCEPTANCE (Cont'd)

7. The first release of holdback will become due on the ____day of _____, 20__ , which is based on the date herein declared or the date on the Certificate of Substantial Performance of _____. Holdback Release shall be in accordance with the Construction Remedies Act.

Dated: _____ Signed: _____
Project Engineer

We, the undersigned, do hereby certify that all matters relating to this contract have been completed to our satisfaction and that the Certificate of "Provisional Acceptance" can be issued.

Dated: _____ Signed: _____
Director of Design & Construction

Dated: _____ Signed: _____
General Manager

C: Owner
Contractor

APPENDIX F: CERTIFICATE OF FINAL ACCEPTANCE

CONTRACT NAME: _____

CONTRACT NO.: _____

CONTRACTOR: _____

I, _____ Project Engineer, do hereby certify that all works required under this contract are accepted as of the _____ day of _____, 20___.

1. A "Certificate of Substantial Performance" was issued on _____.

2. The "Certificate of Provisional Acceptance" was issued on _____.

3. A final inspection of the works was carried out on _____ and those present were:

_____

_____

_____

4. A final deficiency list was prepared (if Yes, attach) Yes___ No ____

5. The attached deficiency list has been addressed by the contractor and an additional inspection conducted on _____ by _____ confirmed that all items new meet the contracted requirements.

6. Portion is dispute Yes _____ No _____
   Contract entirely completed Yes _____ No _____

   If any portion of the work covered by this certificate is in dispute or not entirely completed, a separate written report must accompany this certificate, explaining the particulars.

Dated: _____

Signed: _____
Project Engineer

APPENDIX F: CERTIFICATE OF FINAL ACCEPTANCE (Cont'd)

7. DECLARATION

I/we, the undersigned, declare that the firm of _____ has no further claims against the Owner.

I/we solemnly declare that all persons who have been employed upon the works or who have furnished equipment, materials or services for the works, or persons entitled to protection under the construction Remedies Act, have been fully paid.

I/we make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath, and by virtue of the Evidence Act.

Dated at _____ this ____ day of _____, 20___.

Signature of Witness _____ Signature of Representative _____

Name (Printed) _____ Name (Printed) _____

Title (Printed) _____

Company Seal must be affixed

C: Owner
Contractor

APPENDIX G: CERTIFICATE OF SUBSTANTIAL PERFORMANCE

CONTRACT NAME: _____

CONTRACT NO.: _____

CONTRACTOR: _____

I, _____ , Project Engineer, do hereby certify that the works required under this contract are "Substantially Performed" as of the _____ day of , 20___ and that the following contract requirements have been fully met;

1. All sewer mains have passed leakage tests which were carried out on _____ _____*(Attach completed Appendix "D1").*
2. Video sewer inspection was completed/is scheduled to be done on _____ _____.
3. A complete inspection of the works, involving all required owner and Contractor's representatives, will be conducted on _____.
4. The following minor works items will be completed by _____.

List and comment:

_____

_____

_____

_____

Subject to the requirements of the General Specifications, the first release of holdback monies may become due sixty one (61) days after the above-stated date and in accordance with the Construction Remedies Act.

_____

Signature of Project Engineer

Dated _____

C: Owner
Contractor

APPENDIX H: CAMPGROUND GUIDELINES

1. Developer of new campgrounds and extensions are to submit a detailed campground sewer system design plan to the Greater Shediac Sewerage Commission for approval. As well, a detailed storm water drainage plan shall be submitted for review.

2. At no time will storm water (infiltration) be permitted to enter the sanitary sewer system.-GSSC reserves the right to perform a site inspection at anytime as per By-law 3"D".

3. All campground connections (with or without camper trailers connected) must be a watertight seal meeting both plumping code and as per GSSC Specifications

4. Permanent structures sewer laterals are to meet GSSC Specifications

5. Campsite sewer laterals are to terminate a minimum 150mm above ground surface elevation complete with ground surface sloping away from riser pipe.

6. All materials and construction methods are to meet GSSC specifications.

7. A new gate valve shall be installed at connection point(s) to existing GSSC sewer system.

8. Should the campground connection point to the GSSC sewer system not be at an existing manhole, the campground must have a new manhole immediately upstream of the connection to the GSSC sewer main.

9. As-built drawings for new campgrounds are to be submitted in CAD and hard copy format as per GSSC Specifications.