VILLE DE SHEDIAC

TOWN OF SHEDIAC

DEVIS NORMALISÉ

Pour

TRAVAUX MUNICIPAUX

****

STANDARD MUNICIPAL SPECIFICATIONS

Révisé / Revised

Mars / March 2022

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APPENDICES

INSTRUCTIONS TO TENDERERS

1. TENDER DOCUMENTS

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

1.2 Addenda to the tender documents will be issued only to those persons listed in accordance with subsection 1.1.

1.3 It is the responsibility of all tenderers to ensure that they are listed as having received tender documents.

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

1.5 When tender documents are being provided electronically through the New Brunswick Opportunities Network website, subsections 1.1 to 1.4 may be omitted.

2. TENDER DEPOSIT

2.1 A person submitting a tender shall deposit it in the tender box at the location and within the time stipulated in the public notice of tender.

2.2 Responsibility for deposit of a tender or amendment thereto, in the tender box in the proper location within the proper time, is that of the person submitting the tender. The Town assumes no responsibility for those tender submissions which have been mailed or left with employees of the Town.

2.3 Only those tenders deposited in the tender box will be considered.

2.4 A person submitting a tender may amend the tender subsequent to the deposit of the tender in the tender box and prior to the time of opening the tenders by:

2.4.1 letter, telegram, telex or facsimile (fax) sent by the person(s) signing the original tender deposit; and

2.4.2 depositing the amendment in the tender box prior or the close of tenders; and

2.4.3 clearly identifying the project being tendered and the tender being amended on the face of amending letter, telegram, telex or facsimile (fax).

2.5 An amendment of tender shall not disclose the amended total tender price but shall show:

2.5.1 the revised bid price per items to be amended in the case of a unit price contract; or

2.5.2 the amount to be added to or subtracted from the contract price in the case of a lump sum contract; or

2.5.3 the information that is missing from the tender on deposit.

2.6 Subsection 2.2 also applies to a letter, telegram, telex or facsimile (fax) of amendment of tender.

2.7 If the tender deposit and amendment is found to be a valid submission of tender and amendment, then the contract price shall be amended to reflect the original tender deposit as amended by the tender amendment.

3. TENDER SUBMISSION

3.1 Tenders may be deposited in the tender box up until the time stipulated in the notice of tender.

3.2 The Town Clerk or his designate shall, at the time specified for tender opening in the notice of tender, declare:

3.2.1 that no further tenders will be accepted, whereupon no further tenders may be deposited;

3.2.2 that any person wishing to withdraw their tender shall do so immediately, whereupon the tenders of those persons wishing to withdraw shall be delivered up to those persons unopened; and

3.2.3 that no further tenders may be withdrawn, whereupon the tender opening procedure shall be followed and no person shall be allowed to withdraw their tender.

4. TENDER REJECTION

4.1 A tender submitted for a proposed contract to which the tender regulations apply shall be rejected and the tender not considered if the tender:

4.1.1 is not accompanied by the required security deposit or Bid Bond in the stated amount;

4.1.2 is not accompanied by a letter from a New Brunswick resident agent of an insurance company licensed to do business in the Province stating that the Bid Bond, where required, has been negotiated for, procured from and the premium paid to that agent;

4.1.3 is not "Properly Signed" by the tenderer. "Properly Signed" shall mean:

4.1.3.1 In the case of an INCORPORATED COMPANY, the tender document must be signed in the space(s) provided by the authorized signing officer(s) of the company. The company must also furnish a certified copy of the By-Law or resolution authorizing such execution.

4.1.3.2 In the case of a FIRM, NOT A CORPORATE BODY, a document must be signed by every member of the firm.

4.1.3.3 In the case of an individual, the document must be signed by such individual.

4.1.3.4 In the case of a document being executed by Power of Attorney, the original Power of Attorney (or a copy thereof duly certified by a Notary) must be furnished.

4.1.3.5 Signature(s) shall be witnessed only where indicated on the tender form.

4.1.3.6 A witness shall not be required to the Corporate Signature of an incorporated company.

4.1.4. does not contain the unit prices or fixed price written in words;

4.1.5 does not have the words "dollars" and, where applicable, "cents" set out in the written item bid;

4.1.6 contains any form of qualification of, or unless the tender documents otherwise provide, any unsolicited alternative to the tender;

4.1.7 does not contain a bid for each item required to be bid;

4.1.8 does contain a bid on an item not included in the bid form;

4.1.9 is not contained in an envelope having on the face of it the name of the tenderer and identification of the contract for which the tender is submitted;

4.1.10 does not contain all addenda issued to prospective tenderers, each "Properly Signed" by the tenderer;

4.1.11 is the second one submitted by the same tenderer in which case all tenders submitted by that tenderer shall be rejected;

4.1.12 is made by a tenderer not listed or by a consortium which or each member of which is not listed by the Town as having received tender documents;

4.1.13 contains a change in a written bid price not initialed by the tenderer;

4.1.14 omits any document or information required by or fails to comply with any provision of the tender form;

4.1.15 otherwise materially deviates from accepted tendering practices;

4.1.16 does not contain the construction schedule; if so required in the Tender Form;

4.1.17 if the tender submission does not contain:

A current Letter of Good Standing (LoGS) with either "Audit Pending" or "Certificate of Recognition" under the Certificate of Recognition (COR) Program issued by the New Brunswick Construction Safety Association (NBCSA) or an acceptable equivalent and, an up to date clearance certificate from **WorSafe NB**. NBCSA letters stating "In Process" will not be accepted for the tender submission.

4.2 Subject to subsection 4.1, a tender submitted for a proposed contract to which the tender regulations apply may be accepted, notwithstanding that it contains:

4.3.1 errors in mathematics, in which case proper computation will be carried out and the resultant total used in determining the tender value;

4.3.2 a conflict between the written bid price and the bid price in numbers in which case the bid is corrected to reflect the written bid price;

4.3.3 omission of a "provisional sum" specified by the Town in which case the required "provisional sum" will be inserted and the tender corrected to reflect its inclusion.

4.3.4 "Security Deposit" for an amount greater than the stated or advertised amount.

5. PRICES WRITTEN OUT

5.1 Persons submitting tenders must submit their tenders with unit prices written out and lump sum prices written out.

5.2 The total tender price in a unit price tender need not be written out.

5.3 The written figures in a total tender shall govern and be binding on the tenderer even though totals arrived at disagree with figures or totals given in figures.

6. PUBLIC TENDER OPENING

6.1 All tenders shall be opened in public at the location specified in the public notice of tender.

6.2 Each tender shall be opened individually and checked for completeness and where it is apparent that the tenderer has failed to comply with the requirements of these specifications, the tender shall be rejected forthwith.

6.3 If the tender is rejected, the tender will be returned to the person submitting the tender.

6.4 If the tender is not rejected, the bid price and the name of the persons or firm submitting the tender will be posted. Posting of bid does not constitute acceptance of the tender submission.

6.5 The award of the contract will not take place at the time of the tender opening.

7. SECURITY DEPOSIT OPTION

7.1 Where the Town elects to require a security deposit other than a bid bond, the tender documents shall stipulate the type and amount of deposit.

8. PERFORMANCE BOND AND LABOUR & MATERIAL PAYMENT BOND

8.1 Where a bid bond is required in the submission of tenders for the award of a contract to which these tender regulations apply, a labour and material payment bond and a performance bond shall be supplied by the successful tenderer within the time stipulated in subsection 10.2.

8.2 The labour and material payment bond and performance bond required by subsection 8.1 shall be in an amount, for each bond, equal to 50% of the value of the awarded price. Bonds are to follow requirements of the Construction Remedies Act.

9. REFUND OF SECURITY DEPOSITS

9.1 Where the Town elects to require a security deposit under section 7 the security deposit of the successful tenderer shall, if a contract is entered into with that person, be held by the Town as security for the due performance of the work by the Contractor and shall be returned without interest upon issuance of the first release of holdback.

9.2 The certified cheque, bank draft or money order of the successful tenderer may be cashed and the proceeds deposited with interest at any chartered bank pending deposition under the terms of the contract and any such interest shall be deemed to be and treated as an increment to an part of the security deposit and shall not be refunded upon return of the security deposit.

9.3 Security deposits will be returned without interest to unsuccessful tenderers within two (2) days following the award of the contract.

10. TENDER VALID FOR

10.1 The Town shall, within sixty (60) working days of the public tender opening for the contract, notify the successful tenderer by mail delivery that they are the successful tenderer and call on them to enter into a formal contract for construction of the work.

10.2 The successful tenderer notified in accordance with subsection 10.1 shall, within ten (10) working days of notification;

10.2.1 where required by section 8, provide a performance bond and labour & material bond in the amount stipulated;

10.2.2 provide proof of insurance coverage of the type and in the amount stipulated in the General Conditions; and

10.2.3 execute the formal document.

10.3 The Town reserves the right to increase or decrease quantities and award a contract for more or less than the total bid price based on the unit bid prices.

11. REFUSAL TO ENTER CONTRACT

11.1 If a successful tenderer does not comply with the provisions of section 10 within the time stipulated, they shall be considered to have refused to enter into the contract and section 11.3 applies.

11.2 Where default under subsection 11.1 occurs, the Town may call upon the next suitable tenderer to enter into the contract in accordance with the provisions of section 10.

11.3 Where the successful tenderer has been called upon to enter into a formal contract by the Town and refuses to do so within the time limit stipulated, the Town will:

11.3.1 cash or negotiate the bid deposit and retain a sum equal to the difference between the value of their tender and the value of the next lowest tender and shall return an amount equal to the surplus, if any, to the tenderer whose bid deposit was so forfeited; or

11.3.2 notify the Surety Company where a bid bond was submitted.

12. TENDER BINDING

12.1 A tender is binding upon the person(s) submitting the tender until such time as they receive formal notification by telegram, telex, facsimile (fax) or mail of the rejection of their tender but in no case unless, as successful tenderer, they have received notification under subsection 10.1 shall it be binding upon them for more than sixty (60) working days, from the date of public tender opening, unless requested by the Town and agreed to by the tenderer in writing.

13. CROWN CONSTRUCTION CONTRACTS ACT

13.1 Tenders issued under the provisions of the Crown Construction Contracts Act will be so identified in the Notice of Tender, and if so, will be governed by the latest revision of the Statute's regulations.

GENERAL CONDITIONS

1. DEFINITIONS

In this specification, the following words and expressions shall have the meanings hereinafter assigned to them, except where the context otherwise requires.

1.1 "Approved", "Authorized", "Directed", "Ordered", "Requested", "Required", "Sanctioned", "Satisfactory", etc. shall unless some other meaning is obvious from the context mean to or by the Engineer.

1.2 "The Consultant" shall mean the consulting engineering firm or individual currently licensed to practice in the Province of New Brunswick, assigned or approved by the Town Engineer to carry out the various engineering services required to complete the project.

1.3 "The Contract" shall mean the Agreement between the Town and the selected tenderer governing the execution of the work.

1.4 "The Contractor" shall mean the party or parties, person or persons, firm or company, whose tender for the execution of the work has been accepted by the Town and includes the contractor's personal representatives, successors and permitted assigns.

1.5 "The Engineer" shall mean the Town Engineer of the Town of Shediac or the Project Engineer, Project Manager, Consultant or any other authorized person as may be appointed to supervise the carrying out of the Contract.

1.6 "The Plans" shall mean and include the plans, sections and other delineations which accompany or are referred to in the specifications and any modification of such plans approved in writing for the purpose of the contract and any additional plans prepared by the Engineer to facilitate the work.

1.7 "The Town" or the "Town of Shediac" or "The Owner" shall mean the Town Council of the Town of Shediac, New Brunswick and includes the Town's personal representatives, agents or successors.

1.8 "The Site" shall mean the lands and other places, on, under, in or through which the works are to be executed or carried out.

1.9 "The Specifications" shall mean all sections included in this document including the form of tender, instructions to tenderers, general conditions of contract, plans and technical specifications contained herein and on the plans and all supplementary specifications issued for a particular tender.

1.10 "Working Day" shall mean any day from Monday to Friday, from sunrise to sunset, of any week excluding statutory holidays.

1.11 "Day" shall mean any calendar day from Sunday to Saturday including statutory holidays.

1.12 "The Work" shall mean all the work as set out and described in "The Plans" and "The Specifications" to be executed in accordance with the contract document.

1.13 Where reference is made to standard documents published by such agencies as the Canadian Standards Association (CAN/CSA), American Water Works Association (AWWA) or American Society for Testing and Materials (ASTM), the reference shall be

understood to mean the revision of such standard document which is current at the time of closing of tenders.

1.14 "Incidental items" shall be any item or work, material, labour or equipment necessary to complete a specified item of work in accordance with these specifications, supplementary general or technical specifications, contract drawings or as otherwise required by either a manufacturer or in accordance with recognized standard practice and procedures, for which there is no particularly identified or specified item under any other part of the Town's specifications and for which no payment will be made.

1.15 "Excess Material" shall be any material not to be re-incorporated into the work.

1.16 An "*unbalanced bid*" is a tender containing a unit price which deviates substantially from or does not fairly represent reasonable and proper compensation for the unit of work bid (the Town may use tenders submitted in response to this invitation to tender or for like or similar work as guidelines in determining if a bid is unbalanced).

2. ADHERENCE TO PLANS AND SPECIFICATIONS

The Contractor shall execute the works strictly in accordance with the plans and specifications, or with any Supplementary directions, details or Change Orders ordered by the Engineer, as required for the proper completion of the contract.

3. MEASUREMENTS, PRECEDENCE AND DISCREPANCIES

Figured dimensions shown on the drawings will take precedence over scaled measurements. The Contractor will report any discrepancy to the Engineer.

The specifications are intended to indicate the qualitative aspects of the work and will take precedence in this respect. The drawings are intended to show the location and quantitative aspects of the work and will take precedence in this respect.

If there is any inconsistency or conflict between the provisions of the *Contract Documents* then:

The *Contract Documents* shall govern and take precedence in the following order with the Agreement taking precedence over all other *Contract Documents:*

I) Agreement
II) Addenda
III) Supplementary General Conditions
IV) General Conditions
V) Supplementary Technical Specifications
VI) Technical Specifications
VII) Drawings listed in Article A-3 of the Agreement
VIII) Supplementary Detail Drawings
IX) Standard Detail Drawings
X) Executed Form of Tender
XI) Instructions to Tenderers
XII) All other *Contract Documents*

4. CUSTODY OF PLANS AND SPECIFICATIONS

The original plans and specifications shall remain in the sole custody of the Engineer. Two (2) 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 "Approved for Construction" and a copy of the latest edition of the Town of Shediac Standard Municipal Specifications before commencement of any work. A copy of the plan shall be kept on the works and be open at any time for inspection or reference by the Engineer. Additional copies of the plans or specifications or any working plans will be provided at the contractor's expense.

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.

5. NOTICES

All notices to be served on the Town must be served on the Town Clerk, Town Hall, Shediac, NB. All other notices to be given under the Contract may be served personally upon the person by registered letter to them at their principal place of business or at their last known place of residence.

6. 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.

7. DISPUTES-ARBITRATION

Any claim which the Contractor may have against the Town based on any dispute or difference of any kind whatsoever arising out of the Contract or work, shall not be grounds for delay in the work but shall be referred by the Contractor in writing to the Engineer not later than ten (10) working days after the occurrence giving rise to such disputed difference. Correspondence shall contain a concise statement of the relevant facts.

The claim shall be settled by the Engineer who shall communicate the decision in writing within ten (10) days of the date of receiving written notification. The Contractor shall proceed with the works with all due diligence in accordance with the Contract whether or not such claim shall be referred to arbitration as hereinafter provided.

Except in those circumstances where it is provided in the contract, the decision of the Engineer shall be final. Any dispute or difference persisting after delivery of the Engineer's decision shall be referred to arbitration in accordance with the Arbitration Act and action must be taken within thirty (30) days.

An application for arbitration shall be accompanied by security in the amount of One thousand Dollars ($1,000.00) to apply to the cost of arbitration. The arbitration shall be by a Board of three (3) members. Both parties shall notify the other party in writing of its desire to submit the dispute or difference to arbitration and a notice shall contain the name of the first party's appointee to the Arbitration Board. The recipient of the Notice shall, within seven (7) days, inform the other party of the name of its appointee to the Arbitration Board. The two members, so selected, shall within five (5) days of the appointment of the second of them appoint a third person who shall be Chairman.

The Arbitration Board shall determine responsibility for costs and shall include recommendation for payment in the award decision.

Either party may appeal the arbitration award.

Reference to arbitration by the Contractor as herein provided shall be a condition precedent to any legal action with respect to any dispute or difference of any kind whatsoever which the Contractor may have with the Town arising out of the contract or works.

8. FORFEITURE

The Town may enter upon the site and works and expel the Contractor therefrom and may itself use the materials, equipment, tools or plant upon the premises for the completion of the works, and employ any other Contractor to complete, or may itself complete the works, and upon such entry the contract shall be determined safe as to the rights and powers conferred upon the Town and Engineer thereby, in the event of forfeiture of the contract as evidenced by:

8.1. the bankruptcy of the Contractor;

8.2. the contractor having a receiving order made against them;

8.3. the contractor presenting a petition in bankruptcy;

8.4. the contractor assigning this contract;

8.5. the contractor making an arrangement with or an assignment in favour of their creditors;

8.6. an execution being levied on the Contractor's goods;

8.7. the Engineer certifying to the Corporation that the Contractor;

8.7.1 has abandoned the Contract, or

8.7.2 after receiving written notice to proceed, has suspended the progress of the works for one (1) day without any lawful excuse under the contract or

8.7.3 has failed to make proper progress with the works for three (3) days after receiving written notice to employ more persons and/or equipment upon them, or

8.7.4 has failed to remove materials from the site or to pull down and rebuild work, for three (3) days after receiving written notice that the materials or works are condemned or rejected, or

8.7.5 has failed to provide proper facilities for inspecting the works or any part of them for one (1) day after receiving written notice demanding same, or

8.7.6 has failed to submit any work or materials to specified tests for one (1) day after receiving written notice requiring same, or

8.7.7 has failed to complete all or part of the works by the time or extended time for completion, or

8.7.8 has failed to provide a Schedule of Work acceptable to the Engineer as stipulated in General Condition 37, or

8.7.9 has failed to provide a revised Schedule of Work within 3 days after receiving written notice from the Engineer demanding same.

The Engineer's Certificate under (8.7) above, shall be conclusive proof as between the Contractor and Town of statements contained in it.

9. CERTIFICATE AFTER FORFEITURE

In the event the Town expels the Contractor under Clause "8", "Forfeiture", no right or action for work done under the Contract or for materials, equipment, tools or plant of which the Town may have taken possession, or in any other respect, shall arise until the works have been satisfactorily completed and the cost of completion and the damages due for delay in completion, if any, and the advances which have been made to the Contractor have been ascertained and the amount thereof certified by the Engineer in writing. If such amount is less than the Contract price, then the Town shall pay the balance to the Contractor within seven (7) days after the issue of such Certificate and if such amount is more than the contract price, then the balance shall be a debt due from the Contractor to the Town.

10. ALTERATIONS TO CONTRACT

No alterations in the plans and/or contract documents, however made, shall have effect unless supported by specific written approval of the Engineer.

11. ASSIGNMENT SUBLETTING AND SUBCONTRACTORS

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

Notwithstanding the provision of the foregoing, the Contractor shall, where it is so listed in the Form of Tender, employ Subcontractors for execution of those parts of the work requiring specialist skills. Any change to the list of Subcontractors submitted in the Form of Tender 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, and

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.

Superintendence The Contractor shall employ a competent Superintendent and/or Foreman who shall be in attendance at the work site at all times during the work period.

The Superintendent shall be satisfactory to the Engineer and shall not be changed except for good reason and only then after consultation with and agreement by the Engineer. The Superintendent shall represent the Contractor at the work site and directions given to him by the Engineer shall be perceived as being given to the Contractor. Important directions shall be confirmed to the Contractor in writing; other directions may also be confirmed if requested.

12. AUTHORITY OF THE ENGINEER

The Engineer shall have full authority to define the meanings of the drawings and other contract documents. The Engineer either personally or through delegation of authority to representatives such as Project Engineers, Project Manager, Field Chief, Consultants, Inspectors, 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 both on the Contractor and the Town except as provided elsewhere in these documents concerning settlement of disputes.

13. INSURANCE

The Contractor shall, at its expense, obtain and keep in force during the period contemplated under the Contract, commercial general liability insurance satisfactory to the Town.

Certificates of such insurance shall be filed with the Town and shall be subject to approval but such approval shall in no way relieve the Contractor from any larger responsibility under the contract.

Such insurance shall name the Contractor, the Subcontractors, the Town Engineer, the Town and Consultant (where required), as additional insured, where applicable.

The comprehensive general liability insurance required shall be for an inclusive limit of not less than Five Million Dollars ($5,000,000.00) for each occurrence.

Automobile liability insurance in respect of licensed vehicles shall have limits of not less than $2,000,000 inclusive per occurrence for bodily injury, death, and damage to property, covering all licensed vehicles owned or leased by the Contractor.

"All risks" property insurance shall be in the joint names of the Contractor, the Town, the Consultant, and all Subcontractors, insuring not less than the sum of the amount of the Contract Price and the full value, as stated in the Supplementary Conditions, of Products that are specified to be provided by the Town for incorporation into the Work, with a deductible not exceeding $2,500.00. Coverage is also to include:

- Transit to equal 10% of contract price;
- Permission to occupy endorsement;
- Temporary locations; and
- Testing and commissioning of equipment.

"All risk" contractor's equipment insurance covering Construction Equipment used by the Contractor for the performance of the work, shall be in a form acceptable to the Town and shall not allow subrogation claims by the insurer against the Town. Subject to satisfactory proof of financial capability by the Contractor for self-insurance, the Owner agrees to waive the equipment insurance requirement.

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

Insurance contracts shall be procured from and the premiums paid to, a resident agent of an insurance company or a general insurance broker, licensed to do business in the Province of New Brunswick.

Written notification of any cancellation or changes in the insurance policy, insurance company, etc. must be given to the Town with copy to the Engineer thirty (30) days prior to the date the change will take effect.

If the Contractor fails to provide or maintain insurance as required in the General Conditions or elsewhere in the Contract Documents, then the Town shall have the right to provide and maintain such insurance and give evidence thereof to the Contractor and the Consultant. The cost thereof shall be payable by the Contractor to the Town on demand or the Town may deduct the costs thereof from monies which are due or may become due to the Contractor.

ALL INSURANCES SHALL REMAIN IN EFFECT UNTIL ISSUANCE OF THE "CERTIFICATE OF FINAL ACCEPTANCE". INSURANCE ARE TO BE RENEWED AS REQUIRED TO COVER WARRANTY PERIOD AND SHALL BE SENT TO THE TOWN.

A SEPARATE POLICY ENDORSEMENT SHALL BE PROVIDED IF ANY BLASTING IS TO BE CARRIED OUT UNDER THE CONTRACT.

14. INDEMNITY

14.1 The Contractor shall defend, indemnify and save harmless the Town, its employees, officers, agents, successors and assigns, from and against any and all claims of any nature, actions, causes of action, losses, expenses, fines, costs (including legal costs), interest or damages of every nature and kind whatsoever, including indirect, consequential and incidental damages to persons or property which are or may be in any way related to or connected or associated with the work done or purported to be done in any manner under the Contract. This indemnity shall be in addition to and not in lieu of any insurance to be provided by the Contractor in accordance with this Contract, and shall survive this Contract.

14.2 The Contractor agrees to defend, indemnify and save harmless the Town from and against any and all claims of any nature, actions, causes of action, losses, expenses, fines, costs (including legal costs), interest or damages of every nature and kind whatsoever arising out of or related to the Contractor's status with WorksafeNB. This indemnity shall be in addition to and not in lieu of any proof of WorksafeNB status and compliance to be provided by the Contractor in accordance with this Contract, and shall survive this Contract.

15. BONDS

The Contractor shall furnish a Performance Bond and a Labour and Material Payment Bond according to the requirements of the *Construction Remedies Act* and time limits set out in the Instructions to Tenderers.

16. PERMITS AND LICENSES

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.

PROOF OF CONTRACTOR'S OR SUBCONTRACTOR'S LICENSE OR QUALIFICATIONS REQUIRED AS PER CONTRACT DOCUMENTS, (I.E. ELECTRICAL, PLUMBING AND REFRIGERATION, ETC) SHALL BE PROVIDED WITHIN SEVEN (7) DAYS FOLLOWING AWARD OF CONTRACT.

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 Water 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.

17. 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, or to complete works which could cause significant daytime disruptions to residents and businesses

(i.e. water supply interruption). Such night or overtime work shall be performed by the Contractor without additional or extra cost to the Town beyond the price bid for the work, and shall count in the number of working days.

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 statutory holidays in the Province of New Brunswick. If work must be carried out on such a holiday written notification must be submitted to the Engineer at least four (4) days in advance of such holiday 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 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 such a holiday.

18. INTERIM PAYMENT CERTIFICATES AND HOLDBACK

At the end of each month during the progress of the work; 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 C).

Prior to any payment, the Contractor must also submit a Certificate of Clearance from Worksafe*NB*.

Payment will be made within ten (10) working days after receipt of the Certificate by the Finance Department.

Ten percent (10%) of all monies due to the Contractor in accordance with the payment certificate shall be retained by the Town and shall be termed the Holdback.

If the Town receives a written notice of lien against the holdback, the amount claimed will be withheld from the subsequent payment certificate as per 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 (60) 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 Town 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.

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 Town arising under the Contract against the Contractor or his authorities.

Deficiency Retention, Liquidated Damages and Bonus or Penalty, if applicable, will be calculated and deducted from Payment Certificates.

19. RELEASE OF HOLDBACK MONIES

The Town 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 has been issued:

(i) A statutory Declaration (as supplied by the Town) stating that all persons who have been employed on the contract or who have furnished equipment and materials for the works have been paid, except for statutory holdbacks properly retained, and that the firm has no further claims against the Town of Shediac with respect to this contract (except for any retained holdbacks); and
(ii) A Clearance Certificate from WorkSafeNB

The Town may retain such further amounts from the Contractor under the *Construction Remedies Act* as allowed pursuant to that Act.

20. CERTIFICATE OF SUBSTANTIAL PERFORMANCE

Substantial Performance is achieved once the contract is ready for use or is being used for the purposes intended, and costs to complete the contract and correct known defects are not more than:

(i) 3% of the first $250,000 of the contract price,
(ii) 2% of the next $250,000 of the contract price, and
(iii) 1% of the balance of the contract price.

To ensure installed works are performing as intended, all testing, commissioning and CCTV inspections must be complete prior to obtaining Substantial Performance. A deficiency inspection will also be required prior to obtaining Substantial Performance in order to calculate costs to correct known defects.

As per Section 7(2) of the Construction Remedies Act, the value of the services or materials remaining to be supplied and required to complete the improvement shall be deducted from the contract price in determining substantial performance if it is agreed not to completed the improvement expeditiously.

21. DEFICIENCY RETENTION

The amount deducted from the contract price for the purpose of ensuring the completion of a deficiency in the work shall be referred to as the Deficiency Retention.

If a deficiency is identified in the work, the Town may retain as a Deficiency Retention sufficient funds to allow the proper completion of the work by others, including the use of the Town's own forces or another contractor. The amount detained shall be no less than an amount equal to twice the Engineer's estimate of the cost of remedying the deficiency. The amount shall be retained until the deficiency is remedied to the satisfaction of the Engineer.

22. CERTIFICATE OF FINAL ACCEPTANCE

Eleven (11) months after the date declared in the Certificate of Substantial Performance, 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 Town staff and the Contractor.

The Contractor shall promptly correct all defects, deficiencies, etc. which are identified during the final inspection.

When this work has been completed, the Contractor shall submit a duly signed Statutory Declaration for Final Acceptance, affixing the corporate seal thereto declaring that the contractor has no further claims against the Town of Shediac whatsoever with respect to the contract. The Engineer shall then prepare the "Certificate of Final Acceptance".

23. WARRANTY AND MAINTENANCE PERIOD

The warranty and maintenance period shall commence on the date the Certificate of Substantial Performance is signed 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 omissions or defects and 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.

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 Town. Every effort possible must be made by the Contractor to repair such deficiencies immediately. Failure to make the necessary repairs or corrections due to lack of equipment, material, labour or any reason whatsoever, will result in the Town causing the works to be done at the expense of the Contractor.

All costs and expenses incurred in correcting any defects that appear prior to and during the warranty and maintenance period, whether performed by the Contractor, his representative, or the Owner or its representatives, shall be borne by the Contractor. The Contractor shall, in addition, be liable to the Town for all expenses, losses, or damage incurred by the Town 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 engineering costs, inspection and testing the work.

The Contractor's failure to resolve the defects or deficiencies shall permit (the Town's) access to the Contractors performance bond to resolve such defects or deficiencies.

Neither the Certificate of Substantial Performance, the Certificate of Final Acceptance, nor any payment made thereunder by the Town, shall relieve the Contractor of his responsibilities for faulty materials or defective workmanship. Notwithstanding the previsions 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 such statute or manufacturer's warranty shall apply.

24. DETERMINATION OF COMPLETION DATE

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 Town Council, using the number of working days as originally provided for.

The Town will consider requests for extension to the completion date of the contract, due to adverse weather conditions, extra or additional work, disasters or delay in delivery of equipment or material, on the following basis:

24.1 The Contractor shall give notice in writing to the Engineer within ten (10) working days after any such delay has first arisen stating the reason and requesting a stated extension of time.

24.2 Providing the Contractor commences the work in accordance with an approved schedule of work, additional working days will be granted for each and every working day lost due to weather conditions if the number of hours lost during any one day exceeds fifty percent (50%) of the normal working hours. Working days lost due to weather conditions will be determined by the Engineer and this information will be given to the Contractor at the end of each week.

24.3 Additional working days will be granted for extra or additional work performed, provided the Contractor can show the additional or extra work could not be carried out without interfering with the original Schedule of Work.

24.4 Additional working days may be granted for delay in delivery of equipment or material provided the Contractor can furnish documentation attesting to the delay being claimed.

24.5 If the Contractor does not agree with the figures compiled by the Engineer, the Contractor must make his objections with reasons, in writing, within ten (10) days of receipt of the Engineer's notification, after which, the figures compiled by the Engineer shall be binding.

25. LIQUIDATED DAMAGES FOR LATE COMPLETION

If the Contractor fails to achieve Completion of contract as per Section 8 of the Construction Remedies Act on the day fixed, as stipulated in Section 1.3 of the Agreement (Appendix "K"), or on such other days to which the time for completion may be extended by the Engineer under the powers herein contained, then for every "Working Day" which elapses between such days and the time when the works shall be completed and handed over, the Contractor shall forfeit and pay to the Town by way of liquidated damages all costs incurred by the Town as a result of late completion, including all Engineering, and Administration costs including Consultants' fees. Costs shall be totalled and deducted from any monies due to the Contractor. Substantial Performance must be attained prior to Completion.

The deduction of such sums shall not relieve the Contractor from the obligation to complete the works or from other obligations and liabilities under the contract.

26. BONUS AND PENALTY

If the Contractor achieves Completion of contract as per Section 8 of the Construction Remedies Act before the day fixed for completion, or before such other date as may have been determined hereunder for the completion of the work, and if the work is done to the satisfaction of the Engineer, the Town will pay, at the time as specified in Clause 18 “Interim Payment Certificates and Holdbacks”, a further sum calculated at the rate as identified in each individual tender for each Working Day between the date of completion and the date so specified, as a bonus for early completion. This payment shall not relieve the Contractor of any obligations, duties or liabilities under the Contract. Substantial Performance must be attained prior to Completion.

If the Contractor fails to achieve Completion of contract as per Section 8 of the Construction Remedies Act on the day fixed for completion, or on such other day to which the time completion may be extended by the Engineer under the powers herein contained, then for every “Working Day” which elapses between such day and the time when the works shall be completed and handed over, the Contractor shall forfeit and pay to the Town the amount as identified in each individual tender. The Town shall deduct such sum from any monies in its hands due, or to become due to the Contractor. The deduction of such sums shall not relieve the Contractor from the obligation to complete the works or from other obligations and liabilities under the Contract. Substantial Performance must be attained prior to Completion.

27. ENVIRONMENTAL AND ARCHAELOGICAL 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 to the Town of Shediac or the Contractor therewith.

The Contractor shall take all precautions necessary as determined by the appropriate regulating authorities for the protection of watercourse affected directed or indirectly by the work on the contract.

The Contractor must provide for erosion and sediment control on the construction site. The Contractor shall ensure that sediment control fences or erosion control structures are properly located for the effective runoff control. The selection of appropriate erosion and sediment control measures is site specific and should be selected on project-by-project basis.

All sediment and erosion control work shall be in accordance with NBDTI Standard Specifications Division 600, Item 946 "Work Progression", 948 "Environment Requirements", the NBDTI Environmental Protection Plan and the NBDTI Environmental Field Guide.

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 as per Section 4 (Construction Activities) of the NBDTI Environmental Protection Plan.

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.

The Contractor shall take all precautions necessary to prevent undue damage to trees on construction work sites. The following should be observed when working near trees:

27.1 When trenching is necessary it should be done as far away from the trunk of the tree as possible. Trench boxes may be required. If excavating around roots, do not cut or remove the anchor roots, which prevent the tree from toppling over during high winds.

27.2 Roots should not be left exposed for periods longer than four (4) hours. If the work requires longer exposed periods, the roots shall be wrapped with wet burlap and kept moist until backfilled.

27.3 All roots over 25mm which require cutting shall be cleanly cut.

27.4 When working within the dripline of trees, low branches that cause an obstruction should be raised by using a hose covered wire or rope. Necessary removal of low branches must follow proper pruning techniques. The tree trunk must be wrapped with burlap and then several layers of snow fence to prevent bark damage from machinery working within the dripline.

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 appropriate representatives and the Engineer has approved resumption of the work.

28. ANTICIPATED PROFITS/ADDITIONALS AND DELETIONS

If any alteration in, change, or omission from the works is made by which the amount of work to be done or materials to be supplied shall be changed, or if the execution and completion of the whole or any portion of the works from whatever cause be dispensed with or abandoned, no compensation shall be claimable by the Contractor for any loss of anticipated profits in respect thereof.

The Town reserves the right to increase or decrease quantities or the extent of the work scheduled or to vary in any way the work contracted for. The Contractor shall not be compensated for any work deleted.

Regardless of the amount of increase or decrease to the quantities, there shall be no adjustments to the scheduled rates for any given item.

29. DELAYS

The Contractor shall neither be entitled to any claim nor bring any action or suit against the Corporation 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 Conditions.

30. TAXES - HST

A single line entry is provided in the Form of Tender indicating the total Harmonized Sales Tax (HST) applied to the overall bid price. Unit prices for goods and materials, etc. shall not include any Provincial Sales Tax or Goods and Services Tax.

31. VARIATIONS AND EXTRAS

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.

No compensation for extra work or materials shall be allowed unless so ordered, in writing. If the contract does not contain unit prices applicable to the extra or additional work, then reasonable prices shall be fixed by the Engineer. These prices shall be based on the sum of the following three items:

31.1 the actual costs of the material required for the work, as furnished by the Contractor and delivered to the site, and incorporated in the works plus a mark-up of ten percent (10%) to cover all expenses and profit; and

31.2 labour on an hourly payroll wage basis plus thirty-five percent (35%). No payment shall be made for personnel beyond the class of Foreman.

31.3 rental of construction equipment, other than small tools, at rates in Regulation 82-113 under the Crown's Construction Contracts Act, latest revision. If the latest revision is dated two (2) or more years, a 2% increase for each year since the latest revision may be applied to the rental rates.

In lieu of the above, the Engineer may approve payment for extra work based on an acceptable quotation received in writing from the Contractor.

When the extra or additional work which cannot be valued at the Schedule of Quantities and Prices is carried out by the Contractor's approved Subcontractor, the price for this shall be based on the Subcontractor's approved invoice calculated as above plus five percent (5%) .

Whenever any extra work is in progress, the Contractor shall each working day provide in writing a detailed account of the amount and costs of the labour and materials used in carrying out each order for extra work. No claim for compensation will be considered unless such detailed account has been received. No payment or compensation for the costs or repairs to equipment or for construction equipment standing idle on the site will be considered. Payment for extra work involving equipment will be based on the manufacturer's original specifications.

Time limitation for submission of claims shall be as outlined in clause 18, Interim Payment Certificates and Holdback.

32. BOOKS AND RECORDS OF THE CONTRACTOR AND SUBCONTRACTORS

The Contractor shall keep proper books and records, showing names, trades and addresses of all workers employed, and wages paid to them, including the time worked, expenditures, payments, settlements, receipts and balances in connection with the construction of the works.

All records of the Contractor relevant to the valuation of the works including payrolls, time books of account, invoices and statements, shall be maintained and shall be open at all reasonable times for inspection by the Engineer. The Contractor shall in every way assist such inspection for the purpose of establishing and determining labour costs, the cost of extra work and progress payments to be made, or for any other justifiable cause.

33. EXAMINATION OF SITE/SUFFICIENCY OF TENDER

It is the sole responsibility of the Contractor to become familiar with and understand the nature and extent of the work to be executed, the nature of the soil, surface water drainage, the general form of the surface of the ground, and generally of all matters which can in any way influence the tender, in so far as possible. Information on any matter derived from the plans and specifications or obtained from the Engineer or from test pits, etc. shall not in any way relieve the Contractor from risk or from fulfilling the terms of the Contract. All details and incidental items not particularly mentioned in the specifications but which, whether in temporary or permanent works, must evidently be required by the nature of the works shall be considered included in the contract. On submission of the bid, it shall be understood that this has been done and provision for all risks, incidental items and contingencies are included in the contract price.

34. POSSESSION OF SITE AND ACCESS ROAD

The Town will, on or before the commencement date specified, give the Contractor possession of the site, but if it fails to do so, then the time for completion shall be extended by such period as shall be equal to the time which lapses between the commencement date and the date when the Town gives the Contractor possession, unless the Town's failure to give the Contractor possession arises through the misbehaviour or default of the Contractor, in which case no alteration shall be made on this account. The job sites are generally accessible from existing streets in the area, but it is the responsibility of the Contractor to construct all access roads required to reach the job site.

The Owner shall have the right to take possession of and any use any completed or partially completed portions of the work. Such taking possession and use shall not be construed as relieving the Contractor of any of his responsibilities under the terms of the Contract.

35. LABOUR, MATERIALS, WORKMANSHIP AND TESTING

The Contractor must employ qualified personnel and pay wages in accordance with all Federal and Provincial minimum wage requirements.

All equipment, materials and workmanship shall be the best of the respective kinds described in the specifications and in accordance with the manufacturer's instructions shall be subjected from time to time to such standard tests as the Engineer may direct at the place of manufacture or fabrication, on the site, or at an independent Testing Laboratory.

The use of any such materials may be forbidden if they are found to be defective or if they are considered unsuitable for the incorporation in the works. The Contractor shall provide such assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing the works and the quality, weight or quantity of any materials used and shall supply samples of materials before incorporation in the works for testing as may be selected and required. The cost of this shall be deemed to be incidental and included in the contract price.

The Contractor shall have no claims against the Town in respect of any financial loss from the rejection of such materials and shall also bear the cost of removing them from the site, replacing with sound material and retesting.

The Contractor shall keep the Engineer advised of orders and delivery dates of materials.

36. QUALITY OF MATERIALS AND WORKMANSHIP

The Engineer's decision as to whether the materials supplied and the work done under this Contract comply with the requirements of these specifications will be conclusive and final. In all matters of detail not specifically covered by the specifications, the work shall be well and skillfully done in accordance with the best trade customs and standards for work of like character and purpose and in full compliance with manufacturer's specifications and instructions, where applicable.

When the work completed or being done or the kind or quality of the equipment or materials supplied or being supplied does not meet specifications or is not satisfactory, notice will be given verbally or in writing and the Contractor shall immediately, upon receipt of such notice, reconstruct the work and replace the equipment all in accordance with the specifications. All such reconstruction, replacement and repair shall be done at the expense of the Contractor.

Should the Contractor refuse or neglect to comply with the Engineer's requirements within three (3) working days from the receipt of such notice, the Town will consider the Contractor to have forfeited the contract. The provisions of General Condition 8, "Forfeiture" will then be exercised.

The Engineer's failure to disapprove of, or reject, any part or parts of the work or any of the materials or equipment supplied in connection therewith at the time of making any Interim Payment hereunder, or at any other time during the continuance of this contract, shall not be construed to be an acceptance of any such part or parts of the work or any such material. The removal of work and re-execution thereof shall be at the expense of the Contractor; this includes all costs involved in replacing the work (including all materials destroyed or damaged by the removal of the rejected work), or materials and the subsequent replacement with acceptable work. The Contractor shall also reimburse the Town for any additional engineering, inspection, testing, or other costs incurred in respect of rejected work or materials, whether such materials are replaced or not, or are acceptable at a lower price.

If, in the opinion of the Engineer, it is not expedient to re-execute defective work, the Town may deduct from the contract price the value of the work completed, the amount which shall be determined by the Engineer.

SHOULD THE CONTRACTOR HAVE ANY DOUBT ABOUT ANYTHING TO BE CONSTRUCTED, DONE OR SUPPLIED, OR AS TO ANY OTHER ISSUE, THE MATTER SHALL BE CLARIFIED WITH THE ENGINEER BEFORE SUCH ITEM IS COMMENCED OR DELIVERED.

37. MATERIALS, EQUIPMENT, TOOLS AND PLANT

All materials, equipment, tools or plant brought by the Contractor upon the site or land occupied by the Contractor in connection with the execution and carrying out of the works shall upon arrival on the site be deemed to be the property of the Town; and shall not be removed from the site except on the completion of the works or with the permission of the Engineer. This clause shall not in any way diminish the liability of the Contractor under clause titled "Insurance" and "Indemnity" nor shall the Town 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 otherwise noted, it is the Contractor's responsibility to order and arrange for delivery of all materials necessary for the completion of this contract. Failure to have any materials on the 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 the completion date.

38. SCHEDULE OF WORKS

A complete Schedule of Works based on the number of days between the stipulated start and completion dates shall be submitted with the tender if so required in the Form of Tender. If the Schedule is not called for at the time of bidding, the Contractor shall submit a Schedule of Works showing the completion dates of any and all phases of the work before the commencement of the work.

Failure to provide or follow the Schedule of Work shall be dealt with as per General Condition 8.

During a construction project, the Town may require weekly schedule or work plan. The Contractor shall submit weekly schedule when requested.

39. ORDER AND PROGRESS OF THE WORK

The work under this contract shall be carried out in such sections and with such forces as will secure its completion within the stipulated time in accordance with the order of works. The extent of the job site to be torn up, obstructed or closed to travel at any one time shall be kept to a minimum as stated in these specifications or as directed. Public convenience, safety and time is of the essence.

40. INSPECTION

The Engineer may conduct testing and inspection by Assistants, Inspectors 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.

Any work done in the absence of the Inspector shall be opened up for thorough examination and must be rebuilt or replaced as directed, at the contractor's expense. No approval by an Inspector shall be taken as, or construed into, 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 Town may appoint a consulting firm to conduct testing and inspection of materials, equipment, the work or any aspect thereof in whole or in part to insure conformity with the Specifications.

41. INSPECTOR'S AUTHORITY

Inspectors are required to ensure that all provisions of the contract are adhered to and that quality materials and workmanship are provided and constructed at all times. Inspectors shall have the authority to have removed from the job site indefinitely any workman, foreman, supplier, etc. for any justifiable cause such as impairment, negligence, inability to produce quality workmanship or disregard of orders.

Inspectors shall have the authority to stop the works, or any portion thereof, entirely if there is not a sufficient quantity of suitable and approved material on site to carry out the works properly or if weather conditions will have an adverse effect on the quality of work, or for any other good and sufficient cause.

Orders given by Inspectors relating to the quality of the material and workmanship or safety matters of any nature must be obeyed at once by the Contractor.

42. CONTRACTOR'S FOREMAN AND JOB SUPERINTENDENT

The Contractor shall, during all working hours, keep upon the site the foreman as identified in the Form of Tender. All orders, directions and notices given to this person shall be as binding on the Contractor as though they had been given to the Contractor in person. The Job Superintendent shall continuously monitor the work and liaise with the Engineer. Neither the Foreman nor Job Superintendent shall differ from those identified in the Form of Tender without written request by the Contractor and approval of the Engineer.

43. 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 scale 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.

44 WEIGHING OF TRUCKS – VERIFICATION OF SCALES

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

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.

45. EXCESS AND/OR UNSUITABLE MATERIALS

Unless a disposal site is designated, all excess and/or unsuitable 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 acquisition 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.

When insufficient space is available to allow placing of excavated material on the right-of-way, the Contractor shall load, haul and stockpile such excavated material 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.

46. PAYMENT BY TRUCK RATES

Truck measurement will only be allowed by written permission from the Engineer. Where excavation quantities are measured by truckload instead of sectional measure in place, the excavation quantities will be reduced by thirty percent (30%).

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.

47. CONTRACTOR'S WORK FORCE

The Contractor shall employ as many and such persons as necessary to complete the works within the contract time and shall cease to employ on the works any foreman or person who, in the opinion of the Engineer, has not demonstrated ability or is negligent and shall not re-employ any such foreman or person on the works without the written consent of the Engineer.

48. 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 work days missed due to inclement weather will be as per paragraph 24, "Determination of Completion Date".

49. LAYOUT

Survey Control and the layout of the Work shall be the responsibility of the Contractor. The Engineer shall provide the Contractor with survey control points, and a digital survey point file containing sufficient information to complete the Work. The Contractor shall supply suitably trained survey personnel to layout survey lines and grades and establish all reference points required for the construction of the Work. The Contractor shall furnish and set stakes, marks and furnish data as deemed necessary to establish lines and grades required for the Work from survey control points provided by the Engineer.

Before commencing the Work, the Contractor shall verify the accuracy of all control points at the start of the Work and notify the Engineer of any discrepancies. If discrepancies are found, the Engineer will correct them within three (3) Working days. No claims will be entertained for inaccuracies after the Work has commenced.

The preservation of control points that have been set by the Engineer for the convenience and/or the guidance of the Engineer and the Contractor shall be the responsibility of the Contractor. Control points carelessly or willfully destroyed or disturbed by the Contractor, shall be replaced by the Contractor.

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

50. SAFETY

The Contractor shall be registered with, and shall notify the WorksafeNB prior to starting any work under a Town contract.

All work done under Town contract must comply with New Brunswick Regulation 91-191 under the Occupational Health and Safety Act. The Contractor is responsible to protect the health and safety of persons with access to its project site.

The Engineer will require copies of the Contractor's regular program documentation applicable to the Town's job once the contract is signed and in progress.

51. TRAFFIC CONTROL

The work shall be done in a manner which creates the least interference with traffic, consistent with the safe performance of the work. At the discretion of the Engineer normal traffic may be diverted from a street undergoing major construction, but safe and convenient access to existing private entrances shall be maintained in so far as practicable.

The Contractor shall install and maintain such barriers, signs, lights and signalers as may be necessary for the safety and convenience of the public and work area, as per the Department of Transportation and Infrastructure "Work Area Traffic Control Manual", latest revision, and the Transportation Association of Canada Part D – Temporary Conditions. All work associated with the signage of the Contract shall be the sole responsibility of the Contractor. The supply of all labour, materials and equipment required for providing traffic control (barricades, signs, signallers, etc.) shall be considered incidental to the work and shall not be measured for payment. No work shall begin on any site until all signs and barricades, etc. are properly installed.

The Contractor shall submit a construction signage plan to the Engineer for all detours and lane closures five (5) working days in advance of any proposed street or lane closure. No streets or lanes can be closed without prior written request and subject to approval. The construction, maintenance and removal of such detours shall be the responsibility of the contractor.

All barricades used on construction sites shall be constructed in accordance with these specifications and shall incorporate approved reflective material meeting the minimum requirements and shall indicate the contractors company's name or logo thereon. Continuous barricades must be provided around all excavations for the prevention of entry by unauthorized persons. Where necessary, barricades may be supplemented by approved fencing material to further restrict entry to construction sites or excavated areas.

All signs must be **BILINGUAL**, and in conformance with Part D – Temporary Conditions (Division 2 TEMPORARY CONDITIONS SIGNS) of the Manual of Uniform Traffic Control Devices for Canada.

Signs must be maintained in such a manner that they are clearly visible to the traveling public at all times. Transportation, erection, maintenance and dismantling and returning the signs will not be included for payment, but shall be considered as incidental to the work.

One signaler at each end of the project and one signaler per crew are required unless otherwise directed. Each signaler must use the TC-65 Traffic Control Paddle, 450mm by 450mm, as specified in the MUTCDC, Part D, Division 3 TEMPORARY CONDITIONS DEVICES, and wear a

reflectorized vest or jacket. Persons performing signalers duties shall have successfully completed the New Brunswick Safety Council "Highway Signalers Course" and possess a Certificate of Completion.

52. 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) metres of fire hydrants, which must at all times be readily accessible to the Fire Department.

53. CLEAN-UP

Upon the completion of the job, or any portion of it in a specific area, all surplus construction materials, tools, equipment and temporary structures will be removed from the site by the Contractor. All rubbish, trash, excess material, etc., will be removed and disposed of as in accordance with General Conditions 45.

The Site, as much as possible, must be kept clean and orderly and free from excess material. As the work progresses, the Contractor, must clean up the site periodically and keep it graded level.

54. FIRST-AID STATION

During the progress of the works, the Contractor shall at all times provide and maintain the first aid kits, first aid providers and first aid rooms in an easily accessible location on the work site as required by Regulation 2004-130 under the Occupational Health and Safety Act.

55. DUST CONTROL

The Contractor shall furnish and apply calcium chloride to control dust, as the Engineer may direct. Application shall be by means of an approved spreader or equal. 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 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.

The quantities measured for payment shall be in kilograms of calcium chloride placed. Payment for calcium chloride shall be a the contract unit price. This price shall include the cost of furnishing all labour, materials, and equipment necessary to complete this work. Where the contract does not contain a scheduled rate, payment will be made in accordance with Section 31.

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 the works site is open to public access over dusty surfaces. The Contractor shall be prepared to apply water on a seven-day-per-week basis as required and/or at the request 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 submit, upon request, certification of the approval of the source and method of withdrawal.

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 and/or calcium chloride for Control of dust pollutants shall be considered as incidental to the work; failure to comply will result in the Town having the work carried out whenever necessary, with the costs of such being deducted from the first release of holdback.
No calcium chloride shall be placed within the two (2) weeks prior to asphalt placement.

56. USE OF TOWN HYDRANTS AND VALVES

The use of Town hydrants to obtain water and tampering with or the use of water main valves is **strictly prohibited**. The purpose of this policy is intended to minimize risk and maintain the integrity of the water distribution system. The purpose of this policy is intended to minimize risk and maintain the integrity of the water distribution system.

Failure to comply with these requirements may result in prosecution by the Town under the law.

57. BLASTING

Prior to any blasting operations being undertaken, the Contractor shall furnish a separate General Liability Insurance Policy or Rider satisfactory to the Town covering all aspects of the intended blasting activities, and obtain a 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 Town 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.

58. 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 is required a copy of the said notification and/or permit shall be submitted to the Engineer, prior to commencement of work.

59. 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 Town truck route and then the shortest truck route to and from the origins and destination of the required trip.

60. UTILITY INSTALLATIONS

Various underground and above ground facilities such as water and sewer pipes, gas mains, culverts, conduits, telephone, cable and electric power lines, etc. may be located along the construction route. The approximate location of known facilities may be shown on the plans in so far as possible and based on the best available information at the time; however, the Town accepts no responsibility for the accuracy or completeness of this information.

It is the responsibility of the Contractor to contact the appropriate representative of the various utilities to advise them at least three (3) working days prior to any work being started. This is to allow sufficient time to identify and locate any facility that may be affected by, damaged or disturbed by construction activities. Once completed, a copy of the locates shall be submitted to the Engineer.

Any damage caused to any water and sewer pipes, pipes from catch basins, culverts, etc. will be immediately repaired by the Contractor, in a workmanlike manner. The Contractor will bear the cost of all repairs to any item that is shown on the drawings or is readily visible or is marked out on the site.

No claim will be entertained for any damage or any slowdown of work due to any involvement with the aforementioned utilities.

61. 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.

62. SITE IDENTIFICATION OF CONTRACTOR

To aid the general public in recognizing the contractor responsible for the work, all construction equipment, including trucks and barricades shall bear the name of the Contractor.

The Town may circulate a notification to all homes, businesses, etc. affected by construction activities identifying the Contractor and Foreman in charge by name, address and telephone number, as well as, the Project Engineer in charge.

63. CLOSING OF STREETS

Prior to a street or lane being closed to the public, whether by Town Forces or by agents of the Town, the person or persons affecting the street closure must contact the Public Works Department giving the nearest house civic number affected by the closure and that the Public Works Department relay the message to the Emergency Services deemed necessary for this closure.

Any road closures or detours in the Town will required that the Contractor provide five (5) working days notice to the Engineer, so that proper and timely public announcements may be made.

A penalty of $2,000.00 for each occurrence will be charged for failure to comply with the above when closing a street, at the discretion of the Engineer.

64. HIGHWAY TRANSPORTATION FACILITIES

It is the responsibility of the Contractor to contact the appropriate representatives of the N.B. Department of Transportation and Infrastructure 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 highway personnel. Any necessary scheduling, procuring of required 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.

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

District Highway Engineer
N.B. Department of Transportation
46 Toombs Street
Moncton, N.B. E1A 3A5

65. MINIMUM TESTING FREQUENCY REQUIREMENTS

Refer to Appendix "L" for the minimum testing frequency requirements for trench excavation, granular base and subbase materials, concrete curbs and sidewalks, asphalt concrete and all other tests required.

1. TRENCH EXCAVATION

1.1 Trench Excavation

1.1.1 Scope

This section governs the supply of all labour, materials and equipment necessary for trenching sewer mains, watermains, laterals and appurtenances. Refer to Section 7.1. where clearing and grubbing is required prior to trench excavation.

1.1.2 Construction Methods

1.1.2.1 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. Any work required in meeting these regulations shall be considered incidental to the work.

1.1.2.2 Trenching shall be open cut and excavated only so far in advance of the laying of pipe as safely requirements and soil conditions permit. The centerline of the trench shall follow the line of the pipe as shown on the drawings unless otherwise directed.

1.1.2.3 The width of the trench at pipe depth shall be 600mm to 900mm 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 300mm clearance between service lateral pipes, and 600mm or as required for main pipes.

1.1.2.4 The trench shall be excavated to the depth required for placing of the pipe bedding material. Where the bottom of the trench at subgrade 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 subgrade shall be restored by backfilling 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 2.1.

1.1.2.5 Trenches shall be widened where required for the installation of manholes and other appurtenances.

1.1.2.6 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, pavement removal will be limited to 4 m and a trench box (cage) shall be used.

Cutting of pavement must be done by either use of a jackhammer, cutting wheel or an appropriate piece of machinery or by power saw cutting. UNDER NO CIRCUMSTANCES WILL RIPPING OF PAVEMENT 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.

1.1.2.7 All trenches in roadways shall have "bump ahead" and "bump" signs installed; they are to remain until the final lift of asphalt is completed.

1.1.2.8 The minimum test frequency requirements shall be in accordance with the Appendix "L".

1.1.3 Payment

No separate payment shall be made for trench excavation excluding rock excavation. All trenching 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.

1.2 Trench Excavation in Rock

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 classified 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.

1.2.2 Definition

Rock is defined as solid rock, boulders, concrete or masonry exceeding one-half cubic meter ($1/2m^3$) in volume for which drilling and blasting are required for removal. Soft, layered, broken rock or mudstone which can be excavated by a three quarter cubic meter ($3/4m^3$) hydraulic excavator (minimum size), equipped with a one meter (1 m) wide general duty bucket 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 specified hourly rate for the float used.

In the event there is not tendered price for rock excavation, the Town 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.

1.2.3 Construction Methods

1.2.3.1. Dimensions of Trenches in Rock

Rock shall be excavated to a depth of at least 300mm below the bottom of the pipe to be installed. Width of trench excavation in rock shall be at least 600mm greater than the outside diameter of the pipe 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 600mm clearance between pipes. For service laterals, the minimum width of trench shall be one metre.

1.2.3.2 Disposal of Excavated Rock

Rock fragments larger than 200mm in greatest dimension shall not be used for trench backfill. Disposal of excess rock shall be in accordance with section 45 of the General Conditions.

1.2.3.3 Blasting Operations

Refer to the General Conditions.

1.2.4 Measurement

Trench excavation in rock shall be measured in cubic metres. Calculations shall be based on the established profile of the top of the rock and the depth of 300mm below the bottom of the proposed pipe. Maximum trench width for calculation of quantities shall be as follows:

1.2.4.1 For single main, trench width = pipe O.D. plus 600mm.

1.2.4.2 For service laterals in the following installations, trench width = pipe O.D. plus 600mm.

1.2.4.2.1 single service, and

1.2.4.2.2 sanitary service and water or storm service and water;

1.2.4.3 For service laterals in the following installations(s), trench widths are:

1.2.4.3.1 sanitary service, storm service and water service; trench width of 1200mm, and

1.2.4.3.2 sanitary service and storm service; trench width of 1000mm;

1.2.4.4 For multiple mains, trench width = width as for single main plus 600mm clearance between pipes.

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 and for disposal of rock not used for trench backfill and all incidental items.

1.3 Excess Material

Payment for excavation shall be at the contract unit price and shall include transportation and spreading of excess materials as in accordance with General Conditions 45.

2 BEDDING AND BACKFILLING

2.1 Bedding

2.1.1. Scope

This section governs the supply of all labour, materials and equipment necessary for bedding of all sewer and watermains and service laterals.

2.1.2 Bedding Material

Bedding material shall be crushed rock composed of clean, hard, sound, durable, uncoated particles that do not contain friable, soluble or reactive minerals 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, approved by the Engineer and conforming to the following grading limits:.

Bedding material shall conform to one of the following gradation limits, as specified.

31.5mm Minus (for normal conditions)

Sieve Size	% Passing
31.5 mm	100 –
25 mm	95 – 100
19 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
300 um	5 – 18
75 um	0 – 8

5mm – 20mm – 'drainage stone' (for wet trench conditions only as approved by the Engineer)

Sieve Size	% Passing
20 mm	100 –
14 mm	40 – 80
10 mm	20 – 62
5 mm	0 – 20
2.5 mm	0 – 10
0.080 mm	0 – 3

Drainage stone shall be completely wrapped in non-woven geotextile fabric in order to hinder the migration of fine materials into the rock.

The percentage wear of the aggregate as measured in the Micro-Deval Abrasion Test; MTO Standard LS-618 shall not exceed 25%.

At least 50% of the particles retained on the 5mm 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 Owner reserves the right to reject any source of supply of aggregate on the basis of past field performance, documented by the records and experience of the Owner and/or the Engineer with a specific material, regardless of compliance with physical requirements or grading limits.

2.1.3 Bedding Construction Methods

2.1.3.1 Bedding methods and materials must conform with the pipe manufacturer's requirements for all materials that are being bedded.

2.1.3.2 THE USE OF EXCAVATED MATERIAL FOR BEDDING IS STRICTLY FORBIDDEN UNLESS OTHERWISE DIRECTED AND APPROVED IN WRITING.

2.1.3.3 Once the trench has been excavated to the required grade, bedding shall be placed in layers to a minimum depth of 150mm or 300mm in rock and compacted to a density of 95% of maximum dry density as determined by ASTM D698.

2.1.3.4 Bedding shall be placed in 150mm lifts to a minimum height of 300mm 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 dry density layers shall then be placed and compacted to 95% of maximum dry density as determined by the latest ASTM D698.

2.1.3.5 Bedding material shall not be placed in water or trenches having soft and unstable bottom conditions. Dewatering of trenches shall be properly performed prior to placement of any bedding material.

2.1.3.6 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.

2.1.3.7 The completed bedding shall meet the requirements for class "B" bedding, on PVC, Ductile-iron and all lateral piping and for a modified class "B" bedding on concrete pipe, as per standard details.

2.1.4 Measurement

There shall be no separate measurement for imported pipe bedding material. However, for record purposes, all weigh slips are to be submitted to the Engineer's representative on site.

2.1.5 Payment

There shall be no separate payment for bedding material when authorized and obtained from excavations. Supply, hauling, dewatering, placing and compaction of imported bedding material, and geotextile filter fabric, shall be considered incidental to the work.

All costs associated with this item must be incorporated into bid items for pipe, structures and appurtenances.

2.2. Backfilling

2.2.1. Scope

This section governs the supply of all labour, materials and equipment necessary for backfilling of all pipes, service laterals and appurtenances.

2.2.2. Backfill Material

2.2.2.1. Backfill material shall be approved material, obtained from excavation. The material shall be free of roots, brush, organic material, frozen lumps and shall contain no boulders or broken rock larger than 200mm greatest dimension, approved by the Engineer.

2.2.2.2. Imported Fill Material shall be a sound, durable, granular material free from clay, frozen lumps, organic or deleterious matter and conforming to the following gradation limits:

Sieve Size	% Passing
112 mm	100 –
80 mm	95 – 100
20 mm	15 – 100
5 mm	0 – 80
0.08 mm	0 – 10

2.2.3. Backfill Construction Methods

2.2.3.1. Once bedding material has been placed to the required depth and degree of compaction, the remaining depth of trench shall be backfilled. This backfill shall be placed in layers not exceeding 400mm in thickness (before compaction) and shall be compacted to at least 95% of the maximum dry density as determined by ASTM D698.

2.2.3.2. Where the excavated material is unsuitable for use as backfill, the Contractor shall dispose of this material as in accordance with General Conditions 45, and backfill with an imported fill material upon written order from the Engineer.

2.2.3.3. Backfilling of trenches with imported fill material shall be in layers not exceeding 400 mm in thickness before compaction and compacted to a density of 95% of maximum dry density as determined by ASTM D698.

2.2.3.4. Compacting equipment used during trench backfill operations shall be a vibratory roller for granular soils, or a sheep's foot compactor for cohesive soils, suitably sized to provide the specified degree of compaction required. In areas not accessible to compacting equipment a mechanical tamper shall be used.

2.2.3.5. 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 nor the area being filled shall be frozen.

2.2.3.6. Excess backfill material shall be cleaned-up and disposed of at the end of the days' work.

2.2.4. Measurement

Measurement for imported fill shall be per metric tonne.

2.2.5. Payment

There shall be no separate payment for backfilling excavation. Payment for imported fill shall be at the contract unit price per metric tonne and shall include the supply, hauling, placing and compaction of this material.

3. TRENCH RESTORATION AND MAINTENANCE

3.1. 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.

3.2 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). Crushed rock for trench restoration shall conform to Section 7.3.2.1.

3.3 Construction Methods

3.3.1. Restoration

3.3.1.1. The Contractor shall conduct and confine all construction operations within the limits of the pipe installations.

3.3.1.2. All trench cuts in existing pavement shall be patched within 7 days. The required thickness shall be in accordance with drawing no. 27 for asphalt Type "B" mix (Base Course) and Type "D" mix (Surface Course). The Surface Course shall be applied no more than 7 days after the Base Course application, or as otherwise directed by the Engineer.

3.3.1.3. 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 its original or better condition before issuance of the "CERTIFICATE OF FINAL ACCEPTANCE".

3.3.2 Trench Maintenance

3.3.2.1 The Contractor shall be responsible for maintaining all trenches until issuance of the Certificate of Final Acceptance.

3.3.2.2.Trenches in traveled roads shall be maintained with an aggregate base material as specified in Section 7 until such time as asphalt can be placed to allow a smooth travel surface.

3.3.2.3. Trenches that have settled, washed out or become rutted or displaced by traffic, shall be refilled, re-compacted and re-graded smooth with the existing street, using the following:

settlement < 10cm → use crusher tailings (10mm minus).
settlement ≥ 10 cm → use 0-31.5mm crushed rock.

3.3.2.4. The Contractor shall inspect the trench surface 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".

3.3.3. 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 and must be in accordance with section 55 of the General Conditions.

The Contractor shall not use oil for dust prevention.

3.4. Measurement and Payment

Payment shall be for aggregate base material and asphalt concrete. Measurement for these items shall be per tonne in-place. There shall be no separate payment for trench maintenance.

4. WATER DISTRIBUTION SYSTEM

4.1 Watermains and Fittings

4.1.1. Scope

This section governs the supply of all materials, labour and equipment necessary for the installation of the watermains and fittings, flushing, testing and disinfecting of the watermains and the supply and installation of thrust blocks or joint restraint systems as shown on the drawings and herein specified.

4.1.2. Work Under Other Sections

4.1.2.1. Trenching – Section 1

4.1.2.2. Bedding and Backfilling – Section 2

4.1.2.3. Trench Restoration and Maintenance – Section 3

4.1.3. Materials

4.1.3.1. The minimum diameter size of watermains shall be 200mm, unless otherwise specified by the Town; all hydrant leads shall be 150mm in diameter.

4.1.3.2. The Contractor shall supply all materials in accordance with the Town of Shediac standards and these specifications unless otherwise specified herein, or directed.

4.1.3.3. Watermains shall be:

Polyvinyl chloride (PVC) pressure pipe to the latest AWWA Standard C900 and CAN/CSA B137.3, DR18, colour coded blue, for pipe sizes 150mm to 300mm and AWWA C905, DR18 for pipe sizes 350mm to 1200mm.

OR

Ductile-iron pipe, cement mortar lined, to the latest AWWA C151 for ductile-iron pipe pressure Class 350, with cement mortar lining in accordance with latest specification AWWA C104.

OR

Molecularly Oriented Polyvinyl Chloride (PVCO) pressure pipe meeting the requirements of the latest CAN/CSA Standard B137.3.1 and the latest AWWA Standard C909. PVCO shall be produced with cast-iron outside diameters (CIOD) in all sizes; 100mm – 300mm diameter PVCO pipe wall shall meet minimum thickness requirements for AWWA 909 Pressure Class 235 PSI (PC235). PVCO pipe shall be joined by means of integrated bell elastomeric-gasket joints confirming to ASTM D3139. Spigot ends shall be chamfered by manufacturer. Pipe ends shall be capped at the production facility prior to storage and shipping. Pipe is under the trade name “Bionax”.

Joints:
For polyvinyl chloride piping they will be bell and spigot type with rubber gasket. This is a push-on joint and must be watertight. The bell will be an integral and homogeneous part of the pipe barrel.

For ductile-iron pipe they will be the push-on rubber gasket type meeting the requirements of the latest AWWA Standard C111 for rubber gaskets joints for ductile-iron pressure pipe.

4.1.3.4. End-Caps for watermains:

Approved pipe up to and including 600mm diameter is to arrive on site with factory-installed end-caps on both ends and a "tamper evident seal" on the bell-end only.

Tamper-evident seals will display the manufacturer's name and/or logos. Seals will straddle the cap and/or tape it to the pipe. Removal of the cap should render the tamper-evident seal unusable either by breaking the seal off by leaving a message such as "VOID" on the pipe.

For pipes with diameters greater than 600mm, end-caps are optional.

End-Caps shall be installed at the factory and will be one of the following:
- •White, clear or black plastic discs or cone-shaped plugs fastened with tape.
- •Closed-cell polypropylene foam (Charma Caps)
- •Polyethylene pipe plugs (Manufactured by Taylor Made)

Due to their lengths and accessibility for field cleaning, end-caps are not required for fittings and valves.

4.1.3.5. All fittings (tees, bends and caps) shall be:

Polyvinyl Chloride (PVC) pressure fittings meeting the requirements of the latest AWWA Standard C907 and CAN/CSA Standard B137.2, Class 235 (for sizes 100mm through 200mm). PVC fittings sizes 250mm through 300mm shall be made from segments of the latest AWWA Standard C900 DR 18 PVC pipe bonded together and over-wrapped with fibreglass-reinforced polyester and certified to the latest CAN/CSA Standard B137.3.

OR

Ductile-iron meeting the requirements of the latest AWWA Standard C110, 1725 kPa class or ductile-iron meeting the requirements of the latest AWWA Standard C153, 2415 kPa class.

Joints for ductile-iron and PVC fittings shall be mechanical-type rubber gaskets meeting the requirements of the latest AWWA Standard C111. PVC pressure fittings shall be the push-on bell and spigot type.

All iron fittings shall be corrosion resistant; with high-tensile steel tee bolts and nuts, and completely wrapped with 8-mil poly according to AWWA C105.

4.1.3.6. All thrust blocks shall be cast-in-place concrete; strength 32MPa at 28 days.

4.1.3.7. Joint restraint system components may be used in lieu of concrete thrust blocks, subject to the written approval from the Town of Shediac. Such approvals shall be based on Manufacturer's Specifications, Engineer's design notes and detail drawings showing proposed joint restraints system. Approvals to be obtained prior to installation.

They shall be corrosion resistant, with high-tensile steel tee bolts and nuts tightened using a torque wrench to the Manufacturer's specification and completely wrapped with 8-mil poly according to AWWA C105.

4.1.3.8. Watermain couplings shall be the long-body type, and shall not be less than 20cm in length. Couplings shall be ductile-iron or steel complete with high-tensile steel tee bolts and nuts tightened using a torque wrench to the Manufacturer's specification and completely wrapped with 8-mil poly according to AWWA C105.

4.1.3.9. All ductile-iron pipe and fittings installations shall be polyethylene encased (wrapped) according to AWWA C105. All fittings shall have high-tensile steel tee bolts and nuts tightened using a torque wrench to the Manufacturer's specification, and completely wrapped with 8-mil poly according to the manufacturer's recommendation.

4.1.3.10. All iron fittings used on PVC installations shall have high-tensile steel tee bolts and nuts tightened using a torque wrench to the manufacturer's specification and completely wrapped with 8-mil poly according to AWWA C105.

4.1.4. Construction Methods

4.1.4.1 Installation of Watermains and Fittings

4.1.4.1.1. Installation of watermains and fittings and polywrapping procedures shall be in accordance with the recommendation of the manufacturer and appropriate AWWA Standards unless otherwise specified herein.

4.1.4.1.2. Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and efficient execution of the work. All pipe fittings, etc., shall be carefully lowered into the trench in such a manner as to prevent damage to them. All tee bolts and nuts shall be tightened using a torque wrench to the manufacturer's specification. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

4.1.4.1.3. All pipe and fittings shall be thoroughly inspected for defects before and after laying. Any defective or damaged pipe or accessory shall be removed from the site and replaced with sound material.

4.1.4.1.4. All foreign matter shall be removed from the interior of the pipe before lowering it into the trench. Trenches shall be kept free of water. The pipe shall be installed without earth entering the main. When the work is not in progress trench water and other foreign matter shall be kept out of the pipe by inserting an acceptable test plug or night cap in the end line.

If water has accumulated in the trench, the plug shall remain in place until the trench is dry.

The Contractor shall, at his own expense, permanently provide for and maintain the flow of all sewers, drains, house or inlet connections, and all watercourses that may be encountered during the progress of the work. The Contractor shall not allow the contents or any sewer, drain or building or inlet connection to flow into the trench; and shall, at his own expense, immediately remove from the proximity of the work all offensive matter using such precautions as necessary or may be directed by the Engineer.

4.1.4.1.5. Appropriately sized water main swabs shall be GBS-B (Green Ban Swab bullet nose type with poly backing) or approved equal and shall be inserted by the Contractor into the main at as many locations as needed to ensure that every section of watermain is swept by a swab when the water is first charged into the system. After main lines have been swabbed, hydrant leads shall be thoroughly flushed but not swabbed. (For procedures see Appendix "H")

4.1.4.1.6. The pipe shall be laid to the grade as indicated on the drawings. Deviations from these grades shall be permitted only upon written approval by the Engineer. The pipe shall be laid with no reverse grades, humps or sags not indicated on the drawings.

The minimum depth of cover shall be 1.8m measured from finished grade to the top of the pipe.

4.1.4.1.7. Pipe shall be laid with bell ends facing in the direction of laying unless directed otherwise. If it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstruction or to plumb valve stems, or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that recommended by the pipe manufacturer for the particular size and type of piping being laid.

During installation, care must be taken to avoid over-insertion into the pipe bell beyond the spigot insertion line; it must still be visible when pipes are installed.

4.1.4.1.8. Mechanical joint connections and tightening and torquing of bolts shall be in accordance with the manufacturer's instructions and recognized good practice.

4.1.4.1.9. All tees, bends and end caps on watermains shall be provided with concrete thrust blocks or an approved joint restraint system, as per Section 4.1.3.7, in the locations and to the dimensions as indicated on the drawings. Thrust blocks shall extend to bear against undisturbed ground and shall be so placed that the pipe and fitting joints remain accessible.

4.1.4.1.10. All water lines require the installation of underground marking tape identifying the utility. The tape shall be installed approximately 600mm above the main or line.

4.1.4.1.11. End of main runs (stubs) will require a minimum 1 (one) full length of pipe installed after valve or fitting and an approved joint restraint system, as per Section 4.1.3.7.

4.1.4.2. Connecting to Existing Watermains

4.1.4.2.1. UNDER NO CIRCUMSTANCES WHATSOEVER SHALL A CONTRACTOR OPERATE EXISTING WATERMAIN VALVES OR MAKE CONNECTIONS TO EXISTING WATERMAINS.

It is the Contractor's responsibility to ensure that their operations do not contaminate the public water supply. If, at any time, the water in the existing system becomes contaminated through actions by the Contractor, whether or not due to negligence, he shall be held financially accountable for any corrective action taken by the Town of Shediac, as well as for the cost of defending any settlement of all claims resulting from his negligence, including but not limited to, costs and attorney fees.

4.1.4.2.2. The Contractor shall make all arrangements with the Town Engineering Department at least (48 hours) prior to connecting or locating existing watermains. The Contractor shall coordinate with the Municipality regarding schedules, methods and procedures to be followed for isolating sections of the water system and connecting to these mains.

4.1.4.2.3. All existing plugs or fittings, and hydrants shall, where possible be salvaged, carefully stored and on completion of the works delivered by the Contractor to the Town's Public Works garage. No such fittings shall be removed from the site without the permission of the Engineer. The Inspector shall record all salvaged materials during construction and if not returned, the amount shall be deducted from the first release of holdback.

4.1.5. Testing Water Distribution System

4.1.5.1. Upon completion of watermain installation and prior to testing and disinfection, it shall be filled, flushed and purged of air according to Section 5 of the latest revision of AWWA C651 and Appendix "H" of this specification.

4.1.5.2. Upon completion of the aggregate base application, pressure and leakage tests shall be applied to all watermains including hydrant leads from main tee to hydrant valve disc and all service laterals up to curb stops.

4.1.5.3. A test pressure of at least 1030 kPa (150 psi) shall be applied to each section of the line as it is completed. The Contractor shall supply clean water for tests, either by gravity via mains previously laid or by other means.

4.1.5.4. Valves, appurtenances and water service laterals installed in the test section of watermains shall be tested in conjunction with the mains. The gauge recording the pressure shall be installed at the top of the section under the test, or the required test pressure to be shown on the gauge shall be increased to allow for the static head on the gauge from the water above.

4.1.5.5. Prior to testing the mains, the trench shall be sufficiently backfilled to prevent movement of the pipe under test pressure. All permanent thrust blocks shall be installed on the test section prior to testing.

4.1.5.6. Care shall be taken to brace exposed end of the main to prevent movement when the test applied. The test section of the pipe shall be filled slowly, taking care to expel all air from the line. When all air has been expelled, the test pressure shall be applied. If no means are available for air release at high points on the test section, the Contractor shall make the necessary taps at points of highest elevation using main stops to expel air before the test is made. After testing, the main stop is to be turned off and service tubing to be cut off and crimped at subgrade. This is to be witnessed by the Engineer or his representative.

4.1.5.7. After all air has been expelled and the test pressure applied, it shall be maintained above the minimum level for at least two hours by pumping the required additional water into the section under test. The amount of water added shall be measured by a method acceptable to the Engineer. The leakage, as measured by the amount of water added during the test, shall not exceed the amount given by the formula:

$$Q=\frac{LDP^{1/2}}{795{,}000}$$

Where, Q= allowable leakage in litres per hour;
L= length of pipe (m)
D= nominal diameter of pipe in mm
P= average test pressure in kPa

4.1.5.8. If the test is unsatisfactory, the source of failure shall be located and repaired and the test shall be repeated, at the Contractor's expense.

4.1.5.9. The Contractor shall notify the Engineer at least twenty-four (24) hours in advance of beginning pressure and leakage tests.

4.1.5.10. Following successful completion of the hydrostatic test, each fire hydrant will be tested by the Town of Shediac by applying system pressure to the complete hydrant barrel for a minimum period of 15 minutes. Any leakage, except for minor leakage at the caps, will be cause for rejection.

4.1.6. Flushing & Disinfection of Watermains

4.1.6.1. The completed section of main shall be suitably flushed with clean water, according to AWWA C651 (see Appendix "H"); flushing velocity to be not less than 0.9 m/s. The injection and sampling of the new watermain shall be done in accordance with table 3 of the latest AWWA C651 Standard by using a minimum 20mm main stop at each end of the watermain and the minimum 20mm service tubing with a complete curb box (not self-draining) installed as per Drawing 15. The injection and sampling shall be considered incidental to the work. All water service laterals of 100mm and larger diameter shall also follow the procedures of this section.

4.1.6.2. Before the main is placed in service, it shall be disinfected with liquid chlorine meeting the requirements of the latest AWWA Standards – B300 section for Disinfection Chemicals. The dosage shall be 50 parts per million available chlorine. The chlorine water shall be allowed to stand in the main for a period of not less than twenty-four (24) hours. At the end of the twenty-four (24) hour period the treated water shall be tested and contain not less than 10 parts per million free chlorine or the procedure must be repeated. Following the disinfection procedure, the main shall be flushed until the residual chlorine is reduced to less than 2 parts per million.

Total residual chlorine still present in the water used to disinfect the water main shall be reduced to a maximum of 1 part per million (1.0mg/l) if released to an environment other than a sanitary or combined sewer pipe.

4.1.6.3. After final flushing and before the watermain system is activated, water samples will be tested for HPC, e-coli and total coliform by an approved laboratory. Sampling shall be in

accordance with the latest AWWA C651 Standard. Two sets of samples shall be collected, at least 24 hours apart. At least one set of samples shall be collected from every 366 metres (1200ft) of the new watermain, plus one set from the end of the line and at least one set from each branch. Town of Shediac's staff will take samples. The Contractor shall notify the Engineer not less than forty-eight (48) hours in advance of readiness to sample. If results are not satisfactory, the Contractor shall carry out further flushing and disinfection of the watermain until test results are acceptable. This shall be considered incidental to the work. No hose or fire hydrant shall be used in the collection of samples.

4.1.6.4. Swabbing, flushing, disinfections and bacteriological testing shall be done on new watermains and lateral installations 100mm in diameter and above within the Town's right-of-way and also up to the service entrance inside the building. All watermains and lateral installations smaller than 100mm in diameter shall be thoroughly flushed and bacteriological tested only.

4.1.6.5. When installing corporation main stops (quarter turn, ball style with top cap) on new water mains which have to be tested, the corporation main stops shall be installed with a section of 100 mm diameter PVC pipe (temporary box) plumb over it, or approved equal. The temporary box shall be installed in such a way to restrict intrusion of surrounding material which may affect the operation of the corporation valve. The temporary box is to be removed and the hole backfilled with sand upon successful commissioning of water main; refer to drawing No. 34. The installation and removal of temporary boxes for corporation main stops shall be incidental to the contract.

4.1.7. Measurement

Watermains shall be measured in linear metres of main in-place including the distance through valves and fittings.

4.1.8. Payment

Payment for this item shall be at the contract unit price for watermains of the appropriate size and type and contract unit price for tees, bends, and crosses of the appropriate size. Payment shall include excavation, dewatering, supply and installation of all pipe and fittings including supply and installation of thrust blocks and or mechanical restrainers, anchors, all corrosion protection, testing, flushing, disinfection and removal of excess material in accordance with General Conditions 45.

Payment shall also include trench restoration and maintenance according to Section 3.

There shall be no separate payment for imported bedding material, in accordance with Section 2.1.5.

Payment for imported fill shall be according to Section 2.2.5.

4.2 Gate Valves, Butterfly Valves, Valve Boxes and Tapping Sleeves

4.2.1. Scope

This section governs the supply and installation of gate valves, butterfly valves, valve boxes and tapping sleeves.

4.2.2. Materials

4.2.2.1. Gate valves will be AVK, McAvity, or Mueller and will be provided by the Contractor. All valves shall be epoxy-coated and equipped with high-tensile steel tee bolts and nuts.

4.2.2.2. Gate valves will meet the requirements of the latest AWWA Standard C509 resilient-seated gate valves for water supply service or C515 reduced-wall, resilient-seated gate valves for water supply service. Valves shall be epoxy-coated, iron body, brass-mounted with a non-rising stem, having high-tensile steel tee bolts and nuts and a 50mm square operating nut. They will open counter clockwise and will have mechanical joints and be complete with component parts.

4.2.2.3. Butterfly valves will meet the requirements of the latest AWWA Standard C504, class 150B. Valves will be epoxy-coated, iron body, mechanical joint type having high-tensile steel tee bolts and nuts and a stainless steel shaft. Butterfly valves will be Mueller, Pratt, Clow or approved equal.

4.2.2.4. Valve boxes shall be:
Cast-iron, Bibby or approved equal three-piece screw-type with minimum base diameter of 350mm. Top sections will have two lugs for turning. Valve boxes will be adjustable from 1.8 m to 2.1 m. Valve box threads shall be an integral part of the casting.

or

Mueller MVB or Bibby (CVB) composite valve box complete with 686mm ductile-iron adjustable top and guide plate (See drawing N° 17).

4.2.2.5. Covers shall be Bibby, Mueller or equivalent and the appropriate size to fit the valve box system and will be marked "Water". Covers must have appropriate opening to allow insertion of a pick for ease of removal (See drawing N° 17).

4.2.2.6. Tapping sleeves shall be stainless steel complete with high-tensile steel tee bolts and nuts tightened using a torque wrench to the manufacturer's specification providing a complete seal around the circumference of the pipe. All tapping sleeves shall be approved by the Town. A concrete thrust block is required.

Tapping valves shall be the resilient-seated type, meeting the requirements of AWWA Standard C509 or 515 for gate valves. Tapping valves shall have a flanged mechanical joint, complete with high-tensile steel tee bolts and nuts, tightened using a torque wrench to the manufacturer's specification and shall be AVK, McAvity, Mueller, or approved equal.

4.2.3. Construction Methods

4.2.3.1. Gate valves of the indicated size shall be installed at locations shown on the drawings. Special care must be given to compaction methods around units. Compaction shall conform to Section 1.1.2.4.

4.2.3.2. Gate valves shall be properly joined to the mains with mechanical joint connections according to the requirements of the manufacturer and recognized good practice. The valves shall be set so that the valve stems are vertical and plumb. All nuts shall be tightened with a torque wrench according to the manufacturer's specifications.

4.2.3.3. Valve boxes shall be set on gate valves as indicated on the drawings. 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. Boxes will not be required where valves are in chambers.

4.2.3.4. Covers on valve boxes shall be set flush with the finish grade. On gravel roadways, the valve boxes shall be screwed down 100mm after final inspection.

4.2.4. Measurement

This work shall be measured as the total number of gate valves or tapping sleeves and valves installed.

4.2.5. Payment

Payment for this item shall be at the contract unit price for each gate valve or tapping sleeve and valve of the appropriate size. Payment shall include the supply and installation of the gate valve and complete valve box unit and corrosion protection.

4.4. **Hydrant**

4.4.1. This section governs the supply of all materials, labour and equipment necessary for the complete installation of hydrants, thrust blocks, hydrant extensions and repainting.

4.4.2. Work Under Other Sections

4.4.2.1. Trenching – Section 1

4.4.2.2. Bedding and Backfilling – Section 2

4.4.2.3. Trench Restoration and Maintenance – Section 3

4.4.3. Location

4.4.3.1. Hydrants shall be installed at the locations as indicated on the drawings so as to cover a radius of not more than 75m with the normal spacing not to exceed 150 m. A hydrant will normally be located at the very end of dead end mains.

4.4.4. Materials

Hydrant shall be Clow/McAvity Brigadier M-67 or Canada Valve Century. All hydrants will meet the requirements of the latest AWWA Standard C-502 for hydrants for ordinary water services. Hydrants will be compression type designed for a working pressure of 1000 kPa having two 65mm male threaded hose outlets, a 100mm Storz pumper connection, a 150mm riser barrel, a bottom valve and a 150mm connection with the main. Hydrants will open counter clockwise. Drain holes will be internally plugged. Hose outlets and pumper connections must be the same size and thread as Town of Shediac Standards.

Threads to be as follows: Hose nozzle: maximum OD-2.962
Maximum PD-2.881
TPI – 8

Pumper nozzle: 100mm ø Storz to figure 2 of CAN4-5543M

The hydrants will be installed to a minimum of 2.15 metre bury unless otherwise specified and shall be repainted to Town of Shediac Standards after installation.

Paint to be used for painting the hydrant body shall be:
Devoe Coatings – Alkyd Industrial Gloss Enamel
Color – Safety Red

Paint to be used for painting hydrant top and nozzle caps shall be:
Glidden Ultra – Interior / Exterior Aluminum Paint
Color – Aluminum

All fire hydrants shall have ductile-iron mechanical joints fitted with high-tensile steel tee bolts and nuts tightened using a torque wrench to the manufacturer's specification.

Joint restraint systems to be installed at all joints and fittings between a fire hydrant and the water main tee.

4.4.5. Construction Methods

4.4.5.1. Hydrants shall be set plumb in all respects and installed with pumper connections facing the street.

4.4.5.2. The bury line of the hydrant shall be set at the grade as indicated on detail drawing n^{o} 16. Hydrant extensions, "Gradelok" or equivalent may be used as required to achieve specified grade.

4.4.5.3. Thrust blocks shall be provided on all hydrant bowls unless indicated otherwise on the drawings.

4.4.5.4. Hydrant drain holes are to be filled with brass plugs. The Contractor is responsible to check that these plugs are in-place at the time of installation.

4.4.5.5. If required, hydrant extensions shall be installed by the Contractor under the direct supervision of the Public Works Department. A 48-hour notice must be given to the Public Works Department for scheduling.

4.4.6. Measurement

Measurement for this work shall be for the total number of hydrants installed.

4.4.7. Payment

Payment for this work shall be at the contract unit price for each hydrant installed.

Payment shall include the supply and installation of the hydrant and fittings, thrust blocks, anchors, hydrant extensions, testing and repainting of hydrants to Town of Shediac Standards.

Payment shall also include connecting the hydrant to the gate valve, the excavation and backfilling and all incidental items.

Payment for gate valve adjoining hydrants shall be made under Section 4.2.5.

Payment for the pipe between the hydrant and the main shall be made under Section 4.1.8.

4.5. Water Service Laterals

4.5.1. Scope

This item governs the supply of all materials, labour and equipment necessary for the complete installation of water service laterals.

4.5.2. Work Under Other Sections

4.5.2.1. Trenching – Section 1
4.5.2.2. Bedding and Backfilling – Section 2
4.5.2.3. Trench Restoration and Maintenance – Section 3

4.5.3. Materials

4.5.3.1. Service lateral piping, fittings and appurtenances shall be supplied by the Contractor and shall conform to Town of Shediac Standards. Appurtenances shall include service saddle, or PVC tapping tee, main stop, curb stop, curb box and marker post.

4.5.3.2. Pipe shall be minimum 20mm diameter “Q-Line” tubing (color blue) meeting the latest CAN/CSA Standard B137.9 or minimum 25mm diameter blue (PEX) type “A” meeting the latest requirements of CAN/CSA B137.5 and ASTM F877 Standards, or unless otherwise specified. Stainless steel liner shall be inserted into the ends of all Municipex tubing for all connections to compression fittings.

Brass components shall be Mueller, Cambridge, or Ford, meeting the requirements of ASTM B62 and threads to AWWA Standard C800, latest edition.

4.5.3.3. Corporation main stops shall be Cambridge, Ford, or Mueller and shall be full port ball valve construction, 300 PSI maximum working pressure. Body shall be red brass 85-5-5-5 to the latest ASTM B62 Standard Q-Line or CTS compression type outlet fittings and inlet having AWWA threads conforming to the latest AWWA Standard C-800.

Cambridge Model 311NL ball style main stop with cap to be installed on new watermain, where connecting to existing water service lateral; see drawing n^{o} 15.

4.5.3.4. Service saddles for PVC pipe shall be Cambridge, Concord Daigle D-71, Smith-Blair TaperSeal, Robar, or Romac type, cast-bronze or brass body with stainless steel straps and components, or approved equal. SERVICE SADDLES MUST BE USED FOR ALL SERVICE CONNECTIONS.

4.5.3.5. PVC tapping tees shall meet the requirements of the latest AWWA C907 and CSA B137.2 Standard.

4.5.3.6. Curb stops shall be Mueller, Cambridge or Ford and shall be full port ball valve construction, 300 PSI maximum working pressure. Body shall be red brass 85-5-5-5 without any drains to the latest edition of the ASTM B62 Standard Q-Line or CTS compression type outlet fittings.

Stainless steel liners are to be inserted into the ends of Municipex tubing for all connections to compression fittings.

4.5.3.7. Curb boxes for 19mm and 25mm services shall be adjustable for a depth of bury 1.8.-2.1. m and shall be Mueller Type A-726, Bibby Fig. SB-1100, or approved equal, with a 90cm minimum stainless steel stationary rod and stainless steel cotter pin and Type A-800 cover. Service boxes and stems for 38mm and 50mm services shall meet the above requirements except that the model shall be Mueller Type A-728 or approved equal. Services larger than 50mm in diameter require a standard water valve box and cover as per Section 4.2.2.4 and 4.2.2.5.

4.5.3.8. Corporation couplings shall be suitable for copper to copper compression type, Grip Joint.

4.5.3.9. Compression connections shall be the gripper ring type, having a minimum 1000 kg (2200 lb) pull out resistance and shall be tightened using a torque wrench to the Manufacturer's specification.

4.5.4. Construction Methods

4.5.4.1. The location of water service laterals shall be as per Detail Drawings or as located in the field.

4.5.4.2. Water service laterals shall be installed from the watermain to the property line in common trench with the sanitary service lateral and storm service lateral. New water laterals shall be one continuous length of service pipe.

4.5.4.3. Tapping into watermains shall be with the use of proper tools and equipment and according to recognized good practice and in compliance with the pipe manufacturer's specifications. The watermain shall be tapped at a 67½˚ angle from the top centerline of the pipe.

4.5.4.4. A "goose neck" shall be provided in service lateral piping as detailed on the drawing n˚ 15 and shall have a maximum deflection of 22½˚.

4.5.4.5. All connections on service laterals shall be of the compression type.

4.5.4.6. All new water service laterals shall be one continuous section of pipe with no couplings between the main stop and the curb stop.

4.5.4.7. The curb stop and curb box shall be installed at locations as indicated on the drawings. The curb box shall be set directly over the curb stop and installed plumb. Curb boxes shall be set to finish grade, then adjusted to match existing grade.

4.5.4.8. Water service lateral shall be staked with a 50mm x 100mm x 2m red marker extending one metre vertically above grade.

4.5.5. Measurement

Water service laterals shall be measured in linear metres from the center of the watermain to the end including the distance through the "goose neck".

4.5.6. Payment

Payment for this item shall be at the contract unit price for water service lateral pipe and the contract unit price for water service appurtenance.

Payment shall include excavation, dewatering, tapping and connecting to the main, supply and installation of main stop, service saddle, piping or tubing, corporation couplings, curb stop and box, supply and installation of a red marker stake at the curb box, removal and disposal of excess trench material and all incidental items.

Payment shall also include for trench restoration and maintenance according to Section 3.

There shall be no separate payment for imported bedding material, in accordance with Section 2.1.

Payment for imported fill material shall be according to Section 2.2.

5. SANITARY SEWER SYSTEM

Refer to the Greater Shediac Sewerage Commission Standard Specifications, latest edition, Section No. 4 Sanitary Sewer Systems.

6. STORM SEWER SYSTEM

6.1. Storm Sewer Mains

6.1.1. Scope

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

6.1.2. Work Under Other Services

6.1.2.1. Trenching – Section 1

6.1.2.2. Bedding and Backfilling – Section 2

6.1.2.3. Trench Restoration and Maintenance – Section 3

6.1.3. Materials

6.1.3.1. Minimum size of storm sewer mains shall be 300mm.

6.1.3.2. Storm sewer pipes and gaskets will be supplied by the Contractor.

6.1.3.3. Storm sewer mains 300 mm and larger in diameter shall be reinforced concrete pipe meeting the latest requirements of CAN/CSA Standard 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 the latest CAN/CSA Standard B182.4 and ASTM D3034 for DR 35. The installation shall be complete with marker tape, 100mm wide, with the words "STORM SEWER PIPE" in 50mm letters at 1.0m intervals. The marker tape shall be installed immediately on top of the crushed rock bedding.

or

Polyvinyl chloride (PVC) profile sewer pipe and fittings meeting the requirements of the latest CAN/CSA Standard B182.4 and ASTM F794. The installation shall be complete with marker tape, 100mm wide, with the words "STORM SEWER PIPE" in 50mm letters at 1.0m intervals. The marker tape shall be installed immediately on top of the crushed rock bedding.

or

Profile High Density Polyethylene (HDPE) pipe and fittings meeting the requirements of the latest CAN/CSA Standard B182.8, with a minimum pipe stiffness of 320Kpa and Type 1 (water-tight) joints with integrated bells. The installation shall be complete with marker tape, 100mm wide, with the words "STORM SEWER PIPE" in 50mm letters at 1.0m intervals. The marker tape shall be installed immediately on top of the crushed rock bedding.

or

Polypropylene sewer pipe and fittings meeting the requirements of the latest CAN/CSA Standard B182.13, including the SaniTite HP pipe. The installation shall be complete with marker tape, 100mm wide, with the words "STORM SEWER PIPE" in 50mm letters at 1.0m intervals. The marker tape shall be installed immediately on top of the crushed rock bedding.

6.1.3.4. Joints will be bell and spigot type with rubber gaskets. The bell will be an integral and homogeneous part of the pipe barrel. All rubber gaskets must meet the requirements of the latest CAN/CSA Standard A257.3.

6.1.3.5. Re-bars for pipe inlet shall conform to the latest CAN/CSA Standard G30.18.

6.1.3.6. Plugs and caps for PVC and Profile PVC shall be an approved PVC plug or cap complete with gasket seal and shall meet the requirements in section 6.1.3.3. Plugs and caps for concrete pipes shall be an approved concrete plug or cap complete with rubber gasket seal and shall meet the requirements in sections 6.1.3.3 and 6.1.3.4.

6.1.4. Equipment

Approved laser alignment equipment must be used to control line and grade during all pipe installation.

6.1.5. Construction Methods

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

6.1.5.2. Installation of all storm sewer mains shall be according to recommendations of the pipe manufacturer and in accordance with recognized good practice.

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

6.1.5.4. Laying of pipe in prepared trenches shall commence at lowest point with the bell end of the pipe pointing upstream. Graded offset stakes will be provided only once to establish the line and grade that must be followed.

6.1.5.5. 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 or collar and shall not bear upon the subgrade or bedding. Any pipe that is not in true alignment or shows any undue settlement after installation shall be taken out and re-laid at the Contractor's expense.

6.1.5.6. Trenches where pipe laying is in progress shall be kept dry; no pipe shall be laid in water or on 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 bedded and secured in-place so as to prevent any movement or disturbance of the pipe.

6.1.5.7. During the time when pipe laying is not in progress, open ends of pipe shall be closed with a watertight plug.

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

6.1.5.9. 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.

6.1.5.10 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.

6.1.5.11. Installation of storm inlet pipe grates shall be as shown on the drawings and shall be incidental to the storm sewer pipe work.

6.1.6. Visual and Video Inspection

6.1.6.1. The sewers, service laterals, catch basin laterals, manholes and all related appurtenances shall be cleaned of all foreign material either by flushing, the use of cleaning buckets, by hand or by combination of all three. The video inspection shall not be permitted 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.

6.1.6.2. Sewer pipes including service laterals, shall be inspected for alignment and obstructions. WATER PONDING IN GRAVITY SEWERS that cannot be eliminated by flushing and cleaning shall be considered as evidence of pipe settlement. One hundred percent (100%) of the sewers will be video inspected by the Contractor, upon completion of the aggregate base application. The project inspector must be present when all new sewer pipe is being video inspected.

6.1.6.3. Any and all defects shall be cause for rejection and must be repaired by the Contractor at no expense to the Town. The following conditions shall be considered as defects in the work:

- Any joint in the pipe that shows a gap or spread, offset, gasket or signs of infiltration.
- Any service lateral showing signs of infiltration around connection.
- Any service lateral with a pronounced protrusion into the sewer main.
- Any section of sewer pipe that is cracked, crushed or broken.
- Any variance in grade of sewer section causing ponding.
- Any gravel, roots or foreign material that impedes the flow.
- Any deformation in the shape of the pipe.

In the event of a repair, photos of the work being performed shall be provided to the Engineer. The photos shall clearly show the defect area before and after the repair. A complete (MH to MH) CCTV inspection, clearly showing the repaired area shall be provided, any costs to re-video any sewer main to inspect repaired defects shall be at the Contractor's expense. The MH to MH section shall also include the pan, tilt inspection of all services within this section.

Details of requirements for close circuit television inspection (CCTV) are included in Appendix N.

6.1.7. Measurement

Measurement of storm sewer mains shall be in linear metres measured between the center of manholes. In the case of storm outfalls measurement shall be from the center of a manhole to the end of the pipe installed.

6.1.8. Payment

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

Payment shall include excavation, the supply and installation and joining of the pipe, backfilling, dewatering, inlet pipe grates, video inspection, compaction and the removal and disposal of excess materials in accordance with General Conditions 45.

Payment shall also include the necessary trench restoration and maintenance according to Section 3.

There shall be no separate payment for imported bedding material, in accordance with Section 2.1.

Payment for imported fill shall be according to Section 2.2.

6.2. Storm Sewer Manholes

6.2.1. Scope

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

6.2.2. Work Under Other Sections

6.2.2.1. Trenching – Section 1
6.2.2.2. Bedding and Backfilling – Section 2
6.2.2.3. Trench Restoration and Maintenance – Section 3

6.2.3. Materials

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

6.2.3.2. Manholes shall be of pre-cast concrete sections meeting the requirements of the latest CAN/CSA Standard A257.4 for pre-cast reinforced concrete manhole sections. Joints between sections will be rubber gasket or Ram-nek gasket as indicated on the detail drawings, and will meet the requirements of the latest CAN/CSA Standard A257.3.

6.2.3.3. Manhole base sections shall be of pre-cast concrete with reinforced concrete slabs within. Manhole bases will also have cast-in rubber gaskets to suit the inlet and outlet pipe. Any additional holes required in the field shall be core-drilled and a "Kor-n-seal" connector inserted.

6.2.3.4. Manhole frames and covers shall be 411W cast-iron or adjustable type (Laperle C-50M1 frame, and C-46-1 cover) or approved equal meeting the requirements of the latest ASTM A536. Standard (off-road) manhole frames and covers shall be lock-down type, R12S as manufactured by IMP Group Ltd. or approved equal, meeting the requirements of the latest ASTM A48. Anchor bolts shall be stainless steel. Lock-down bolts shall be pentagon-shaped (5-sided) and shall be stainless steel.

A manhole lid gasket by Cretex or approved equal shall be installed inside the frame for all manholes located in the traffic wheel path, if rattling of manhole cover occurs, and shall be incidental.

6.2.4. Construction Methods

6.2.4.1. Manholes shall be constructed of pre-cast concrete sections according to the details indicated on the drawings. Additional openings required in the field in the units shall be core drilled with a Kor-n-seal connector insert. Hammering is not an approved method. Special care must be given to compaction methods around units. Compaction shall conform to Section 1.1.2.4.

6.2.4.2. Manhole base section shall be set on a 150mm layer of bedding material conforming in all respects to the requirements for pipe bedding. Manholes shall be constructed plumb.

6.2.4.3. Joints in pre-cast manhole sections shall be made watertight with the use of rubber gaskets or Ram-nek gaskets. Lifting holes in pre-cast sections shall be plugged with cement mortar for full depth and made watertight.

6.2.4.4. Manhole frames and covers in paved roadways shall conform to the crown of the road. Frames and covers located in gravel roadways shall be set at least 50mm below the top of the aggregate base.

6.2.4.5. Manhole frames and covers located off traveled roadways shall be set flush with finished grade unless otherwise specified and be complete with stainless steel anchor bolts and marker posts. Marker posts to be 100mm x 100mm (4" x 4") wood and shall be embedded 1m in the ground and protrude 1.5m above ground level, painted yellow, with the words "STORM MH" written in black on all faces on the top. Install reflective tape (to C.G.S.B. 62GP-11M reflective Level 1) at top of post on all sides, 100mm wide, silver and orange in color.

6.2.5. Measurement

This work shall be measured as the total number of manholes installed of the appropriate size.

6.2.6. Payment

Payment for this work shall be at the contract unit price for manholes of the appropriate size.

Payment shall include the supply and installation of manholes including benching, frames and covers and adjustment work. The prices shall also include the excavation, dewatering, backfilling, trench restoration and maintenance and all incidental items.

6.3. Storm Sewer Laterals

6.3.1. Scope

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

6.3.2. Work Under Other Sections

6.3.2.1. Trenching – Section 1

6.3.2.2. Bedding and Backfilling – Section 2

6.3.2.3. Trench Restoration and Maintenance – Section 3

6.3.3. Materials

6.3.3.1. Storm service lateral pipe, tees, wyes, bends, couplings, rings, fittings, elbows, caps and saddles shall be provided by the Contractor.

6.3.3.2. Storm service lateral pipe and fittings shall be polyvinyl chloride (PVC) sewer pipe, DR28 meeting the requirements of ASTM D-3034 and CAN/CSA Standard B182.1 and shall be a minimum 100mm diameter. Pipe shall be color-coded white. Joints will be bell and spigot type with locked-in rubber gasket.

6.3.3.3. Caps for ends of lateral pipe shall be PVC.

6.3.3.4. Saddles shall be PVC gasketed and strap-on type of the size as indicated on the drawings, meeting the same requirements as the storm sewer service pipe or the Rubber “Inserta-tee” or the “Quick Seal” type connector.

6.3.3.5. Bends shall be of the long radius type.

6.3.3.6. For connections to existing sanitary laterals, shielded or reinforced couplings to be used; standard flexible couplings shall not be permitted.

6.3.4. Construction Methods

6.3.4.1. Storm service laterals shall be installed in the locations as staked and according to the sizes as indicated on the drawings.

6.3.4.2. Service laterals shall extend from the sewer main to the property line and terminate with a PVC cap. Service lateral piping shall be laid on a minimum grade of 2% for all new developments and 1% on existing streets. The minimum depth shall be 2.5m unless restricted by existing ground elevations.

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

6.3.4.3. Service laterals shall be staked with a 50mm x 100mm red marker stake set vertically in the ground at the capped end of the lateral and extending 1(one) metre above existing grade.

6.3.4.4. Connection of the storm sewer laterals to concrete mains shall be made by core-drilling an appropriately sized circular hole in a neat and workmanlike manner without damaging the pipe. These holes shall be of sufficient size to accommodate Inserta-tee connection or approved equal.

6.3.4.5. Connections of service laterals to PVC mains shall be made with tees or saddles that 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 without damaging the pipe (See drawing n◦ 14).

6.3.4.6. Laterals shall be placed and bedded in dewatered trenches.

6.3.4.7. Laterals shall be video inspected, following criteria outlined in section 6.1.6.

6.3.5. Measurement

Measurement of storm service laterals shall be in linear metres measured from the center of the sewer main to the capped end of the service lateral.

6.3.6. Payment

Payment for this work shall be at the contract unit price for storm sewer laterals.

Payment shall include the supply and installation of the pipe, saddles, bends, pipe caps, marker stakes and the excavation, dewatering, backfilling, connections, video inspection, removal and disposal of excess materials in accordance with paragraph 44 of General Conditions, and all incidental items.

Payment shall also include trench restoration and maintenance according to Section 3.

There shall be no separate payment for imported bedding material, in accordance with Section 2.1.

Payment for imported fill shall be according to Section 2.2.

6.4. **Catch Basins**

6.4.1. Scope

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

6.4.2. Work Under Other Sections

6.4.2.1. Trenching – Section 1

6.4.2.2. Bedding and Backfilling – Section 2

6.4.2.3. Trench Restoration and Maintenance – Section 3

6.4.3. Materials

6.4.3.1. Pre-cast catch basin sections and frames and grated covers shall be supplied by the Contractor.

6.4.3.2. Catch basins shall be of the pre-cast reinforced type, of a size as indicated on drawings and shall have cast-in rubber gaskets or pre-cut circular holes with "Kor-n-seal" connectors on all openings larger than 150mmø. Catch basins shall meet the requirements of the latest CAN/CSA Standard A257.4 for pre-cast reinforced concrete manhole sections and shall be stamped with the manufacturer's name and date of casting. Joints between sections will be rubber-gaskets or Ram-nek gaskets as indicated on the detail drawings.

6.4.3.3. Catch basin frames and grates shall be cast iron Town of Shediac Standard and meet the requirements of the latest ASTM A48.

6.4.4. Construction Methods

6.4.4.1. Catch basins shall be constructed of pre-cast concrete sections complete with pre-cast base sections. (See detail drawing n◦ 5). Openings for curb drains shall be made with the use of a core drill; hammering is not an approved method. Special care must be given to compaction methods around units and shall conform to Section 1.1.2.4.

6.4.4.2. Base sections shall be placed on a 150mm layer of bedding conforming in all respects to the requirements for pipe bedding. Catch basins shall be constructed plumb.

6.4.4.3. Sumps shall be provided on catch basins according to details as indicated on drawings.

6.4.4.4. Lifting holes in pre-cast sections shall be plugged with cement mortar to full depth and made watertight.

6.4.4.5. Catch basin frames and grates shall be constructed to grade as established on site and as indicated on drawing N^{o} 6 and 6A.

6.4.4.6. Double catch basin frame and grates shall be constructed to match the cross slope of finished gradient of road and as indicated on drawing N^{o} 6A or as directed by the Engineer.

6.4.5. Measurement

This work shall be measured as the total number of catch basins installed.

6.4.6. Payment

Payment for this work shall be at the contract unit price for catch basins installed.

Payment shall include the supply and installation of catch basins including connection to storm sewer mains, supply and installation of frames and covers. The prices shall also include the excavation, dewatering, backfilling, trench restoration and maintenance and all incidental items.

6.5. Catch Basin and Sluice Box Laterals

6.5.1. Scope

This section governs the supply of all materials, labour, equipment and incidentals necessary for the complete installation of catch basin and sluice box laterals.

6.5.2. Work Under Other Sections

6.5.2.1. Trenching – Section 1

6.5.2.2. Bedding and Backfilling – Section 2

6.5.2.3. Trench Restoration and Maintenance – Section 3

6.5.3. Materials

6.5.3.1. Lateral pipes and all accessories shall be supplied by the Contractor.

6.5.3.2. Catch basin and sluice box lateral pipe shall be 200mm, unless otherwise specified, PVC DR35 meeting the requirements of the latest CAN/CSA Standard B182.2 and ASTM D3034 and color-coded green with marker tape as per section 6.1.3.3.

6.5.3.3. Requirements for bends to be approved by the Town of Shediac, long-radius type, color-coded white.

6.5.4. Construction Methods

6.5.4.1. Laterals shall be installed to connect all catch basins to the storm sewer manhole and to connect all sluice boxes to catch basins.

6.5.4.2. These laterals shall have a minimum slope of one percent (1%).

6.5.4.3. The amount of protrusion of any pipe into a manhole or catch basin shall be, not more than 10cm and not less than 5cm.

6.5.4.4. Laterals shall be placed and bedded in dewatered trenches.

6.5.4.5. Laterals shall be video inspected, following criteria outlined in section 6.1.6.

6.5.5. Measurement

Measurement of catch basin laterals shall be in linear metres measured from the center of the sewer pipe or manhole, to the center of the catch basin.

Measurement of the sluice box laterals shall be in linear metres measured from the center of the sluice box to the center of the catch basin.

6.5.6. Payment

Payment for this work shall be at the contract unit price for catch basin laterals and for sluice box laterals.

Payment shall include the supply and installation of the pipe, the excavation, dewatering, connections, gaskets, video inspection, backfilling and all incidental items.

Payment shall also include trench restoration and maintenance according to Section 3.

There shall be no separate payment for imported bedding material, in accordance with Section 2.1.

Payment for imported fill shall be according to Section 2.2.

6.6. **Sluice Boxes**

6.6.1. Scope

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

6.6.2. Work Under Other Sections

6.6.2.1. Trenching – Section 1

6.6.2.2. Bedding and Backfilling – Section 2

6.6.2.3. Trench Restoration and Maintenance – Section 3

6.6.3. Materials

6.6.3.1. Pre-cast sluice boxes and frames and grated covers shall be supplied by the Contractor.

6.6.3.2. Sluice boxes shall be of the pre-cast concrete type and shall meet the requirements of the latest CAN/CSA Standard A257.4, with pre-cut holes of sufficient size to suit the OD of the storm lateral.

6.6.3.3. Concrete for sluice boxes shall conform to all requirements as specified in Section 9 of these specifications.

6.6.3.4. Sluice box frames and grates shall meet the requirements of the latest ASTM A48 for grey-iron castings as supplied by IMP Castings or approved equal.

6.6.4. Construction Methods

6.6.4.1. Sluice boxes shall be installed at locations indicated on drawings, or as directed.

6.6.4.2. Sluice boxes shall be placed on a 150mm layer of bedding conforming to the requirements for pipe bedding and shall be constructed plumb.

6.6.4.3. Sluice box frames and grates shall be set to grade as indicated on drawings.

6.6.5. Measurement

This work shall be measured as the total number of sluice boxes installed.

6.6.6. Payment

Payment for this work shall be at the contract unit price for sluice boxes installed.

Payment shall include the supply and installation of sluice boxes including connection to the lateral, supply and installation of frames and covers. The prices shall also include the excavation, backfilling, trench restoration and maintenance and all incidental items.

6.7. Storm Outfall Headwall

6.7.1. Scope

This section governs the supply of all materials, labour and equipment necessary for the completion installation of storm outfall headwalls as shown on the Drawings and herein specified.

6.7.2. Work under other sections

6.7.2.1. Trenching – Section 1

6.7.2.2. Bedding and Backfilling – Section 2

6.7.2.3. Trench Restoration and Maintenance – Section 3

6.7.3. Materials

6.7.3.1. Pre-cast iron outfall headwalls shall be supplied by the Contractor.

6.7.3.2. Storm outfall headwalls shall be of the pre-cast concrete type and shall meet the requirements of the latest CAN/CSA Standard A23, with pre-cut holes of sufficient size to suit the OD of the storm pipe. Shop drawings to be submitted for approval by the Engineer prior to manufacturing.

6.7.3.3. Concrete for storm outfall headwalls shall conform to all requirements as specified in Section 9 of these specifications.

6.7.3.4. Steel plate and reinforcements shall conform to the latest CAN/CSA Standard G30.18.

6.7.3.5. Grates shall be as per drawing no. 31 and made of galvanized steel or approved equal and shall be hinged and locked.

6.7.4. Construction Materials

6.7.4.1. Storm outfall headwalls shall be installed at locations indicated on drawings or as directed.

6.7.4.2. Storm outfall headwalls shall be installed on a 150mm layer of bedding conforming to the requirements for pipe bedding and shall be constructed plumb.

6.7.4.3. Storm outfall headwalls shall be set to grade as indicated on the drawings.

6.7.5. Measurement

This work shall be measured as the total number outfall headwalls installed of the appropriate size.

6.7.6. Payment

Payment for this work shall be at the contract unit price for outfall headwalls of the appropriate size.

Payment shall include the supply and installation of outfall headwalls including the steel grate. The prices shall also include the excavation, dewatering, backfilling and all incidental items.

7. ROAD CONSTRUCTION

7.1. Clearing and Grubbing

7.1.1. 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 and easements in order to carry out the installation of services and/or road construction.

7.1.2. 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 removal and disposal of such cut materials from the site.

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, 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 the 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 in accordance with General Conditions 44.

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, the site will be left in such a condition that grading operations and installation of services can be undertaken immediately.

All required ditches and/or swales are to be constructed upon completion of the grubbing operation. The disposal of all excavated materials shall be the Contractor's responsibility unless otherwise directed by the Engineer.

7.1.3. Measurement

Measurement for clearing and grubbing shall be in square metres or hectares. Grubbing operations shall be considered to include a depth of material of 300mm.

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.

7.1.4. Payment

Payment for work under this item shall be at the contract unit price for clearing and grubbing. This includes cutting and disposal of all materials, clean-up and all work incidental thereto.

Payment for the construction of ditches and/or swales shall be by the lineal metre.

7.2. Excavation

7.2.1. 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 limits.

7.2.2. Materials

All material, excluding rock excavated within the right-of-way, shall be classified as common excavation.

Rock excavation shall be as classified in Section 1.2.

Common excavation material may be used as fill material for embankments or fill areas, if required.

7.2.3. Construction Methods

Roadways, ditches and 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 rocks larger than 150mm in greatest diameter.

The top of all road cut sections shall be scarified to a depth of 150mm, below subgrade level, moistened if necessary, shaped and re-compacted to the subgrade to 95% maximum dry density as determined and by the latest ASTM D698. Fill sections shall be placed in lifts having a maximum thickness of 200mm and shall be compacted to 95% maximum dry density as determined by the latest 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 the latest ASTM D698.

7.2.4. Measurement

Measurement for common excavations shall be in cubic metres based on volumes calculated by the average end area method. The top elevations used in calculations shall be the elevations taken after grubbing operations, or topsoil removal, when these operations are paid for separately. Measurement for rock excavation shall be in cubic metres based on the average end area method.

7.2.5. Payment

Payment for excavation shall be at the contract unit price and shall include disposal of excess material as in accordance with General Conditions 44.

7.3. **Road Construction**

7.3.1. Scope

This section governs the supply of all labour, materials and equipment necessary for the completion of the aggregate subbase and base materials in roadways.

7.3.2. Materials

7.3.2.1. Aggregate Subbase and Base

Aggregate shall be composed of clean, hard, sound durable, uncoated particles that do not contain friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate 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, approved by the Engineer and conforming to the latest NBDTI Standard Specifications 201.2 and 201.4.

7.3.2.2. Geotextile Fabric

Geotextile fabric shall be installed in accordance with manufacturer's recommendations. Geotextiles for drainage applications shall be non-woven fabrics. Woven fabric shall be used for stabilization and separation under aggregate subbase and base materials, when specified.

The Contractor shall submit, upon request, the manufacturer's recommended procedures for installation and instructions for handling of the selected geotextile. 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. 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 jointed by sewing, or by an overlap of at least 500mm and all overlap joints shall be securely held in-place. In no case, shall equipment travel on uncovered fabric.

The Contractor shall immediately repair any damaged geotextile, by covering with a patch of the same fabric extending a minimum of one metre beyond the perimeter of the damaged area.

Overlapped joints, patches and seams shall be measured as a single layer of fabric; no payment shall be made for overlap.

Geotextile fabrics shall meet the following minimum requirements:

PROPERTY	UNIT	ASTM TEST	NON-WOVEN FABRIC	WOVEN FABRIC
Mullen Burst Strength	kPa	D3786	1100	1500
Tearing Strength (Trapezoid method)	N	D4533	160	200
Grab Tensile Strength (Both Directions)	N	D4632	400	400
Elongation at Break	%	D4632	50	25 max.
Apparent Opening Size	μm	D4751	50-250	840 max.
UV Degradation	% Ret.	D4355		70 min.
Permittivity	-1 sec.	D4491	1.75 – 3.50	0.01 min.

Property values above the heavy lines 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. The minimum roll average is the average minus approximately two standard deviations.

7.3.3. Construction Methods

7.3.3.1. Grading

Grading shall consist of clearing, grubbing, excavation and embankment construction conforming to the lines, grades and typical cross-sections shown on the plans, or as directed.

7.3.3.2. Excavation and Embankment

Excavation shall be done to proper line and grade and the excavated material shall be placed in embankments or removed from the site as in accordance with General Conditions 44.

Immediately prior to placing the aggregate subbase and base materials, the material below the subgrade shall be scarified to a depth of 150mm and compacted in accordance with Section 7.2.3. Embankments shall be constructed using suitable excavated material or imported fill. Topsoil and organic or deleterious material shall be stripped from all areas on which embankments are to be constructed.

Embankments shall be placed and compacted in layers having a compacted thickness not greater than 200 mm. At the start and completion of compaction, the moisture content of the material shall be not below and not more than three percentage points above optimum as determined by ASTM D698 (standard moisture-density relations test). Each layer shall be uniformly compacted to a density not less than ninety-five (95%) of maximum dry density as determined by ASTM D698.

At the completion of excavation and embankment construction, the subgrade shall be shaped and rolled to give a smooth firm surface.

7.3.3.3. Aggregate Subbase and Base Construction

7.3.3.3.1. Preparation

Stockpiling of borrow or aggregate materials on site and intended to be incorporated into the works, is not permitted. Any borrow or aggregate materials placed in stockpiles on site without the permission of the Engineer will not be considered for payment, regardless of whether the material is incorporated into the work.

Prior to placing the aggregate subbase and base, the subgrade shall be properly shaped, crowned and compacted so as to be firm and able to support the construction equipment without displacement. Soft or yielding subgrade shall be corrected and made stable and all ponding water shall be removed prior to placing the aggregate subbase and base materials.

All area that are found to be loose, soft, and spongy or composed of unsuitable material must be dug out, refilled with material as specified and compacted to 95% of maximum dry density as determined by ASTM D698. All ponding water shall be removed prior to placing the aggregate subbase material.

Where the gradation of the subgrade soil and the aggregate subbase and base are such that mixing of the two materials may occur, an approved geotextile fabric shall be placed.

For residential, collector or arterial streets, the overall thickness will be as shown in Drawings No. 27 and 28.

7.3.3.3.2. Spreading and Compaction

The aggregate subbase and base materials shall be spread and compacted in layers having a depth not greater than 200mm. Compaction must commence immediately following the spreading and shaping of each layer. Water shall be added to give a moisture content within two percentage points of optimum as determined by ASTM D698 and each layer shall be uniformly compacted to as least 95% of maximum density as determined by ASTM D698 before the subsequent layer is placed.

Water truck(s) shall be supplied by the Contractor and shall be available to apply water for compaction purposes as required, and in accordance with section 54 of the General Conditions, and shall be considered as incidental to the work.

Following compaction, the surface of the aggregate base shall be shaped to require line, grade and cross-section. The surface shall be smooth, dense and free from ridges or loose material. The surface shall not vary more than 10mm in 3m in conformance with the roadway cross-section as shown on the detail drawings.

7.3.3.3.3. Proof Rolling

For proof rolling of the subgrade and the aggregate base, 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 25mm of deflection occurs.

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 Town of Shediac if affected area has previously been backfilled or prepared by contractor..

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.

7.3.3.3.4. Fine Grading and Maintenance

Prior to fine grading, any unsuitable material shall be removed and sub-base scarified. The entire length and width of the aggregate base shall be scarified to a depth that will ensure the deepest potholes are fully scarified.

All aggregate base surfaces must be fine graded to the specified crown and tolerances using a motor grader only, a minimum of three (3) specific times within the maintenance period of the contract.

First Grading Immediately prior to inspection in preparation for the issuance of the "Certificate of Substantial Performance".

Second Grading Immediately prior to the inspection in preparation for the issuance of the "Certificate of Final Acceptance".

Third Grading At any time during the maintenance period the Town may order that all aggregate base surfaces be fine graded.

All costs for work under this paragraph shall be considered incidental to the contract and separate payment to meet this requirement will not be considered.

7.3.4. Measurement

This work shall be measured in cubic units of material excavated, square meters of geotextile fabric in-place, excluding overlaps, and tonnes of aggregate base material.

Excavated material in cuts shall be measured in original position by the method of average end areas. Topsoil stripping shall be calculated in cubic units using a depth of 300mm for the area stripped.

Materials placed in excess of 110% of theoretical quantity, based on the specified measurements indicated on the detail drawings, or as determined by “Final Measure”, shall not be included for payment.

7.3.5. Payment

Payment for this work shall be at the contract unit price for excavation, for Geotextile Fabric and for aggregate subbase and base materials.

Payment shall include all incidentals such as water, dewatering, compaction, haulage (as in accordance with General Conditions 45), aggregate subbase and base preparation or treatment, placing of excavated material in embankments, placement, finishing and shaping of road surfaces.

Excavation required for the installation of sewer and water pipes is included under Section 1, Trench Excavation and will not be measured for payment under this section.

7.4. Roadway Shoulder Construction

7.4.1. Scope

This section governs the supply of all labour, equipment and materials necessary for the construction of roadway shoulders according to these specifications and standard drawings.

7.4.2. Materials

All materials shall be supplied by the Contractor.

Shoulder material shall be an approved, sound, crushed rock conforming to the requirements for 31.5mm minus crushed rock as per Section 7.3.2.1. (NBDTI Standard 201.2 and 201.4)

7.4.3. Construction Methods

Should 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 pavement. Any shoulder material that should fall on the pavement shall be cleaned off immediately.

Shoulder material shall be placed in layers not exceeding 150mm and compacted to a minimum of ninety-five percent (95%) maximum dry density as determined by ASTM D698.

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 and leave the road in a neat and clean condition.

7.4.4. Measurement

The quantities to be measured for payment shall be the number of tonnes of shoulder material in-place.

7.4.5. Payment

Payment for this work shall be at the contract unit price for crushed rock used for shoulder construction.

Payment shall include all incidentals such as weighing of material, hauling, spreading and compaction, cleaning or existing roadway, etc.

8. ASPHALT CONCRETE PAVING, RESURFACING, PATCHING, RESTORATION AND CRACK SEALING

8.1. Scope

This section governs the supply of all labour, equipment and materials necessary for the placement of asphalt concrete pavement in accordance with the plans and specifications or as directed by the Engineer. All reference to NBDTI Section 260 shall be from the 2015 Edition.

8.2. Materials

8.2.1. General

All materials shall be supplied by the Contractor and must meet all requirements of the latest New Brunswick Department of Transportation and Infrastructure Standard Specifications, unless otherwise specified.

8.2.2. Aggregate for asphalt concrete shall meet the requirements of the NBDTI Standard Specifications, Item 260.2.1.2 for Coarse aggregate, Item 260.2.1.3 for Fine aggregate and Item 260.2.1.5 for Blending sand. The production of aggregates shall be as per Item 260.2.2. The grading limits of combined aggregates shall be as per Table 260-8 for Types "B" and "D", and as follows for Type "E".

Square Sieve Size mm	Type "E" Sand Seal Surface % passing by weight
9.5	100
4.75	85-100
2.36	65-85
1.118	45-70
0.600	30-55
0.300	15-35
0.150	5-20
0.075	3-8

The aggregate grading limits for the Type D asphalt concrete in Table 260-1 (2015 edition of the NBDTI Standard Specifications) shall be changed to the following:

Sieve Size ASTM Designation		Type D % (by mass) Passing Each Sieve
Coarse Aggregate	25.0 mm	-
	19.0 mm	-
	16.0 mm	-
	12.5 mm	100.0
	9.5 mm	76.0 - 96.0
	6.3 mm	60.0 - 84.0
Fine Aggregate	4.75 mm	45.0 - 60.0
	2.36 mm	30.0 - 50.0
	1.18 mm	20.0 - 40.0
	600 µm	15.0 - 30.0
	300 µm	8.0 - 25.0
	150 µm	6.0 - 12.0
	75 µm	2.0 - 6.0

Laboratory proof of this gradation to be supplied to the Town upon request.

8.2.3. 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 (Superpave) for Type "B" Base Course, Type "C" Base or Surface Course, Type "D" Surface Course, or the requirements of these specifications (Marshall) for Type "E" Sand Seal Surface Course for used on parking lots and driveways and for patching purposes.

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.

8.2.4. Asphalt Binder shall be *Performance Grade (PG)* asphalt binder shall meet the requirements of AASHTO M332, Table 1-Performance Graded Asphalt Binder Specifications and Table 8-1A as shown below:

Table 8–1A
MSCR % Recovery Requirements

Traffic Designation	J_{nr} (@ 3.2 kPa)	% Recovery (min)
S	$\leq 4.5\ kPa^{-1}$	-
H	$\leq 2.0\ kPa^{-1}$	30%
V	$\leq 1.0\ kPa^{-1}$	35%
E	$\leq 0.5\ kPa^{-1}$	45%
	$\leq 0.25\ kPa^{-1}$	55%

When anti-Stripping admixtures are required, the asphalt binder grade shall meet the specified requirements of Table 1 – Performance Graded Asphalt Binder Specifications and Table 8-1A, after the addition of the required admixtures

8.2.5. Anti-Stripping Admixtures shall be supplied by the Contractor and incorporated into the mix in conformance with the NBDTI Standard Specifications, Item 260.2.1. The dosage shall be determined at the mix design stage. When anti-stripping admixtures are required, then the asphalt binder grade shall meet the specified requirements of 8.2.4, after the addition of the required admixtures. The type and dosage of all asphalt binder anti- stripping shall be noted on the delivery slip.

8.2.6. Tack Coat shall be RS-1 or CRS-1 Grade asphalt emulsion and shall conform in all respects to the provisions of ASTM D977 and D2397, respectively. The Contractor shall submit, upon request, manufacturer's certifications that the materials supplied meet the specified requirements, or representative samples, shall be supplied on request.

8.2.7. Asphalt Concrete Mixes shall be supplied by the Contractor and incorporated into the mix in conformance with the NBDTI Standard Specifications, Item 260.2.1. The dosage shall be determined at the mix design stage. When anti-stripping admixtures are required, then the asphalt binder grade shall meet the specified requirements of 8.2.4, after the addition of the required admixtures. The type and dosage of all asphalt binder anti-stripping shall be noted on the delivery slip.

The Physical properties for Type E Sand Seal used for seal coats in driveways, on parking lots, Multi-Purpose Trails and for patching shall be as per the following table:

Property	Type "E" Sand Seal
Stability, kN at 60 Degrees Celsius, minimum	4.5
Flow, mm	2-4
Percent Air Voids in mixture	3-6
Percent Voids in Mineral Aggregate, minimum	17±1
Asphalt Cement Content (%)	6.0-8.0

Mix Design and Mixture Testing for Type "E" shall be completed per the Asphalt Institute Series MS-2 with a compaction effort of 75 Blows per side.

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.

Theoretical density for calculation purposes:

	Type B	**Type C**	**Type D**	**Type E**
tonnes / cubic metre	**2.40**	**2.40**	**2.35**	**2.35**

8.2.8. **WATER** REQUIRED FOR THE WORKS SHALL BE SUPPLIED BY THE CONTRACTOR. THE CONTRACTOR WILL NOT BE PERMITTED TO USE TOWN HYDRANTS. The purpose of this policy is intended to minimize risk and maintain the integrity of the water distribution system.

Failure to comply with these requirements may result in prosecution by the Town under the law.

8.2.9. 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 (1120 lb/in) across width and 100kN/M (560 lb/in) along length.

8.3. Equipment and Construction Methods

8.3.1. General

All equipment and construction methods shall conform to the requirements and practices of the New Brunswick Department of Transportation and Infrastructure as stipulated in their Standard Specifications, latest edition, unless these specifications provide otherwise.

8.3.2. Mix Design

Two weeks prior to the date paving operations are to commence, the Contractor shall present information, in writing, outlining the proposed Design Mix Formula (DMF) and the Job Mix Formula (JMF) based on the use of aggregate stockpiles that are representative of those to be used for the work.

The Contractor shall use professional engineering services and a qualified testing laboratory to assess the aggregate materials proposed for use and to carry out the design of the asphalt concrete mix.

The submitted Design Mix Formula (DMF) shall include the following:

8.3.2.1. Asphalt concrete mix design summary sheet which has been signed and dated by the manager or a designated person, and includes the following:

- Type of mix
- Mix Design laboratory
- Contract/Project Identification
- Location of plant
- Date of mix design completion

The VMA % (min) and Voids Filled with Asphalt % (VFA) values in Table 260-1 (2015 edition of the NBDTI Standard Specifications) under Physical Requirements for Asphalt Concrete for the Type "D" mix shall be changed to the following:

- VMA % (min): 14.5 (target 15.0)
- VFA % : 65.0 – 75.0

8.3.2.2. Mix design test results, worksheets and graphs developed at the mix design stage.

8.3.2.3 The volumetric properties for the mix selected in accordance with Table 8-7 of the NBDTI Specifications, %Gm @ Nini, %Gm @ Ndes and %Gmm @ Nmax. Graphs shall be submitted for the air voids, VMA, Voids Filled with Asphalt (VFA), dust to binder ratio (d/b) and the gyratory curves of the mix plotted for the considered asphalt cement contents.

8.3.2.4. Mix bulk specific gravity by AASHTO T166. If the percent of water absorbed by the specimen is found to exceed 2% by volume, as described in AASHTO T166, then the bulk specific gravity should be carried out in accordance with AASHTO T275 or ASTM D6752.

8.3.2.5. The theoretical maximum specific gravity of the mix in accordance with AASHTO T209.

8.3.2.6. The typical mix weight to produce a gyratory specimen with a height of 115mm +-5 mm.

8.3.2.7. Superpave concensus properties

- Coarse aggregate angularity

- Flat and elongated particles content
- Uncompacted voids content (fine aggregates angularity)
- Sand equivalent

8.3.2.8. Designations of coarse aggregates, fine aggregates and RAP and the respective gradations for each prior to blending.

8.3.2.9. Material proportions and sources, for aggregates (including RAP) and anti-stripping additive.

8.3.2.10. Other physical properties of coarse and fine aggregate required by the specification.

8.3.2.11. Type of Performance Graded Asphalt Cement (PGAC), its source and its percentage by weight of mix.

8.3.2.12. Information on the percentage of fines which were returned to the mix and the resulting effect on the aggregate gradation.

8.3.2.13. Aggregate absorptions (apparent and bulk).

8.3.2.14. Bulk relative density and percentage of asphalt cement in the RAP used in the mix.

8.3.2.15. Moisture susceptibility reports showing the tensile strength ratio (TSR) of the asphalt concrete without the anti-stripping additive and with the addition of anti-stripping additive at its required dosage.

8.3.2.16. The mixing and compaction temperature of the briquettes during sample preparation.

8.3.2.17. The job mix formula (JMF)

8.3.2.18. The results of mix design verification by an independent consultant.

8.3.2.19. A temperature-viscosity graph which should be provided to the contractor by the supplier of the asphalt cement indicating the optimum compaction and mixing ranges unique to the asphalt cement used in the mix.

The mix design documentation shall be reviewed by the Engineer. If the submission meets all the requirements of the project and/or Town's Specifications, the Engineer shall provide a signed letter or technical memorandum stating its acceptance. Should the mix design be rejected, the Contractor is then required to address the issue(s) and submit a new or corrected mix design with the required documentation. The mix must be approved prior to the commencement of the paving operation. A mix design should be submitted for each mix type used on a project. The mix design should be current (completed within the last 12 months).

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.

8.3.3. Preparation

8.3.3.1. Aggregate Base

Where the area is to be covered with asphalt concrete, the foundation shall be excavated or filled-up with an aggregate base material to top elevation of the aggregate base so that after being compacted to 95% of maximum dry density as determined by the latest ASTM D698, the top elevation plus the thickness of the paving material will correspond to the finished surface of the pavement as set. In excavating, the earth must not be disturbed below the subgrade unless directed. Plowing will not be permitted where the depth of material to be removed is less than 150mm.

All areas that are found to be loose, soft spongy or composed of unsuitable material must be dug out, refilled with suitable material as specified and compacted to 95% of maximum dry density as determined by the latest ASTM D698.

When the rolling of the aggregate base is completed, the dry surface must be nowhere more than 20mm below, nor more than 10mm above the finished grade of the aggregate base, either as set, or in conformity with the Town Standard roadway cross-section.

Immediately prior to placing the asphalt concrete base course, the aggregate base material shall be reshaped and rolled in a manner that leaves the surface smooth, firm and true to grade. When checked with a straight edge, the surfaces shall not vary more than 10mm in 3m.

8.3.3.2. Aggregate Base Preparation and Fine Grading

For the purpose of payment, aggregate base preparation shall mean the excavation, removal and disposal in accordance with General Conditions 44, of insitu material to a maximum depth of 300mm including backfilling, grading and compaction of the aggregate base material prior to paving. This shall also apply to widening of streets where a center strip of asphalt pavement exists.

For the purpose of payment, fine grading shall mean grading of existing aggregate base material to a maximum depth of 100mm, including the disposal of excess material in accordance with General Conditions 44, and compaction prior to paving.

8.3.3.3. Disposal of Excavated Material

Excavated material, where suitable, shall be used as backfill material for the works included in the contract.

Excavated material shall be considered in the custody of the Contractor in accordance with General Conditions 44.

8.3.3.4. 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 rock or asphalt material should fall inside the structures, they shall be cleaned out immediately following occurrence.

8.3.3.5. Resurfacing and Patching Preparation on Existing Pavement

Where asphalt concrete is applied for resurfacing or patching purposes, all holes and areas showing signs of surface or base failure shall be cut out using a saw or cutting wheel to give a rectangular-shaped hole with a well squared edge for bonding.

If larger areas of asphalt are removed, compaction of the existing granular base shall be tested and the general support condition should be checked by proof rolling. The exposed granular base shall meet the requirements of Section 7, Roadbed Construction, before it is covered with hot-mix asphalt.

If the aggregate base material is excessively wet moves under proof rolling equipment and/or does not meet minimum compaction requirements, the areas so affected shall be excavated, filled with new aggregate base material and compacted all as per Section 7.

The excavated areas shall be brought level with the surrounding pavement with a layer of Type "B" or Type "C" Base Course material, placed and compacted to these specifications. The vertical face of the surrounding asphalt layer(s) shall first be painted with asphalt tack coat. Disposal of the excavated material shall be in accordance with General Conditions 44. Thickness of asphalt placed shall be within the guidelines as shown in Detail Drawings.

Where asphalt pavement widening is undertaken, the edges of existing pavement shall be cut, removed, cleaned thoroughly and tack applied before new asphalt is placed. The cuts shall be made with a cutting saw/wheel giving a straight vertical face through the thickness of the pavement. Then another cut should be carried out in the surface course asphalt so that a step joint is formed. The offset shall be a minimum of 150mm.

Where asphalt concrete is applied as a resurfacing layer on existing pavement, tack coat shall be a non-tracking emulsion. Non-tracking emulsion shall be diluted with 40% water, and shall meet the requirement of Table 259-1 (NBDTI latest specifications). The non-tracking emulsion shall be applied in a uniform manner, without streaking, at a rate of 0.30 L/m2. The edge of the cut along the existing pavement shall be cleaned and tack coated. The full width of surface to be treated shall be cleaned with power or hand broom to remove all sand, gravel, mud, dust and other debris from existing pavement. This shall be incidental to the work.

Where the Engineer has designated the use of a pavement reinforcement mesh, GlasGrid Type 8501 for full width cracking 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. The surface prepared for the placement of the reinforcement shall be clean, dry and even. 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.

Tack: Distributors shall be equipped with a tank gauge and measuring stick, graduated in litres, and a sampling valve. The Contractor may place the bituminous tack coat by hand placement method 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.

Temperature of the tack when applied shall be between 38º and 66ºC.

The Contractor shall be responsible to reinstate, at his own expense, any bituminous tack-coated surface that becomes fouled due to weather and/or traffic.

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 10ºC.

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 asphalt concrete placed that same day.

The tack coat shall be cured before hot-mix asphalt is placed; the placement of hot-mix asphalt on freshly applied coat is not permitted.

8.3.4. Applying Asphalt Concrete

Asphalt concrete base and surface courses shall be applied 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 applied as required or directed. This work shall be considered as being incidental to the work 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 165ºC or the temperature recommended by the asphalt binder supplier.

The temperature of the asphalt mixes shall not be less than 118ºC immediately after spreading and prior to breakdown rolling. The temperature ranges for mixing and compaction shall be verified using the temperature-viscosity chart for the used asphalt cement.

The Base Course shall not be applied unless air temperature at surface of road is 2ºC and rising. When air temperature drops below 2ºC, paving operations will cease.

The Surface Course shall not be applied unless air temperature at surface of road is 7ºC and rising and the surface temperature of the material to be overlaid is at a minimum of 5 ºC.

Patching shall not be applied unless air temperature at dry surface of road is 7 ºC and rising.

Any mixture that does not comply with specifications shall be rejected.

Asphalt thickness greater than 75mm shall be placed in two lifts.

Paving of intersections, extra widths and other variations from standard lane alignment and as defined in the Contract Documents, whether by hand spreading or machine laying, shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Engineer.

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-two and a half percent (92.5%) and not more than ninety-six and a half percent (96.5%) 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 the average thickness specified and shall vary no more than 6mm from the specified thickness.

Along the edge of gutter, asphalt pavement to be finished slightly higher than the front edge of gutter. All excess asphalt concrete to be removed from gutter.

The surface of finished pavement shall be free from depressions exceeding 3mm as measured with a 3m straight edge.

Any part of pavement not meeting the requirements of specifications shall be removed by the Contractor and replaced a new asphalt mix placed and compacted in accordance with this specification at no additional cost to the Town.

Weather Conditions: When paving on aggregate base, it 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 applied on existing paved surfaces shall be laid upon a dry surface.

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. Hydrocarbon fuels and solvents shall not be used.

Placing Asphalt Concrete: No traffic shall be allowed on newly applied asphalt concrete until finish rolling is complete and the finished mat has been permitted to cool to 60ºC. Water required to lower the mat temperature shall be supplied by equipment capable of applying the water at a uniform and even rate of distribution 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:

1. Steel Drum Vibratory roller 2. Pneumatic tire roller 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 3.0kg/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 118ºC.

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 a fresh, straight vertical surface, free from broken or loose material and tacked in accordance with 8.3.3.5.

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, incidental to asphalt paving work.

Longitudinal Construction Joints: The base and surface course shall be placed in two lane widths, unless otherwise specified. The base course shall be placed with the joint following the centre line and the joint for the surface course shall be offset a minimum of 150 mm from the base course. At no time shall longitudinal joints coincide. All longitudinal joints left exposed overnight or which are exposed to moisture from rain 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. Asphalt compaction at the joint shall not be lower by more than 1.5% than in the middle of the adjacent asphalt mat.

Guarantee

- The Contractor shall, for a period of two (2) years after the completion of the Work, guarantee all longitudinal joints against failure and defects.

- Failure and defects shall include but not be limited to pot-holing, ravelling and cracking along the joint.

- Cracking along the joint shall be repaired by routing and crack-sealing using a method, materials and schedule as submitted to and approved by the Engineer.

- The Contractor shall submit, in writing, his proposed method and schedule for the repair of all other failures and defects, for the Engineer's approval.

- The Contractor shall carry out the repairs at his expense in accordance with the approved submissions or as otherwise approved by the Engineer.

All temporary and permanent markings to be carried out by the Contractor.

Temporary Traffic Markings: The Contractor shall supply and install temporary markings on all newly constructed or milled pavements to be exposed to traffic, in areas as designated by the Engineer. The Contractor shall supply the temporary traffic marking strip material or pavement markers. Spacing shall be 50m center to center on tangents and 25m center to center on curves.

8.3.5. 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.

8.4. Construction of Substructures

During the progress of the work, the Town reserves the right 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, watermains or gas pipes lying within the limits to be paved. The Town also reserves the right to suspend the work at any time for the purposes stated above, without compensation to the Contractor other than an extension of time to complete the work equal to the delay thereby caused.

8.5. Measurement

8.5.1. Asphalt Concrete Paving and Resurfacing

This work shall be measured in tonnes of asphalt concrete of the appropriate type in-place, square units of milling, square units of tack coat applied, square units of pavement reinforcement, square units of fine grading, square units for aggregate base preparation, cubic units of excavation below subgrade, tonnes of asphalt base material in-place and square units of asphalt pavement cut and removed. Any asphalt quantity placed in excess of 106% of the theoretical quantity, based on the specified thickness, shall not be included for payment.

A linear width of 0.8 metres had been allotted to accommodate the 'slug' fronting sections of curb and gutter renewal. Quantities in excess of allotted amounts will not be measured for payment.

8.5.2. Asphalt Concrete Patching

The work shall be measured in tonnes of asphalt concrete of the appropriate type in-place, tonnes of asphalt concrete of the appropriate type at the plant and tonnes of aggregate base material in-place.

8.5.3. Excavation

Excavation quantities of street areas shall be determined from cross-sections and elevations taken prior to and immediately following the excavation; quantities will be based on in-place measurements.

Where excavated quantities are measured by truckload instead of sectional measure in-place, the excavated quantities and overhaul quantities for various distances shall be reduced by thirty percent (30%).

8.6. Quality Control / Quality Assurance

8.6.1. Quality Control

Quality control (QC) shall be carried out by the Contractor in order to assure that the hot-mix asphalt paving meets the requirements of this specification.

8.6.2. Quality Assurance Testing and Payment Adjustments

Quality assurance (QA) is carried out by the Town in order to assure that the hot-mix asphalt paving meets the requirements of this specification.

Acceptance of the hot-mix asphalt paving will be based entirely on the results of the QA testing.

While the Contractor shall be fully and exclusively responsible for producing the end product, acceptance testing is the responsibility of the Engineer.

Certain requirements, limits and tolerances are specified regarding the quality of the materials and workmanship to be supplied. The required physical properties for the Superpave Mixes B, C and D are listed in Table 260-1 of NBDTI Specifications, Item 260, Asphalt Concrete.

The Engineer shall test for compliance with these requirements as described in Section 8.6.2.

The Engineer reserves the right to inspect and / or test any of the Contractor's operations or materials and those of subcontractors and suppliers, regardless of location.

Such inspections and tests shall not relieve the Contractor of his responsibilities to control quality.

The Engineer's approval of any materials or mixture shall in no way relieve the Contractor from his obligation to provide materials, mixtures and workmanship in accordance with the Specifications.

The loose mix samples shall be taken by the Contractor.

The core samples shall be taken by the Engineer.

The asphalt sample and core locations shall be determined by the Engineer.

The Engineer will be responsible for:

- Labelling of loose mix and core samples.
- Storage and transportation of the loose mix samples to the laboratory.
- Storage and transportation of the cores and the loose mix appeals samples.
- Providing the Contractor with a copy of the results of acceptance tests within one working day of their availability.

The Contractor shall reinstate the pavement at each core sample location in conjunction with the removal of the core by dewatering the core hole and filling it with hot mixed asphalt concrete in 50mm lifts to the Pavement surface elevation compacting each lift with 25 blows using a standard compaction device.

Tests performed by the Engineer shall not be considered to be quality control tests.

Asphalt Sampling shall not be applied to the following areas:

- Areas of obvious surface defects shall be marked and repaired as directed by the Engineer.
- Small areas such as tapers, aprons, bridge approaches, gores and areas of handwork and asphalt mix used for isolated levelling and repair of failed areas.

The QA results will be used to determine if the paving is acceptable, borderline or rejectable. If the results are borderline, the Contractor will receive a warning and shall adjust the production, placement or compaction to meet the requirements. If there are three consecutive borderline results, the paving shall be considered rejectable. If the paving is rejectable, the Contractor shall remove it and replace with new paving meeting the requirements of this specification at no additional cost to the Town.

Sampling frequency for QA testing is listed in Appendix 'K' of the Town of Shediac Standard Municipal Specifications.

If, at any time before issuing the Certificate of Final Acceptance, any ravelling, shoving, bleeding or other fault develops in the pavement as laid or surface, all materials in such place shall be repaired as directed by the Engineer. All such removal and replacement of unsatisfactory material shall be done at the expense of the Contractor.

8.6.2.1. Quality Assurance for Asphalt Content, Gradation and Air Voids

Loose samples will be taken on the road behind the paver before compaction, or from the MTV discharge using an approved hopper based on the Modified Lot method sampling frequency for QA testing as described below:

- Minimum of one (1) Asphalt Concrete Mix Test per full day of asphalt production per HM type or 500 tonnes per HM type placed. There shall be a minimum of three (3) tests per lot/day per HM type taken in order to carry out additional testing required by the Testing Agency even when quantities placed are less than the threshold increment.

- For each lot, the first sample taken by the Contractor as directed by the Engineer will be tested for quality assurance.

- Each sample will be split into two equal portions, one of which will be tested and the other set aside in the event the Contractor requests an appeal.

- If the test results from the first sample meet the criteria in Table 8.6.2A, no further testing of the control characteristics will be required for the modified lot being tested.

Table 8.6.2A Tolerances for Asphalt Mix Gradation, Air Voids and Cement Content.

Attribute	Tolerance on the Job Mix Formula (%)		
	Acceptable	Borderline	Rejectable
16.0 mm Sieve for Mix B and 9.5 mm Sieve for Mixes	< 5.0	5.0 to 7.5	> 7.5
4.75 mm Sieve	< 5.0	5.0 to 7.5	> 7.5
600 µm Sieve	< 3.5	3.5 to 5	> 5.0
75 µm Sieve	< 1.0	1.0 to 1.5	> 1.5
Asphalt Cement Content	< 0.3	0.3 to 0.5	> 0.5
Air Voids	2.5 to 5.0	2.0 to 2.5 or 5.0 to 6.0	< 2.0 or > 6.0

The above tolerances apply entirely to the gradation and asphalt cement design values in the Job Mix Formula (JMF) of the mix design, not to the limits listed in Table 260-8 of the NBDTI Specification, Item 260, Asphalt Concrete.

If the test results from the selected sample do not meet the above criteria the Engineer will test the remaining sample from the lot.

A Sample Mean or the Mean of Deviations for the combined test results will be determined and this value will be used for acceptance, rejection or Unit Price Adjustment as per Tables 8.6.3A, 8.6.3B, 8.6.3C, and 8.6.3D in Section 8.6.3 below. If the pavement is rejected, the Contractor shall remove it and replace it with new paving meeting the requirements of this specification at

no additional cost to the Town and shall be repaired generally in accordance with Town of Shediac specification requirements.

If the Contractor questions an individual test result from a Lot, he may appeal the results for the entire Lot as per Section 8.6.2.3.

If an individual test result from the Lot is still questioned following completion of appeal testing, the validity of the test result in question will be determined per ASTM E178- Standard practice for Dealing with Outlying Observations, using a "t" test at 5% significance level.

The Outlying Observations procedure will include all the test results from the initial and appealed Lots.

The new combined results shall be binding on both the Contractor and the Town.

8.6.2.2 Quality Assurance for Asphalt Density Testing / Compaction

Compaction testing shall be based on a Lot average method.

Pavement samples will be taken on the road by coring at locations determined by stratified random sampling procedures. Three (3) test sites per Lot will be selected, one from each of three segments of approximately equal length.

The test site in each segment will be located using random numbers to identify the distance from the end and edge of the segment, except that test sites identified in the following areas will not be used:

- Within 0.3 metre of the edge of a mat;
- Within 25 metres of a loose sample location;
- Cores shall be obtained per ASTM D5361 within a minimum of 12 hours and maximum of 24 hours after placement of the Lot.

Small areas, tapers, aprons and handwork shall not be cored.

The Engineer may allow cores to be obtained within 12 hours in heavy traffic areas.

The maximum may be extended to 72 hours to exclude Saturday and Sunday unless the Contractor is placing asphalt either day.

Table 8.6.3A in Section 8.6.3 below shows the unit price adjustment for field compaction of asphalt.

8.6.2.3 Appeal of Lot Test Results

The Contractor may appeal the results of acceptance testing of the density, asphalt content, gradation and thickness for any rejected or penalized Lot only once.

Appeals shall be only be considered for all tests within the Lot.

Any attempt to improve density on the appeal Lot after the Engineer has tested the Lot for acceptance shall void the appeal and the original test results shall apply.

The following procedures shall apply for an appeal:

- The Contractor shall serve notice of the appeal to the Engineer, in writing, within 48 hours of receipt of the test results.
- The Contractor and the Engineer shall agree on a time at which the cores for the appeal of the Lot shall be taken.
- The cores for the appeal for the Lot shall be taken within 48 hours of the submission of the notice for the appeal.
- If the density or thickness of the Lot is appealed, the Contractor shall, at his own expense, take four (4) cores at random locations, as determined by the Engineer. These cores shall be tested by the Engineer.
- If the asphalt content, gradation or air voids is appealed, the Engineer shall take the remaining portion of the loose samples obtained in Section 8.6.2.1. and test them.
- Asphalt content, gradation and air voids appeal testing shall be conducted by the Engineer. The Contractor may have a representative present during the period of the testing. The Contractor's representative shall comment on anything concerning the testing which he does not consider to be valid and the Engineer shall respond to all comments in order to resolve them.
- Prior to leaving the Engineer's Testing Laboratory, any unresolved comments regarding the testing procedures are to be given to the Engineer in writing.
- Any comments, with respect to the testing procedures, which are made subsequent to the Contractor's representative leaving the laboratory, shall not be considered.

8.6.3 Unit Price Adjustment (UPA) of the Lot

The unit price adjustment UPAs for asphalt concrete are shown in tables 8.6.3A (field compaction of asphalt), 8.6.3B (Asphalt Content), 8.6.3C (Gradation) and 8.6.3D (Air Voids).

If repairs are carried out by removal and replacement or overlay of the asphalt concrete, the UPA for the Lot shall be based on quality assurance testing carried out on the repaired Lot.

The Unit Price (UP) for asphalt concrete base or surface mixes shall be adjusted for each Lot as follows:

$UPLot = UP + \Sigma$ (UPA Density +UP Asphalt Content + UP Gradation+ UP Air Voids)

Table 8.6.3A Unit Price Adjustment for Field Compaction of hot-mix asphalt

% of Maximum Theoretical Density	Unit Price Adjustment $ per Tonne
93.0 to 92.6	1.00
92.5	0.00
92.4 to 92.0	-1.00
91.9 to 91.5	-2.00
91.4 to 91.0	-4.00
90.9 to 90.5	-8.00
90.4 to 90.0	-12.00
<90.0	rejectable

Table 8.6.3B Unit Price Adjustment for Asphalt Content of hot-mix asphalt

Mean of the Deviations of Actual Asphalt Content from the Approved Asphalt Content		Unit Price Adjustment $ per Tonne
Type B	0.00 to 0.40	0.00
	0.40 to 0.45	-0.50
	0.46 to 0.50	-1.00
	0.51 to 0.55	-1.50
	0.56 to 0.60	-2.00
	0.61 to 0.65	-2.50
	>0.65	rejectable
Type D	0.00 to 0.30	0.00
	0.31 to 0.35	-0.50
	0.36 to 0.40	-1.00
	0.41 to 0.45	-1.50
	0.46 to 0.50	-2.00
	>0.50	rejectable

Table 8.6.3C Unit Price Adjustment for Asphalt Gradation of hot-mix asphalt

Sieve Size ASTM Designation	Mean of the Deviations of the Gradation from the JMF		Unit Price Adjustment For Gradation $ per Tonne
	Type B	Type C/D	
4.75 mm	0.0 to 6.0	0.0 to 5.0	0.00
	6.1 to 6.2	5.1 to 5.2	-0.25
	6.3 to 6.4	5.3 to 5.4	-0.50
	6.5 to 6.6	5.5 to 5.6	-0.75
	6.7 to 6.8	5.7 to 5.8	-1.00
	6.9 to 7.0	5.9 to 6.0	-1.25
	7.1 to 7.2	6.1 to 6.2	-1.50
	7.3 to 7.4	6.3 to 6.4	-1.75
	7.5 to 7.6	6.5 to 6.6	-2.00
	7.7 to 7.8	6.7 to 6.8	-2.25
	7.9 to 8.0	6.9 to 7.0	-2.50
	8.1 to 9.0	7.1 to 8.0	-5.00
	9.1 to 10.0	8.1 to 9.0	-7.50
	>10.0	>9.0	rejectable
75 µm	0.0 to 0.8	0.0 to 0.5	0.00
	0.9	0.6	-0.25
	1.0	0.7	-0.75
	1.1	0.8	-1.50
	1.2	0.9	-2.50
	1.3	1.0	-3.75
	1.4 to 1.5	1.1 to 1.2	-6.00
	>1.5	>1.2	rejectable

In addition to the above acceptance/rejection requirements for gradation, the following shall apply:

a) If the lot average of Lot test results for the 4.75 mm sieve size falls outside the gradation limits, the Lot shall be rejected.
b) If the average of Lot test results for the 75 µm sieve size exceeds 6.5%, the following shall apply:
   i. 6.6% to 7.5% the Lot Payment shall be reduced by $5.00/t;
   ii. >7.5%, the Lot shall be rejected.

Table 8.6.3D Unit Price Adjustment for Asphalt Air Voids Percent of hot-mix asphalt

Mean of the Deviations of Air Voids from Target Value Air Voids (4.00%)	Unit Price Adjustment $ per Tonne
0.00 to 1.00	0.00
1.01 to 1.10	-0.25
1.11 to 1.20	-0.50
1.21 to 1.30	-1.00
1.31 to 1.40	-2.00
1.41 to 1.50	-3.00
1.51 to 1.60	-4.00
1.61 to 1.70	-5.00
1.71 to 1.80	-6.00
1.81 to 1.90	-7.00
1.91 to 2.00	-8.00
>2.00	rejectable

8.7. **Payment**

8.7.1. 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 detail 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.

8.7.2. 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, and shall include cleaning or sweeping of all asphalt surfaces including existing asphalt surfaces prior to placing subsequent layers, sub base preparation including crushed rock required to achieve grades and asphalt cutting and removal, for tack coat applied, for pavement reinforcement, for fine grading (when pre-existing granular base was placed by others), for aggregate base preparation, for excavation below subgrade, for aggregate base material and for pavement cutting and removal.

8.7.3. Asphalt Concrete Patching

Payment for patching work shall be at the contract unit price for asphalt concrete of the appropriate type in-place, for asphalt concrete of the appropriate type at the plant or for aggregate base material.

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 aggregate base preparation.

8.8. Asphalt Concrete Pavement Crack Sealing

8.8.1. Description

The work under this section consists of routing, cleaning, drying and filling with joint sealing compound of cracks in asphalt concrete pavement in accordance with these specifications.

8.8.2. Materials

All materials shall be supplied by the Contractor.

The joint sealing materials for crack filling shall be hot-poured rubberized asphalt compounds formulated to meet ASTM Specification D6690 and shall be Beram 195 LM, Beram 3060 LM or approved equal.

Certified producer's test data or representative samples shall be supplied on request.

8.8.3. Equipment

The routing equipment must be sufficiently portable and flexible to accurately follow random cracks without undue spalling of the crack edge. The router shall be equipped with cutter bits that can cut a groove 20mm wide by 20mm deep with clean, neat edges formed at 90° to the base of the cut.

The hot compressed air lance shall deliver a high temperature, high velocity (300 metres per second) clean, oil-free air that can adequately and effectively clean and dry the routed crack.

The melting kettle shall be of the indirect heating or double boiler type with built-in mechanically operated agitator to ensure proper mixing constant agitation and uniform heating of the sealing material and equipped with a positive thermostatic temperature control or accurate thermometers to maintain constant temperature control in both the sealing compound and heat transfer oil. Temperature controls shall be capable of maintaining the temperature of the crack sealing material within the manufacturer's recommended tolerances.

A crack sealing applicator wand shall be attached to a heated hose that is attached to a heated crack sealing chamber.

8.8.4. Construction Methods

8.8.4.1. Crack Preparation

Alligator cracks block cracks and any cracks exhibiting severe branching shall not be sealed. All random, meandering, longitudinal and transverse cracks wider than 3mm but not exceeding

12mm in width shall be routed to a width and depth of 20mm. Vertical sides of the cut are to be perpendicular to the pavement surface.

The router shall be guided so that the crack is entirely within the routed channel. The bits used to rout the cracks must be kept sharp and replaced promptly when dull. The bit shall be replaced when routs contain rounded bottoms or when routs are V-shaped.

All random, longitudinal and transverse cracks, wider than 12mm but not exceeding 25mm in width shall not be routed.

The routed and un-routed cracks shall be completely cleaned using suitable compressed air equipment and such other mechanical means as is essential to expose the freshly milled surface. Care shall be taken to remove all debris from the surface of the pavement so that dust or foreign materials are not blown back into the crack before it is sealed.

A hot compressed air lance shall be used to warm the cracks and remove moisture. The lance shall be kept moving at a pace that will not allow the surrounding pavement to be burned. The hot air lance is not a cleaning tool and shall be only used with the tip 5mm to 10mm from the crack or rout necessary to warm and remove moisture.

All old sealing materials and/or other debris removed from the cracks shall be swept up and removed from the site.

8.8.4.2. Hot Poured Sealant Preparation

The sealing compound shall be heated and melted in a melting kettle. The kettle should be charged by adding a few units of sealing compound at a time. When the compound has reached a fluid condition, additional material can be added until the kettle is full. The compound shall be subjected to continuous and positive agitation during melting. The temperature used in melting the compound shall be in accordance with the manufacturer's recommendation as shown on the container and extreme care shall be taken not to overheat the sealing compound.

Material which is heated in excess of the maximum specified temperature shall be immediately removed and discarded from the project. The removal and cost of the overheated material shall be at the Contractor's expense. When the pouring temperature has been reached, the compound shall be maintained at this temperature until it is placed in the crack and in no instance shall the material be held at fluid temperatures for more than three (3) hours.

Only as much compound as can be poured in a given day shall be melted on that day. The Contractor shall discard all melted materials remaining at the end of the day. Reheating sealant must be avoided. The overnight heating of sealant to allow for rapid start-up in the morning must also be avoided.

8.8.4.3. Hot-Poured Sealant Application

Immediately prior to sealing the routed crack, the cracks shall be thoroughly dried and cleaned of all residual dust and debris followed by the heating of the crack with the hot compressed air lance.

No sealing shall be carried out under adverse weather. The pavement shall be clean and dry with no standing or flowing water on the surface. The decision to proceed with the work in less ideal, dry warm conditions shall be subject to approval by the Engineer.

The sealing compound shall be applied using a manual pouring cone or by using a mechanical pressure-type applicator equipped with a satisfactory means of keeping the sealer heated, positive temperature control, an effective mechanically operated agitator and a suitable shoe at the point of discharge so as to obtain a slightly overfilled crack. Immediately strike off excess sealant material using "V" shaped squeegee, leaving as thin as possible a layer on adjacent pavement surface measuring 20 to 50mm on each side of the crack. Thicker bands will be subject to removal and replacement by Contractor at the direction of the Engineer's representative.

Where the sealant shrinks or settles into the joint or cracks after the initial pouring, a second application shall be applied to bring the material up to the specified level. The spillage of sealant on exposed pavement surfaces shall be immediately corrected by the Contractor at his own expense.

All cracks shall be sealed within 2 minutes after the heating of the crack with the hot compressed air lance.

The sealed joints or cracks shall be dusted immediately after the work is completed with neat cement or Glenzoil in a quantity sufficient to prevent "picking up" under normal traffic flow. The neat cement or Glenzoil shall not be applied until the crack sealing material has cooled enough to form a film over its exposed surface.

Following the application of the crack sealing material and before the area is open to traffic; all treated areas will be thoroughly checked as part of the quality control for areas exhibiting adhesion failure, damage to sealant and other problems. All areas not meeting the acceptable criteria shall be prepared and resealed at the Contractor's expense until considered satisfactory by the Engineer.

Treated areas shall be protected from vehicular traffic for at least 30 minutes after the sealant has been poured or in accordance with the manufacture's specifications, the more stringent of the two.

8.8.4.4. Restrictions

The sealing compound shall not be applied when the ambient temperature is below 5˚C.

The sealing compound shall not be applied when there is any evidence of dampness on or within the pavement or pavement pores.

8.8.5. Guarantee

The contractor shall guarantee that, subject to normal wear and tear, all work performed under this contract will remain in acceptable condition for a period of a 12 months from the Date of Acceptance. The Date of Acceptance being the date of the "Certificate of Substantial Performance".

8.8.6. Measurement

Measurement for Asphalt Crack Sealing shall be in linear metres.

8.8.7. Payment

Payment for this work shall be at the contract unit price for crack sealing.

All work done by the Contractor for which specific unit prices are not names 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, such as tapers or ramps, traffic control (Signallers), disposal of debris, etc., 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.

8.9. Crack Filling

This section governs the supply of all labour, materials and equipment and incidentals necessary for crack filling of the selected areas.

Work involves crack milling as per the Town Spec. Where crack milling is required, the milled area shall be filled with Type "D" asphalt and the width of the milled area shall be a minimum of 250mm.

The locations for crack milling will be determined following the milling operation by the Town's appointed inspector.

8.9.1. Measurement

Measurement for Crack Filling shall be in linear metres.

8.9.2. Payment

Payment for Crack Filling shall be at the contract unit price and shall include the asphalt milling, tack coat and asphalt concrete type "D".

9. CONCRETE CURB & GUTTER AND SIDEWALKS

9.1. Scope

This section governs the supply of all labour, equipment and materials necessary for construction of concrete curb & gutter and sidewalks in accordance with the plans and specifications.

9.2. Materials

9.2.1. All materials shall be supplied by the Contractor.

9.2.2. The Aggregate Base Material shall be an approved, sound, crushed rock conforming to the latest NBDTI Standard Specifications 201.2 and 201.4, latest version for 31.5mm minus, and as set forth in Section 7.3.2.1.

9.2.3. Geotextile fabric shall be as per Section 7.3.2.3 of these Specifications.

9.2.4. Cement shall conform to the requirements for normal Portland cement, Type 10, and the latest CAN/CSA Standard -A5.

9.2.5. Water used in mixing or curing shall be potable water and meet the requirements of CAN/CSA Standard -A23.1.

9.2.6. Fine and coarse aggregate for concrete shall conform to the requirements of the latest CAN/CSA Standard -A23.1. Coarse aggregate shall be 20mm-5mm in nominal size.

9.2.7. Air-Entraining admixture shall conform to the requirements of the latest ASTM C260.

9.2.8. Concrete shall conform to the requirements of the latest CAN/CSA Standard -A23.1 for Class C-2 exposure unless these or supplement 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.

9.2.9. Materials for curing concrete shall meet the requirements of the latest CAN/CSA-A23.1. They shall be sheet material (HydraCureS16 as manufactured by PNA Construction Technologies), or approved equal, or white liquid membrane forming curing compound, ASTM C309 (latest edition) or approved equal.

9.2.10. Forms shall conform to the requirements of the latest CAN/CSA Standard -A23.1 and shall produce a final cross-section in compliance with the detail drawings.

9.2.11. Expansion joint material shall be pre-moulded, asphalt-saturated, cane fibreboard - "Flexicell" as manufactured by Sternson Limited or approved equal. Thickness shall be 13mm and shape shall conform to the section of the curb and gutter with which it is to be used.

9.2.12. Perforated Flexible Curb Drain and Fittings shall be 100mm Solflow by Soleno, Boss 1000 by Armtec (or approved equal). 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, continuous tubular, knit, run-resistant, rot-proof and inert to most soil chemicals.

9.3. Construction Methods

9.3.1. General

Concrete curb & gutter and sidewalk shall be constructed to the lines and grades as staked and in accordance with the drawings and specifications. Unless modified by these specifications, construction methods shall conform to the requirements of the latest CAN/CSA Stnadard A23.1.

9.3.2. Preparation

9.3.2.1. 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 95% maximum dry density as determined by the latest ASTM D698. Where existing curb & gutter or sidewalk is to be removed, the removal shall be done in a manner that leaves the subgrade 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 ninety-five percent (95%) of maximum dry density as determined by the latest 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 an aggregate base material and compacted to ninety-five percent (95%) maximum dry density as determined by the latest ASTM D698.

Limbs of mature trees damaged by construction operations shall be cut clean with a sharp saw immediately after occurrence. The cut must then be sealed with an approved tree wound dressing in accordance with the manufacturer's instructions.

9.3.2.2. Disposal of Excavated Material

Excavated materials, where suitable, shall be used as backfill 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 of in accordance with paragraph 44 of General Conditions.

9.3.2.3. Perforated Flexible Drain Tile shall be installed as indicated on 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. Unless otherwise approved, the drain pipe shall extend into each catch basin located in curb line, and the annular space sealed with grout. Drain pipes shall not be connected through shaft riser rings and must drop a minimum of 30cm before entering the catch basins.

9.3.3. Concrete

9.3.3.1. Mix Design

Concrete shall be proportioned and have the uniformity of production, in accordance with the requirements of the latest CAN/CSA Standard 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/m³
Minimum Strength at 28 Days	32 MPa
Slump (See Note Below)	80mm ±30mm
Air Content	5% - 8%

The cement content of 400kg/m³ shall have a minimum of 360kg/m³ 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 paragraph 12 of the General Conditions.

If at any time there is a change of the components of the mix, a trial mix and a 28-day strength test of concrete cylinders must be submitted.

9.3.3.2. Placing and Finishing

9.3.3.2.1. General

Concrete shall be placed to proper line and grade to give the section required by the plans and typical sections, with a tolerance of ± 10 mm from the required elevation and dimensions, and without ponding water. The time between batching and complete discharge shall not exceed 120 minutes.

Immediately prior to placing concrete the aggregate base shall be thoroughly moistened. 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 that 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.

All concrete requiring saw-cuts shall be done with the use of a wet diamond blade and shall commence eight to twenty-four hours after the concrete placement as soon as the surface has hardened sufficiently to resist ravelling while cutting. All saw cuts shall be pre marked and cut at 90 º to the face of the curb.

After placing, the concrete shall be leveled or screeded to proper grade, afterward floated using an aluminum or magnesium float to eliminate unevenness. Floating is to be completed before bleed water accumulates on the surface.

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.

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 unless approved otherwise by the Engineer. At no time shall vehicles of any type be permitted to travel on newly placed concrete until the compressive strength has reached 80% of its specified value.

9.3.3.2.2. Curb & Gutter

Control joints shall extend completely through the curb height and ¼ into the gutter section and have a width not greater than 6mm. They shall be spaced at intervals of 3 metres along the length of the curb and gutter. Additional control joints to be saw-cut at all municipal structures within the curb.

Expansion joints shall be formed using expansion joint material at locations where the curb and gutter abuts structures.

All concrete requiring saw-cuts shall be done with the use of a wet diamond blade and shall commence eight to eighteen hours after the concrete placement as soon as the surface has hardened sufficiently to resist ravelling while cutting. All saw cuts shall be pre-marked and cut at 90 ° to the face of the curb.

9.3.3.2.3. Sidewalks

The depth of forms shall be at least 125mm and not less than the thickness of any other concrete sidewalk required.

Control joints having a depth of not less than one third (1/3) that of the slab shall be saw-cut at intervals of 1.5 metres along the length of the sidewalk. Sections of sidewalk with spacing less than 1.5m shall be as directed by Engineer .

Expansion joints shall be formed using expansion joint material installed to the full depth of the sidewalk and at a perpendicular angle to the edge at locations where the sidewalk abuts the curb and gutter, buildings, or other objects and at 6 metre intervals along the sidewalk. A 50 mm wide strip shall be finished smoot along the edges and the joint of each slabs. Expansion joints and edges shall be rounded with an approved edging tool to a radius of 6 mm. Expansion joint materials to be in place and supported prior to the placement of concrete. **Under no circumstances** is this material to be installed after the concrete has been placed.

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 90º to curb at wheelchair ramps.

The spacing of control joints shall vary to coincide with the centre of manholes or other box-outs.

9.3.3.3. 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 the latest CAN/CSA Standard A23.1.

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 after October 1st, after which time moisture-proof paper shall be used.

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 metres 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 300mm 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.

9.3.3.4. 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 and replaced with 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.

9.3.3.5. Cold Weather Requirements

Moisture-proof paper shall be used when the forecasted nightly low temperature is at or below 5 degrees Celsius. When the outside air temperature is at or below -5 degrees Celsius 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 6mil 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 degrees Celsius. 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 degrees Celsius. Under no circumstances shall concrete be placed over frozen ground.

9.3.4. 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 leave the site in a neat and clean condition.

9.3.5. Catch Basin Adjustment

Catch basins shall be adjusted with an approved steel inserts and/or steel rings, as required, and as indicated on detailed drawings and be set at the elevation of the top of finished gutter elevation.

9.4. Measurement

9.4.1. General

Excavation quantities shall be determined from cross-sections and elevations taken by the Engineer prior to and immediately following the excavation. Quantity will be an in-place measurement (no bulking will be allowed).

Where excavated quantities are measured by truckload instead of sectional measure in-place, the excavated quantities shall be reduced by thirty percent (30%).

Standard 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. The standard excavation for either shall be considered to have a volume of 0.5 m^3 per linear metre.

Any extra excavation that is required greater than 0.5.m^3 per linear metre shall be paid in cubic metres. Extra excavation shall be considered for sloping of adjacent embankments or for depths greater than those shown on the detail drawings for curb and/or sidewalks due to soil conditions. Perforated curb drain and its connection to the catch basin will not be measured for payment but shall be included in the unit prices for concrete curb and gutter.

9.4.2. Curb and Gutter

This work shall be measured in linear metres of concrete curb and gutter in-place including perforated flexible curb drain and curing, linear metres of curb and gutter protected with

insulation, cubic metres of extra excavation, cubic metres of fill material if required, and tonnes of crushed rock in-place.

9.4.3. Sidewalk

This work shall be measured in square metres of sidewalk in-place including curing, square metres of sidewalk protected with insulation, cubic metres of extra excavation below subgrade, cubic metres of fill material if required, and tonnes of crushed rock in-place.

Felts used for expansion joints at 6 metres intervals along the sidewalk and for isolating the curb and gutter at corners will not be measured for payment and will be considered as incidental to the work Extra felts used for isolating fixed structures, buildings etc. will not be measured for payment.

9.5. Payment

9.5.1. 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 names in the contract. The Contractor will not be entitled to any extra or additional compensation thereof.

9.5.2. Curb and Gutter

Payment for this work shall be at the contract unit price for concrete curb and gutter in-place, for curb and gutter protected with insulation, for cubic units of extra excavation below subgrade, for fill material and for crushed rock.

9.5.3. Sidewalks

Payment for this work shall be at the contract unit price for concrete sidewalk in-place, for sidewalk protected with insulation, for cubic units of extra excavation below subgrade, for fill material and for crushed rock.

9.5.4. Catch Basin Adjustment

Payment for catch basin adjustments shall be at the contract unit price for catch basin adjustments. Payment shall include the supply and installation of the pre-cast concrete catch basin sections, cast iron inserts and rings, excavation, dewatering, backfilling and all incidental items.

9.5.5. Reduced Payment Schedule – Concrete Strength

The Town of Shediac will reduce payment on the unit bid item of concrete if the 28-day strength test cylinder(s) is less than the minimum 32 MPa.

The Town of Shediac **will not** accept any concrete that has strength less than 28.0 MPa at 28 days; all such concrete must be replaced at the Contractor's cost.

The table below lists the rates that the Town of Shediac will pay for strength reductions based on concrete test cylinders at 28 days.

	Compressive Strength	**Pay Percentage of Unit Bid**
i)	Less than 32.0 MPa Equal to or greater than 30.0 MPa	80% of unit bid
ii)	Less than 30.0 MPa Equal to or greater than 28.0 MPa	60% of unit bid
iii)	Less than 28.0 MPa	Complete replacement at Contractor's expense.

9.5.6. Reduced Payment Schedule - Scaling

Individual concrete sidewalk blocks and curb sections showing evidence of scaling during the warranty period shall be noted according to severity of surface damage.

The Town of Shediac **will not** accept a concrete sidewalk showing signs of scaling on more the 50% of its surface. All such areas must be replaced at the Contractor's expense.

The table below lists the rates that the Town of Shediac will pay for scaled concrete.

	Percentage of Surface Damage	**Pay percentage of Unit Bid**
i)	Less Than 10	100
ii)	10 - 25	75
iii)	25 - 50	50
iv)	More than 50	Complete replacement at Contractor's expense.

10. ELEVATION ADJUSTMENT OR REPLACEMENT OF MUNICIPAL STRUCTURES

10.1. 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.

10.2. Materials

10.2.1. All materials shall be supplied by the Contractor.

10.2.2. Concrete shall conform to the requirements of the latest CSA/CSA Standard A23.1 unless these specifications provide otherwise.

10.2.3. Valve box, curb box and valve box accessories shall conform to the Town Standards. Cast-iron valve box extensions shall be the screw type only. 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. Covers shall be Bibby Ste. Croix VB-825 (112mm depth) (or Mueller AJBV-5C when using the self-adjusting Mueller valve box top section) or equivalent, and will be marked “Water”. Covers must have appropriate openings to allow insertion of a pick for ease of removal. See Detail Drawings. Valve box covers and upper section adjustment units shall be of the long neck design.

10.2.4. Pre-cast reinforced concrete manhole and catch basin sections shall meet the requirements of the latest CAN/CSA Standard A257.4 and ASTM C478. Concrete sections shall be legibly marked with the manhole, catch basin and specification designation, date of manufacture, and name or trademark of the manufacturer. Marking shall be indented or painted thereon with waterproof paint.

10.2.5. Backfill shall be as per Section 7 of these specifications.

10.2.6. Final height adjustment to catch basins shall be made using approved cast-iron rings and/or steel inserts, according to Detail Drawings.

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 boulevard as per detail drawings.

10.3.2. Preparation

The material immediately surrounding the structure to be adjusted shall be carefully excavated and piled neatly nearby so as to cause minimum interference to vehicular and pedestrian traffic. Cutting of pavement shall be carried out so as to leave a vertical edge.

10.3.3. Adjustment

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 with Ram-nek gaskets 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.

Water valve boxes and curb boxes shall be adjusted to the required elevation.

Valve box and curb box extensions, if required, shall be supplied by the Contractor.

10.3.4. Valve Box and Curb Box Repair or Extension

Should the Contractor encounter a valve box 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 Standard Municipal Specifications. Upon completion of the repair, the box will be properly adjusted and backfilled according to Section 10.2.5. No separate payment shall be made for final height adjustment.

10.3.5. Backfilling around structures

The aggregate base material excavated from around the structures shall be replaced in uniform layers not exceeding 300mm in thickness and shall be compacted using suitable vibration compactors to ninety five percent (95%) maximum dry density as determined by the latest ASTM D698. For excavation below subgrade, backfilling will be done using suitable material compacted to 95% of maximum density.

If the excavated material is unsuitable for use as backfill, imported fill material shall be supplied by the Contractor and the unsuitable material removed and disposed of in accordance with paragraph 44 of General Conditions. Payments shall be at the contract unit price for fill material as specified in Section 7 of these specifications.

10.4. **Measurement and Payment**

10.4.1. Measurement

Each manhole, catch basin, sluice box, valve box and curb box that is adjusted shall be measured as a single unit. Materials, required to adjust manholes or catch basins beyond 450mm, or for repair work, will be measured for payment. If valve box extensions or curb box extensions are required they will be measured for payment.

10.4.2. Payment

Payment for this work shall be at the contract unit price for the adjustment of valve boxes, for adjustment of curb boxes and for the adjustment of manholes. For the purpose of payment, all catch basins and sluice boxes shall be considered manholes.

Manual adjustments to curb boxes not requiring excavation will be considered incidental.

The Contractor will be reimbursed for the cost of materials required to adjust manholes or catch basins beyond 450mm, valve box extensions and curb box extensions unless allowed for in the Schedule of Quantities and Prices. Copy of purchase invoices for these materials will be required to substantiate the claim.

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 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.

11. REMOVAL AND DISPOSAL OF EXISTING ASPHALT AND CONCRETE

11.1 Scope

This section governs the removal, haulage and stockpiling or disposal of existing asphalt or concrete.

11.2 Construction Methods for Cut and Removal

The Contractor shall cut and remove all pavement 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 pavement, concrete or structures during excavation, vertical cuts shall be made with cutting saw 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 and must be done in a manner which leaves the aggregate base undisturbed. Under no circumstances will the cutting of pavement be allowed by the use of excavators or backhoe buckets, etc.

Where concrete sidewalk has been overlaid with a layer of pavement, the removal will be considered as removal of concrete only.

Where excavated materials are to be recycled for Town use, they will remain the sole property of the Town of Shediac and any use, disposal or sale thereof, not specifically approved in writing is strictly forbidden.

Where materials are not designated for recycling, they will become the property of the Contractor and may be used or disposed of as the contractor sees fit, respecting all Federal, Provincial and Municipal regulations and requirements, including acquisition of permits, etc.

11.3 Construction Methods for Cold Milling of Asphalt Pavement

In full depth removal, care must be taken not to contaminate the reclaimed asphalt pavement (RAP) with the underlying aggregate base material. 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.

When partial depth removal is performed on a road with paved shoulders, and some or all of the shoulder is to remain, the Contractor shall provide for drainage. The Contractor shall remove all pavement 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 area. Any RAP that falls into structures shall be removed.

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.

The Contractor shall continuously maintain the site work, in a condition to provide for the safe and efficient flow or traffic, free of potholes and any sharp transitional edges, from the time of removal until such time as the new asphalt concrete is placed.

11.4 Removal and Stockpiling of Materials

Where excavated materials are to be retained for Town use, they will remain the sole property of the Town of Shediac and any use, disposal or sale thereof, not specifically approved in writing is strictly forbidden. All RAP, retained for Town use, shall be loaded and hauled to sites as directed by the Engineer.

Where materials are not designated for recycling, they 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 paragraph 44 of General Conditions.

11.5 Measurement

The work shall be measured in square metres of pavement removed, linear metres of curb and gutter removed and square metres of sidewalk removed.

11.6 Payment

Payment for the work shall be at the contract unit price for pavement removal, for curb and gutter removal and for sidewalk removal. Where material is salvaged for use by the Town, the cost of overhaul to the Town salvage site or site designated in the specifications will be included in the price for removal.

Where material is not salvaged by the Town and becomes the property of the Contractor, payment for overhaul and disposal at the Contractor’s site will be included in the price for removal.

12. PROPERTY RESTORATION

12.1. 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.

12.2. Materials

12.2.1. All materials shall be supplied by the Contractor.

12.2.2. Asphalt concrete shall conform to Section 8 of these specifications.

12.2.3. Crushed rock for driveway restoration shall be 19mm minus, unless otherwise specified.

12.2.4. Seeding, topsoil and sodding shall be as per Section 13.

12.3. 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 or better.

The edge of existing pavement to be restored shall be cut in a straight line to full depth using a cutting saw. The surface of the existing pavement adjacent to the cut shall be swept clean in areas requiring paving. Tack coat shall be applied to all edges of the existing pavement, the edge of the sidewalk or curb and gutter where the asphalt concrete will abut, and to the edge of the pavement cut, and over the surface of existing pavement 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 color of existing crushed rock, 19mm minus crushed rock, unless other sizes are allowed for in the Schedule of Quantities and Prices, to meet the sidewalk or curb and gutter and to provide a proper grade for pedestrian and vehicle traffic and proper drainage. 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 rock not readily available at local quarries because of the type, gradation and colour, the Contractor must retain and stockpile the crushed stone in the individual owner’s driveway for use in driveway restoration.

12.4 Measurement

The work shall be measured in tonnes of asphalt concrete in-place and tonnes of crushed rock in-place.

Each driveway that requires retention of existing crushed rock, brick pavers or non-standard materials for restoration shall be considered individually.

12.5 Payment

Payment for this work shall be at the contract unit price for asphalt concrete in-place including tack coat and for crushed rock 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 names 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. TOPSOILING, SEEDING AND SODDING AND EROSION CONTROL

13.1. Topsoiling, Seeding and Sodding

13.1.1. Scope

This section governs the supply of all labour, equipment and materials for topsoiling, seeding and sodding of property for the purposes of establishing or restoring ground surface. All work under this section shall be completed by a landscaping company or person with current membership in the Canadian Nursery Landscaping Association (CNLA), unless otherwise approved by the Engineer.

13.1.2. Materials

Note: All materials shall be approved by the Engineer prior to incorporation into the works and shall meet the following criteria:

13.1.2.1. All materials are to be supplied by the Contractor. 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 by 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.

13.1.2.2. Topsoil

Friable loam 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 20mm.

13.1.2.3. 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 equal with a formulating ratio of:

2:4:1 80% SCU for Spring and early Fall planting (6-12-3)

1:4:1 100% SCU for late Fall planting (6-24-6)

13.1.2.4. Lime

Agriculture grade dolomitic limestone containing total 85% carbonates and graded as follows:

SIEVE DESIGNATION	CUMULATIVE & PASSING
N°10	100%
N°100	50%

13.1.2.5. Seed and Hydraulic Seed Mix

Canada Nº 1 lawn grass mixture to Government of Canada Seeds Regulations having a minimum germination of 75% with a purity of 95%.

The grass seed mixture containing the following formulation shall be used on areas adjacent to privately maintained properties:

% BY WEIGHT	REGULAR MIX
APPLICATION RATE: 245 kg/ha	
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)

The grass seed mixture containing the following formulation shall be used on low maintenance area (i.e. landfills):

SEED MIX % BY WEIGHT	SPECIES
APPLICATION RATE: 167 kg/hg	
40%	Creeping Red Fescue
20%	Hard Fescue
15%	Canadian Blue Grass
10%	Alsike or White Clover
10%	Annual Ryegrass
5%	Red Top

13.1.2.6. Mulch

Wood or wood cellulose fibre, free of germination of growth-inhibiting ingredients and forming blotter-like ground cover allowing absorption and percolation of water.

13.1.2.7. Erosion Control Agent

Emulsified asphalt meeting the requirements of the latest CAN/CGSB Standard 16.2, Type 2 or polyvinyl acetate polymer.

13.1.2.8. Water

Clean, fresh and free from impurities that inhibit plant growth.

13.1.2.9. Sod

Commercial Grade Turfgrass Nursery Sod is grass that has been seeded and cultivated in a nursery sod field as a turfgrass sod. At the time of sale, it should be in a healthy condition. Sod of this quality may contain up to 5 broadleaf weeds per 40 square metres 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 4cm. The mowing height range should be 7 to 10cm 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 1.5cm. Thickness of the soil portion of the sod may vary with field and environmental condition at the time of harvest. Note that the soil portion is generally composed of at least 50% volume of grass roots.

Commercial Grade Turfgrass Nursery Sod is suitable for erosion control, roadsides, boulevards and minimum maintenance areas.

13.1.2.10. Accessories

Pegs - Wood 25mm x 25mm x 200mm nominal size.
Mesh - 37mm chicken wire or plastic

13.1.3. **Construction Methods**

13.1.3.1. Field Conditions

Work shall not be performed under adverse field conditions, such as frozen ground or ground covered with snow, ice or standing water, without prior approval.

For hydraulic seeding (hydro-seeding), reasonable care shall be taken to prevent spraying items such as structures, signs, guide rails, fences, plant materials and utilities. Hydraulic seeding shall not be performed in wind speeds over 20 km/hr. Any over spray on other facilities shall be cleaned-up immediately or the Town shall have it cleaned-up at the Contractor's expense.

For hydraulic seeding (hydro-seeding), all hydrants shall be covered up before spraying and shall be uncovered immediately after spraying.

13.1.3.2. Preparation

Ground surface to be graded to eliminate uneven areas and rough spots, and to ensure positive drainage. All debris, roots, branches, stones in excess of 50mm diameter, and other deleterious materials shall be removed, as well as any subsoil that has been contaminated with toxic materials. Contaminated material shall be disposed of off site.

When topsoil is not required, the area shall be cultivated, or tilled to minimum depth of 50mm.

Cultivation to be repeated in those areas where equipment used for hauling and spreading has compacted soil.

13.1.3.3. Placing Topsoil

Topsoil shall not be spread until ground surface has been inspected and a test result, of the soil being placed, has been approved by the Engineer.

Topsoil to be spread in uniform layer over dry ground surface where seeding or sodding is indicated. Topsoil shall not be placed on frozen ground surface.

Topsoil to be kept 15mm below finished grade for sodded areas. For seeded areas, topsoil shall be brought to finished grade by applying topsoil to minimum depth of 150mm after rolling.

Topsoil to be fine graded to lines and elevations indicated, leaving surface smooth and uniform with a fine loose texture. Approval of topsoil grade and depth shall be obtained before proceeding with seeding or sodding.

13.1.3.4. Application of Lime and Fertilizer (Hydro Seeding Low Maintenance Areas)

Lime shall be applied in accordance with pH test results as determined by soil analysis. Lime shall be mixed thoroughly into full depth of topsoil prior to application of fertilizer, at the following rates:

Please note that the following table is in Imperial measurements as governed by current industry usage.

Limestone Recommended to bring pH to 6.5

Sandy Loam Soil			Loam Soil	
pH	**Lbs / acre**	**Lbs / 1000 ft²**	**Lbs / acre**	**Lbs / 100 ft²**
4.5	5000	120	7000	160
5.0	35000	80	5000	120
5.5	25000	60	3000	70
6.0	1000	25	2000	45

13.1.3.5. 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 81.6 kg/ha or as recommended by seed manufacturer, then covered and rolled with a roller having a mass of 50 kg/m of width.

13.1.3.6. 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. If necessary, existing lawn or

adjoining areas shall be cut out to accommodate sod. Sod shall never be placed over existing grass or lawn.

Sod shall be rolled with a roller having a mass of 50kg/m of width. Repeated rolling to correct irregularities in grade is not permitted.

Sod shall be watered within 4 hours of placing to obtain moisture penetration through sod into top 100mm 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 town's right-of-way. (Ex. Boulevard areas or directly behind sidewalk fronting a residence) The landscaping company completing the sod work shall provide a bilingual letter (on their letterhead) to every affected homeowner / resident requesting their support and help in continuing the maintenance fronting their home. This letter shall be approved by the Town 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 100mm below the top edges, spaced at 3 pegs per metre and flush with surface of root mat.

13.1.3.7. Hydraulic Seeding

Seeding shall be done during local growing season when natural moisture is available to ensure germination and growth (April – June, September – October).

All quantities of material shall be measured by weight or by weight-calibrated volume measurement.

Seeder shall be charged with water and, while agitating, mulch, seed, fertilizer and lime shall be slowly added until all components are thoroughly mixed.

When required, erosion control agent shall be added to seeder and mixed thoroughly to complete seeding slurry.

Slurry Application per ha	
Seed	81.65 kg or as recommended by seed manufacturer
Fertilizer	50 kg of nitrogen
Mulch	1000 kg
Erosion Control Agent	As recommended by manufacturer or 300 kg
Water	Minimum 1000 L
Lime	As determined by soil analysis

Apply slurry uniformly, blending into grassed areas.

Remove slurry from items and areas not designated to be sprayed.

13.1.3.8. Maintenance: Hydraulic Seeding (Low Maintenance Areas)

Seed or sod shall be watered adequately to assure continued growth. Watering shall be controlled to prevent washouts.

Grass shall be mowed to height of 60mm when it first reaches a height of 80mm, and maintained at height of 50 – 75mm for two more mowings. Clippings that could smother grass shall be removed.

Grassed areas shall be fertilized after first mowing using a turf starter type fertilizer, at the manufacturer's recommended rate.

In the Spring following the initial installation, an approved fertilizer to promote newly seeded or sodded areas, shall be applied.

13.1.4. Acceptance

Grassed or sodded areas will be accepted upon completion of third mowing provided that growth is properly established, and the area is free of bare and dead spots and without weeds.

Areas sodded or seeded in the fall will be accepted the following Spring, one month after start of growing season, providing that above acceptance conditions are fulfilled.

Maintenance and mowing shall be continued until acceptance (Low Maintenance Areas).

13.1.5. Measurement

The work shall be measured in square metres of topsoil, sod and hydro-seeding in-place.

13.1.6. Payment

Payment for this work shall be at the contract unit price for topsoil, sod and hydro-seeding preparation and placement.

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 units of measurement.

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.

13.2. Erosion and Sediment Control

13.2.1. Scope

This section governs the supply of all labour, equipment and materials for the installation of erosion and sediment control measures. All erosion and sediment control work shall be in accordance with the latest NBDTI Standard Specifications Division 600, Item 946 "Work Progression", 948 "Environment Requirements", NBDTI Environmental Protection Plan and the NBDTI Environmental Field Guide.

13.2.2. Materials

All materials and equipment for this item shall be supplied by the Contractor.

13.2.3. Construction Methods

Refer to the latest NBDTI Standard Specifications Division 600.
Sediment control fence shall be installed as directed on Standard Drawing No 35 and prefabricated sediment control fence shall be installed as per manufacturer's instructions.

13.2.4. Maintenance

A maintenance program should be implemented throughout construction activities. The maintenance program includes daily routine checks, repairs, replacements and an inventory of control materials. All control measures shall be inspected periodically and after each rainfall event.

Ensuring that erosion and sediment control structures are properly maintained will help prevent or limit mosquito breeding. Maintenance should include cleaning out temporary sediment traps and basins, maintaining ditches to ensure positive drainage and removing grass cuttings and other debris.

The sediment and erosion control measures must remain in place and be maintained on functional condition until permanent vegetation has been established, the site has been otherwise stabilized or until instructed by the Engineer.

13.2.5. Measurement

Mulch

The work shall be measured in square meters of mulch applied. The area shall be measured along the slope of the ground.

Mats and Geotextiles

The quantity to be measured for payment shall be the number of square meters of mats or geotextiles installed in accordance with this item. Overlapped joints, patches and seams will be measured as a single layer.

Rip Rap

The quantity to be measured for payment shall be the number of tonnes of random rip rap supplied and placed in accordance with this item.

Sediment Control Fence

The quantity to be measured for payment shall be the number of linear meters of sediment control fence supplied, installed and maintained in accordance with this item.

Erosion Control Structures - Check Dams

The quantity to be measured for payment shall be the number of erosion control structures that are supplied, installed, constructed and maintained in accordance with this item.

Gabions

The quantity to be measured for payment shall be the volume in cubic metres of gabions supplied and installed in accordance with this item.

13.2.6. Payment

Mulch

Payment for this work shall be at the contract unit price for straw or hay mulch erosion control.

Mats

Payment for work under this item shall be at the unit price.

Geotextiles

Payment for work under this item shall include a separate unit price for each type of geotextile, as identified under the contract.

Rip Rap

Payment for work under this item shall include a separate unit price for each gradation of rip rap, as identified under this contract.

Cost of the provision of materials, labour and equipment to test the rip rap to resolve disagreement between the owner and the Contractor shall be borne by the Contractor if the test results show that the material does not meet the specified gradation, otherwise the owner shall bear the cost of the test.

Cost of any retesting to resolve the supply of the specified material gradation shall be borne by the Contractor.

Sediment Control Fence

Payment for work under this item shall be at the unit price.

Erosion Control Structures - Check Dams

Payment for work under this item shall include a separate unit price for each type of erosion control structure, as identified under this contract.

Gabions

Payment for work under this item shall be at the unit price.

14. PIPE CULVERTS

14.1. Scope

The work under this section consists of the installation of polyethylene pipe culverts as per plans and specifications.

14.2. Work Under Other Sections

14.2.1. Trenching – Section 1

14.2.2. Bedding and Backfilling – Section 2

14.2.3. Reinstatement and Trench Maintenance – Section 3

14.3. Materials

14.3.1. All materials shall be supplied by the Contractor.

14.3.2. Polyethylene pipe shall be high-density, double wall with smooth interior surface and a minimum ring stiffness of 320kPa, meeting the requirements of the latest CAN/CSA Standard B182.8-02. Ends of pipe shall be plain end with proper couplings supplied by the manufacturer.

14.3.3. Crushed rock slope protection to be 75-150mm crushed drainage material.

14.4. Construction Methods

Prior to placing the pipe in the ditch, each pipe shall be inspected for defects. All defective pipes shall be removed from the site and replaced with sound materials.

All dirt and gravel must be kept out of the joint so that the corrugations fit snugly.

The pipes and specials shall be laid in the trench so that after the culvert is completed the interior surface shall conform accurately to the grades and the alignment of the ditch. 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.

14.5. Measurement

14.5.1. Measurement of culvert pipe shall be per linear metre of the appropriate size and type.

14.5.2. Measurement for imported fill shall be in cubic metres, crushed rock and rip-rap shall be in metric tonnes.

14.6. Payment

14.6.1. Payment for culvert pipe shall be per linear metre of the appropriate size of pipe.

14.6.2. Payment for imported fill shall be at the contract unit price per cubic metre, crushed rock and rip-rap shall be at the contract unit price per metric tonne.

15. MULTI-PURPOSE TRAILS

15.1. Scope

This section governs the supply of all labour, equipment and materials necessary for construction of multi-purpose trails in accordance with the plans and specifications.

15.2. Materials

All materials shall be supplied by the Contractor.

Granular Fill material shall be pit run gravel meeting the requirements of the latest revision of the Standard Specifications of the Department of Transportation and Infrastructure, Section 201.

Aggregate Base material shall be 0-31.5mm crushed rock, as per Section 9.2.2.

Crusher Tailings shall be 0-6mm crushed rock approved by the Town.

Asphalt concrete paving shall be Type "B" Base and Type "E" Surface Course, as per Section 8.2.

15.3. Construction Methods

15.3.1. General

Multi-purpose trails shall be constructed to the lines and grades as staked and in accordance with the typical cross-sections shown on the drawings. All equipment and construction methods shall conform to 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.

Preparation for multi-purpose trails shall be as per Section 9.3.2 and Section 8.3.3.

For gravel trails, the overall thickness of the trail shall be 300mm, of which 200mm shall be Aggregate Base material topped off with 100mm of crusher tailings. A layer of pit run gravel may be applied under the Aggregate Base material, if required.

For asphalted trails, the overall thickness of the trail shall be 270mm, of which 200mm shall be the Aggregate Base material and 70mm shall be asphalt concrete, Type “B” and “E”. Applying Asphalt Concrete shall be as per Section 8.3.4 of these Specifications. Any asphalt quantity placed in excess of 106% of the theoretical quantity, based on the specified thickness, shall not be included for payment.

15.3.2. 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 asphalt applied and compacted. All such removal and replacement of unsatisfactory material shall be done at the expense of the Contractor.

15.3.3. 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.

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 leave the site in a neat and clean condition.

15.4. Measurement

The work shall be measured in lineal meters of gravel trail and lineal metres of asphalted trail.

15.5. Payment

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.

Payment for the work shall be at the contract unit price for, lineal metres of gravel trail and lineal metres of asphalted trail.

APPENDIX "A"

DETAIL DRAWINGS INDEX

DRAWING Nº	TITLE
1.	STANDARD MANHOLE SECTION FOR PIPE SIZES UP TO 525mmø
2.	STANDARD MANHOLE SECTION FOR PIPE SIZES UP TO 750mmø
3.	STANDARD MANHOLE SECTION FOR PIPE SIZES ABOVE 750mmø UP TO 1500mm
4.	TYPICAL MANHOLE CROSS-SECTION TOP SHAFTING
5.	STANDARD CATCH BASIN
5A.	DOUBLE CATCH BASIN UNIT
6.	MANHOLE / CATCH BASIN 411W FRAME AND COVERS
6A.	DOUBLE CATCH BASIN FRAME AND COVER
7.	ADJUSTABLE MANHOLE FRAME AND COVER FOR USE WITHIN THE PAVEMENT SURFACE
8.	SLUICE BOX DETAIL
9.	SLUICE BOX FRAME AND COVER
10.	PIPE BEDDING AND BACKFILL DETAIL CLASS "B" AND MODIFIED CLASS "B"
11.	SERVICE DETAIL CROSS-SECTION AT STREET LINE
12.	TYPICAL STREET CROSS-SECTION LOCATION OF SERVICES
13.	TYPICAL STREET CROSS-SECTION LATERAL SERVICES
14.	TYPICAL SERVICE CONNECTIONS CROSS-SECTION THROUGH PIPES

15. TYPICAL WATER SERVICE
BRANCH LATERAL

16. STANDARD HYDRANT, LEAD AND VALVE
INSTALLATION DIAGRAM

17. VALVE BOXES

18. CONCRETE THRUST BLOCK DETAIL
TYPICAL END CAP & TEE

19. CONCRETE THRUST BLOCK DETAIL
HORIZONTAL BENDS

20. CONCRETE THRUST BLOCK DETAIL
VERTICAL BENDS

21. CONCRETE THRUST BLOCK REQUIREMENTS
MINIMUM CONTACT AREAS

22. CONCRETE CURB AND GUTTER
BARRIER AND MOUNTABLE TYPES

23. SIDEWALD AND BOULEVARD DETAIL
SECTIONS

24. TYPICAL WHEELCHAIR RAMPS
FOR STANDARD 6M CURB RETURNS

24A. TYPICAL EXPANSION JOINTS AT CURB RADIUS
FOR STANDARD 6M CURB RETURNS

25. TYPICAL DRIVEWAY ENTRANCE
FOR STREETS WITH A BOULEVARD

26. TYPICAL DRIVEWAY ENTRANCE
FOR STREETS WITH SIDEWALK ADJACENT TO THE CURB

27. TYPICAL ROADBED CONSTRUCTION
RESIDENTIAL STREETS AND COLLECTOR / ARTERIAL STREETS

28. TYPICAL ROAD CROSS-SECTION
OPEN DRAINAGE

29. DRIVEWAY CULVERT

30. MULTI-PURPOSE TRAILS
CROSS-SECTIONS

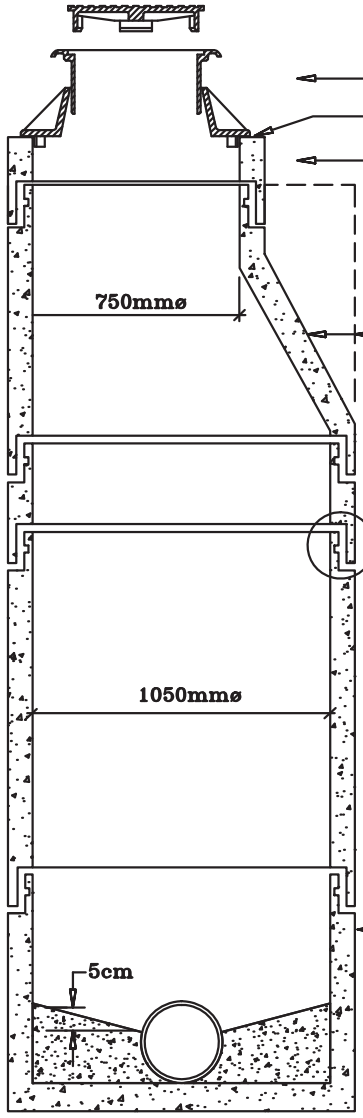
31. STORM SEWER
HEADWALL & GRATE DETAILS

32. (no drawing)

33. STANDARD MANHOLE LADDER
MODEL MSU 1105 ACCESS LADDER

34. TYPICAL INJECTION / FLUSHING POINT
TEMPORARY SERVICE

35. SEDIMENT CONTROL FENCE



FRAME and COVER (see DWG. N° 7)

RAMNEK

FLATTOP SECTION (see DWG. N° 4)

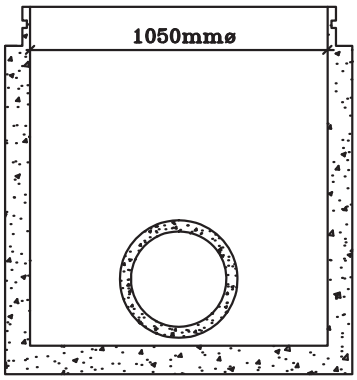
ECCENTRIC CONE
1050mmø x 750mmø
BELL & SPIGOT

THIS 90mm BELL and SPIGOT is REQUIRED ON ALL MANHOLE SECTIONS. COMPLETE WITH "O" RING RUBBER GASKET

INTERMEDIATE SECTIONS
VARIABLE HEIGHTS AVAILABLE

BASE SECTION
45cm to 1.5m deep
AVAILABLE WITH OR WITHOUT BENCHING

STORM



–WHEN STORM MANHOLES ARE USED AS CATCH UNITS AND PLACED IN THE CURB LINE, THEY SHALL BE EQUIPPED WITH A 60cm SUMP.

GENERAL NOTES:

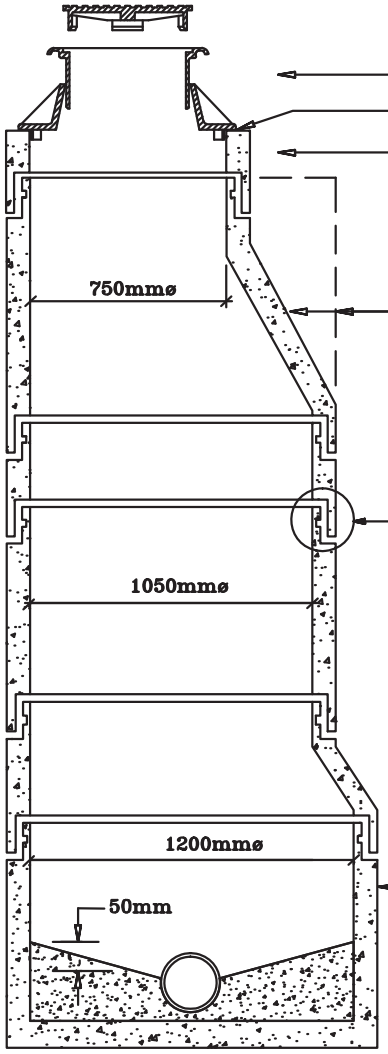
–ALL JOINTS TO BE MADE WATERTIGHT WITH RUBBER GASKETS, OR RAMNEK WHERE APPLICABLE, TO CAN/CSA A257.3

–STRUCTURE TO CAN/CSA A257.4

–CONCRETE TO BE AIR–ENTRAINED, STRENGTH 32MPa (4640 psi) AT 28 DAYS, TO CAN/CSA A23.1

–MANHOLE BASE DIAMETER TO BE DETERMINED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION BASED ON MAINLINE PIPE DIAMETER AND DEFLECTION ANGLE.

SCALE: **N.T.S.**	STANDARD MANHOLE SECTION	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013	**FOR PIPE SIZES UP TO 525mmø**	DRAWING N° 1



FRAME and COVER (see DWG. N° 7)

RAMNEK

FLATTOP SECTION (see DWG. N° 4)

ECCENTRIC CONE
1050mmø x 750mmø
BELL & SPIGOT

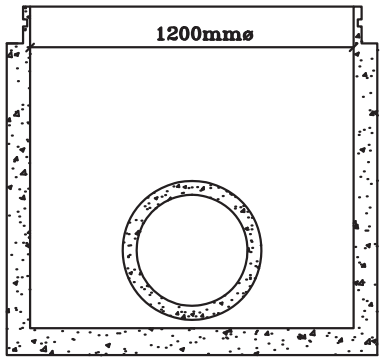
THIS 90mm BELL and SPIGOT is REQUIRED ON ALL MANHOLE SECTIONS. COMPLETE WITH "O" RING RUBBER GASKET

INTERMEDIATE SECTIONS
VARIABLE HEIGHTS AVAILABLE

BASE SECTION
45cm to 1.5m deep
AVAILABLE WITH OR WITHOUT BENCHING

WHEN STORM MANHOLES ARE USED AS CATCH UNITS AND PLACED IN THE CURB LINE, THEY SHALL BE EQUIPPED WITH A 60cm SUMP.

STORM



GENERAL NOTES:

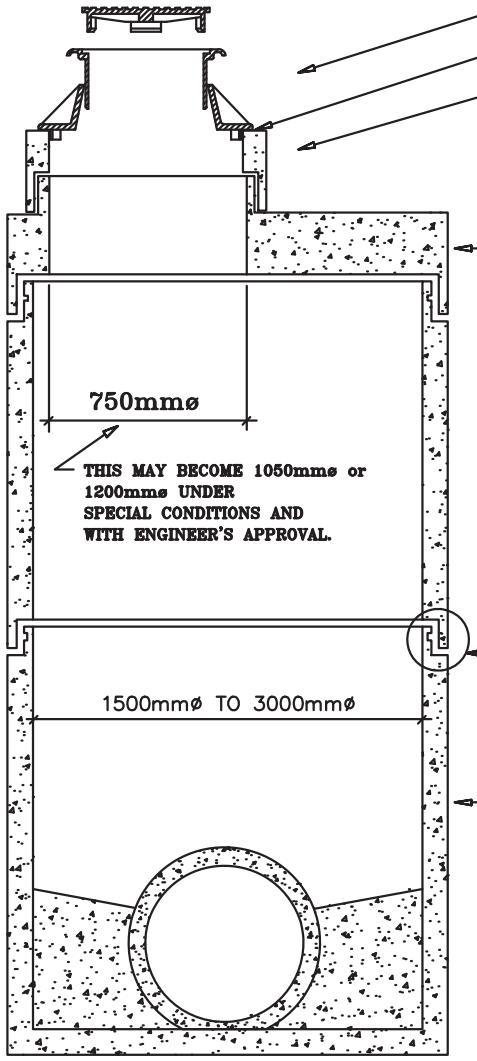
–ALL JOINTS TO BE MADE WATERTIGHT WITH RUBBER GASKETS, OR RAMNEK WHERE APPLICABLE, TO CAN/CSA A257.3

–STRUCTURE TO CAN/CSA A257.4

–CONCRETE TO BE AIR–ENTRAINED, STRENGTH 32MPa (4640 psi) AT 28 DAYS, TO CAN/CSA A23.1

–MANHOLE BASE DIAMETER TO BE DETERMINED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION BASED ON MAINLINE PIPE DIAMETER AND DEFLECTION ANGLE.

SCALE: **N.T.S.**	# STANDARD MANHOLE SECTION	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013	FOR PIPE SIZES UP TO 750mmø	DRAWING N° 2



FRAME and COVER (see DWG. N° 7)

RAMNEK

FLATTOP SECTION (see DWG. N° 4)

FLAT TOP COVER
25cm deep

NOTE: USE ECCENTRIC CONE INSTEAD OF FLAT TOP COVER IF THE DEPTH ALLOWS.

THIS MAY BECOME 1050mmø or 1200mmø UNDER SPECIAL CONDITIONS AND WITH ENGINEER'S APPROVAL.

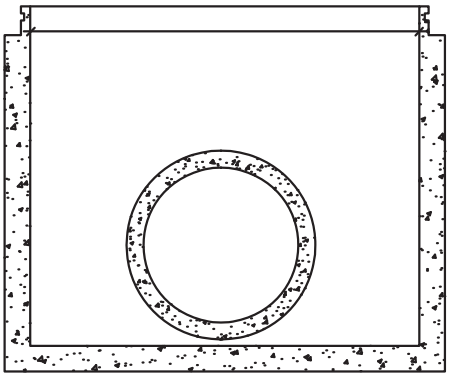
INTERMEDIATE SECTIONS
VARIABLE HEIGHTS AVAILABLE

THIS 90mm BELL and SPIGOT is REQUIRED ON ALL MANHOLE SECTIONS. COMPLETE WITH "O" RING RUBBER GASKET

BASE SECTION
120cm to 230cm deep
AVAILABLE WITH OR WITHOUT BENCHING

–WHEN STORM MANHOLES ARE USED AS CATCH UNITS AND PLACED IN THE CURB LINE, THEY SHALL BE EQUIPPED WITH A 60cm SUMP.

STORM



GENERAL NOTES:

–ALL JOINTS TO BE MADE WATERTIGHT WITH RUBBER GASKETS, OR RAMNEK WHERE APPLICABLE, TO CAN/CSA A257.3

–STRUCTURE TO CAN/CSA A257.4

–CONCRETE TO BE AIR–ENTRAINED, STRENGTH 32MPa (4640 psi) AT 28 DAYS, TO CAN/CSA A23.1

–MANHOLE BASE DIAMETER TO BE DETERMINED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION BASED ON MAINLINE PIPE DIAMETER AND DEFLECTION ANGLE.

SCALE: **N.T.S.**	# STANDARD MANHOLE SECTION	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013	FOR PIPE SIZES ABOVE 750mmø UP TO 1500mm	DRAWING N° 3

SCALE: N.T.S.

REVISION N°:

DATE: March 2013

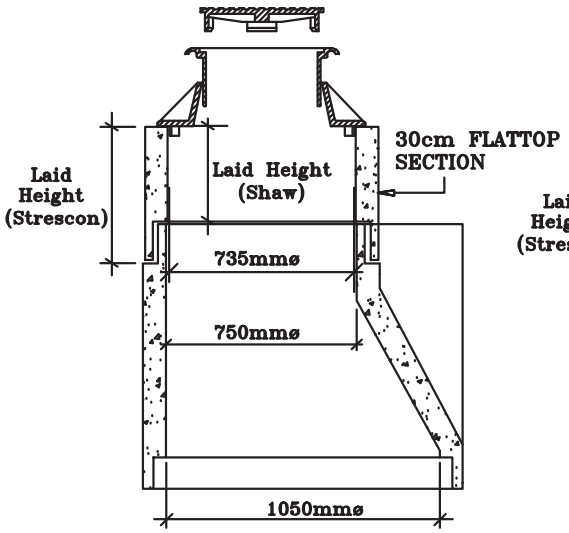
TYPICAL MANHOLE CROSS-SECTION

TOP SHAFTING

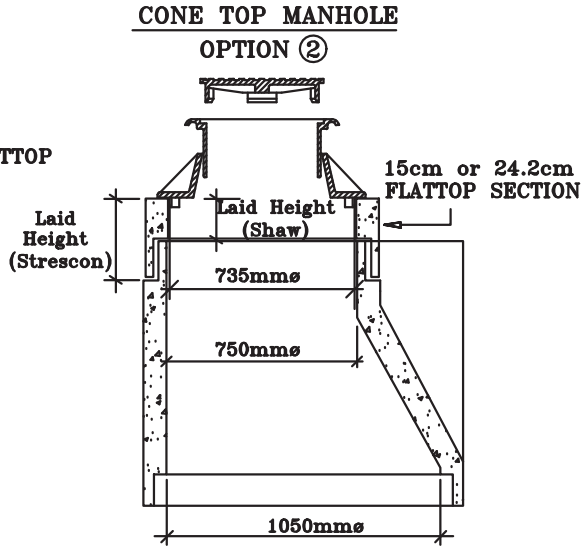
TOWN OF SHEDIAC
ENGINEERING
DEPARTMENT

DRAWING N° 4

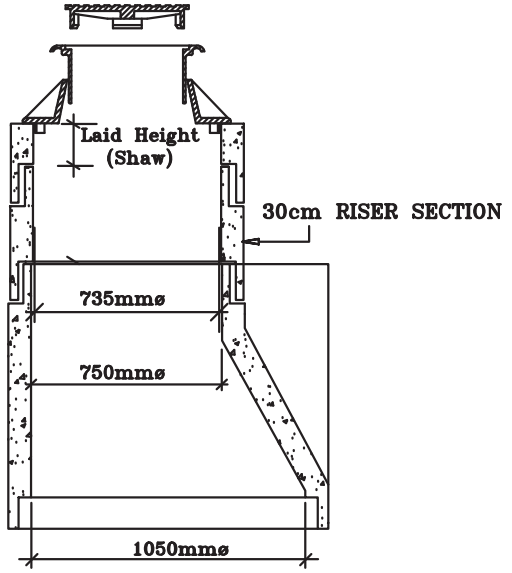
CONE TOP MANHOLE OPTION ①



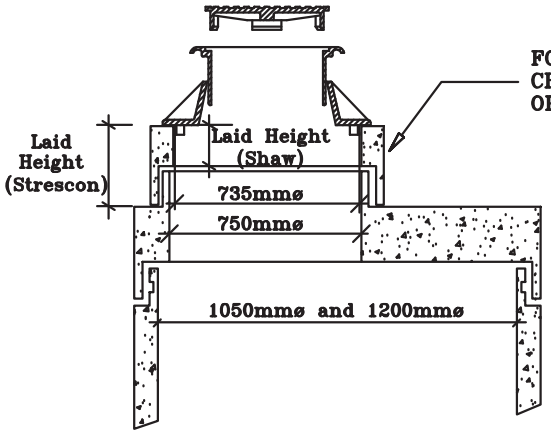
CONE TOP MANHOLE OPTION ②



CONE TOP MANHOLE OPTION ③



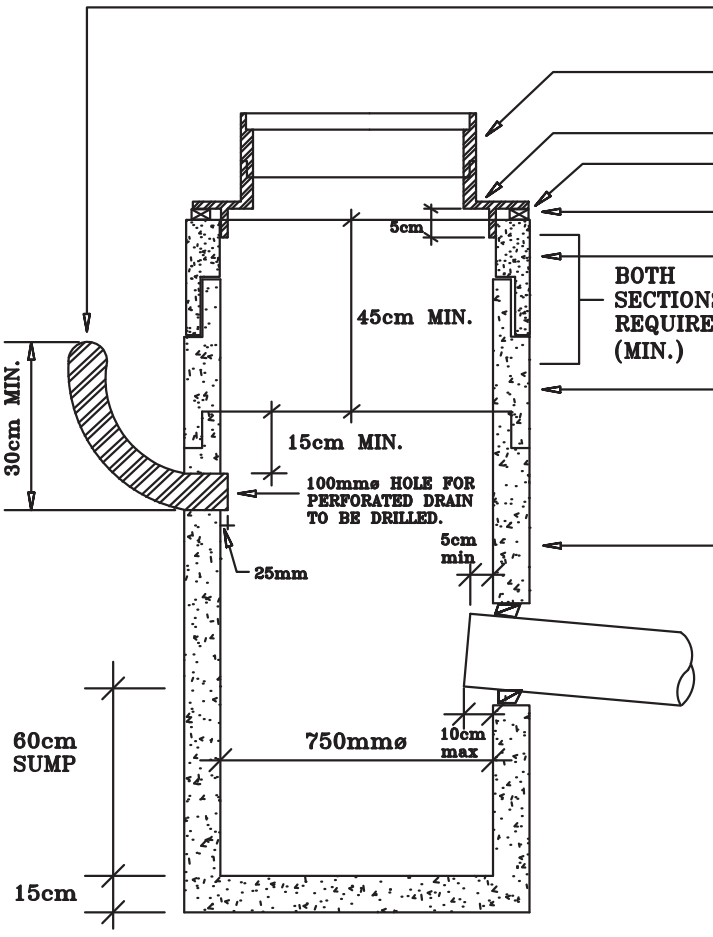
FLAT TOP MANHOLE



FLAT TOP COVER (see DWG. N° 3)
25cm deep

GENERAL NOTES

- FRAME and COVER (see DWG. N° 7).
- RAMNEK BETWEEN CONCRETE AND STEEL AND ON ALL JOINTS BELOW STEEL FRAME.
- FLATTOP SECTION (follow option 1, 2, or 3).
- TOP OF STRUCTURE TO BE 10mm BELOW FINISHED GRADE.
- STEEL/CAST IRON SHIMS ARE NOT PERMITTED.



CONTINUOUS DRAIN TILE

411 FRAME EXTENSION – 7cm (optional)
(MAXIMUM OF TWO)

FRAME and COVER (see DWG. N° 6)

RAMNEK

25mm CAST IRON RING (optional)
(MAXIMUM OF ONE)

15cm FLATTOP SECTION
SHAW H150F (150mm Laid height)
or
STRESCON COVER SECTION (304mm Laid height)

BOTH SECTIONS REQUIRED (MIN.)

30cm RISER SECTION

ALL JOINTS TO BE MADE WATERTIGHT WITH RUBBER GASKETS, TO ASTM C443 OR RAMNEK GASKET.

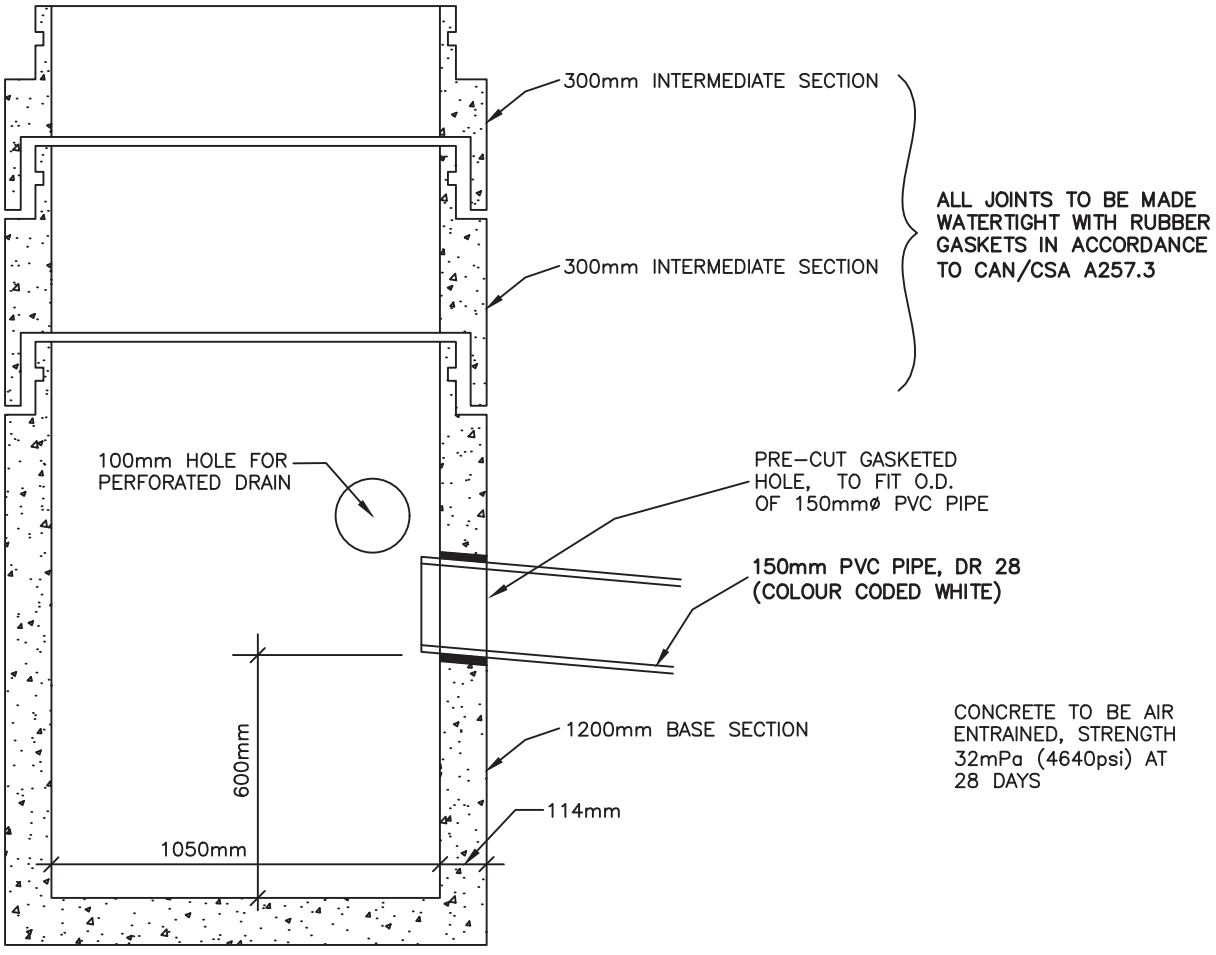
BASE SECTION
1.2m deep

OUTLET PIPE TO BE SECURED WITH RAMNEK GASKETS AND GROUT AROUND OPENING AFTER INSERTION OF PIPE.

CONCRETE TO BE AIR-ENTRAINED STRENGTH 32mPa (4640 psi) AT 28 DAYS.

SCALE: N.T.S.	STANDARD CATCH BASIN	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013		DRAWING N° 5

—FRAME AND COVER DETAIL
AS PER DRAWING N° 6A

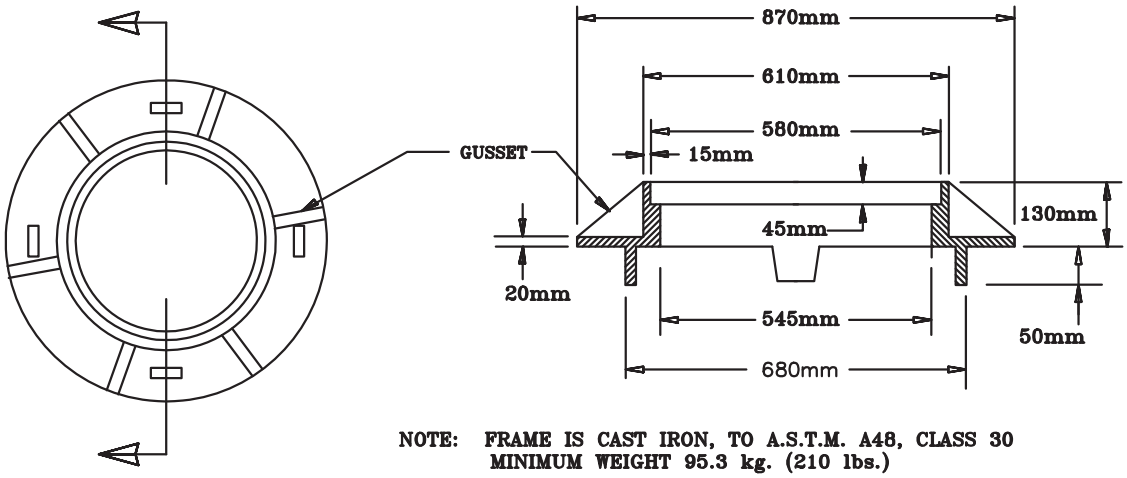


SCALE: N.T.S.	DOUBLE CATCH BASIN UNIT	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2022		DRAWING N° 5A

NOTE:

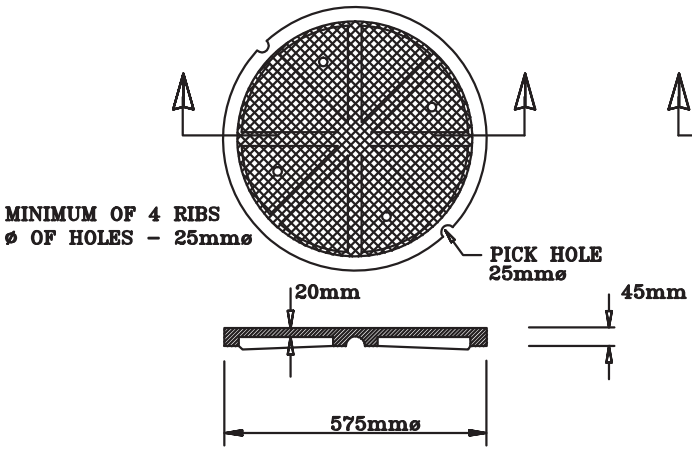
ALL CASTINGS MUST HAVE A PERMANENT MARKING, IDENTIFYING THE MANUFACTURER AND MAKE OR MODEL NUMBER OF THE CASTING.

FRAME N° 411W

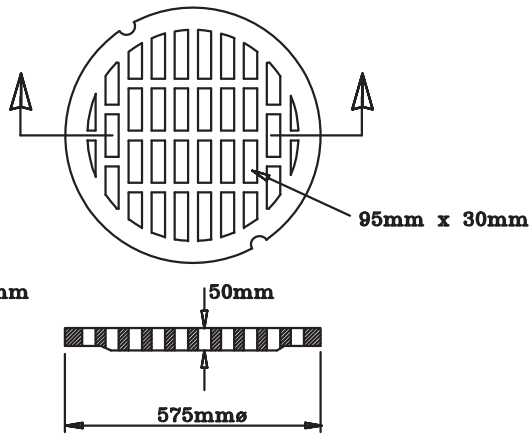


NOTE: FRAME IS CAST IRON, TO A.S.T.M. A48, CLASS 30 MINIMUM WEIGHT 95.3 kg. (210 lbs.)

MANHOLE COVER N° 411 SOLID



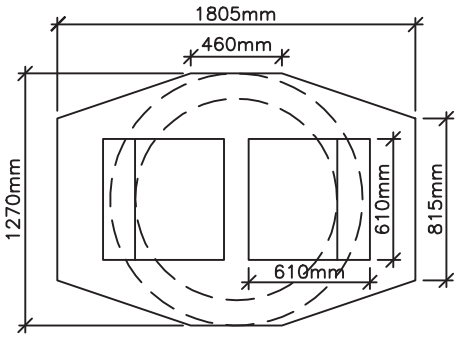
CATCH BASIN COVER N° 411 GRATED



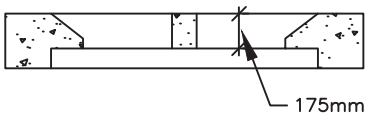
NOTE: ALL COVERS TO BE SNUG FIT, RATTLE FREE.
COVERS ARE CAST IRON, TO A.S.T.M. A48, CLASS 30.
M.H. COVER MIN. WEIGHT 43.1kg (95lbs.)
C.B. COVER MIN. WEIGHT 52.2kg (115lbs.)

SCALE: N.T.S.	MANHOLE/CATCH BASIN	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013	411W FRAME AND COVERS	DRAWING N° 6

COVER DETAIL

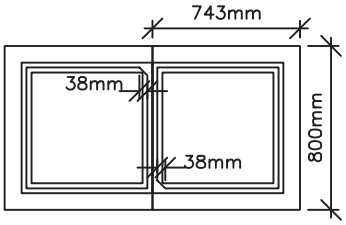


TOP

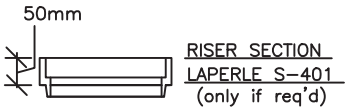


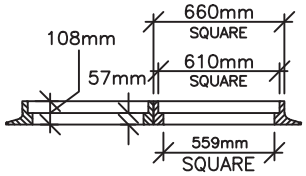
SECTION

FRAME DETAIL

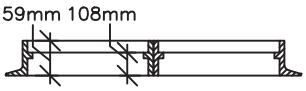


TOP



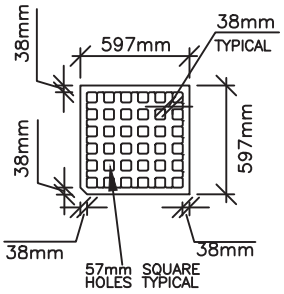


SECTION S 401

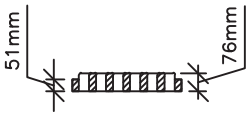


SECTION S 411

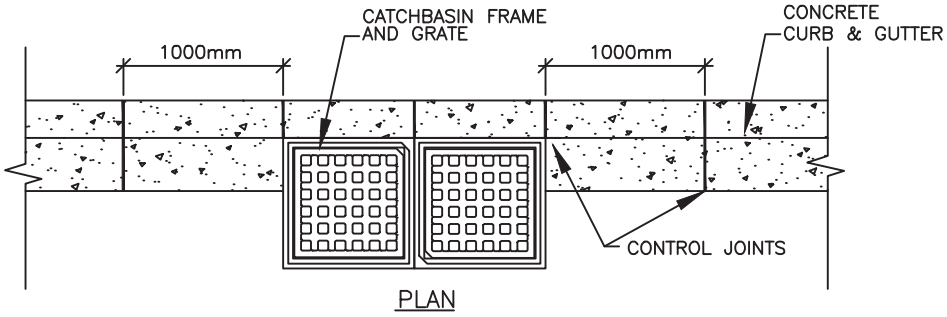
GRATE DETAIL



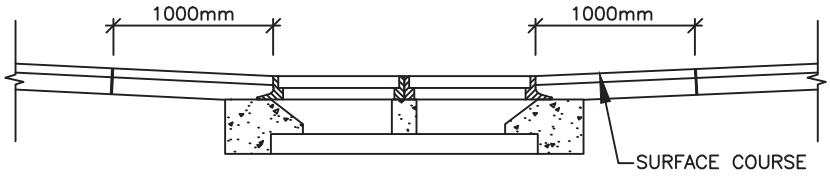
TOP



SECTION



PLAN



PROFILE

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS
2. THE PRINCIPAL APPLIES TO ALL STRUCTURES IN THE CURB ALIGNMENT
3. FRAME SHALL BE SLOPED TO MATCH CROWN OF ROAD
4. INSTALL GRATE 10mm LOWER THAN NORMAL GUTTER ELEV. TYP. BOTH SIDES

SCALE: N.T.S.	# DOUBLE CATCH BASIN	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	FRAME AND COVER	
DATE: March 2022		DRAWING N° 6A

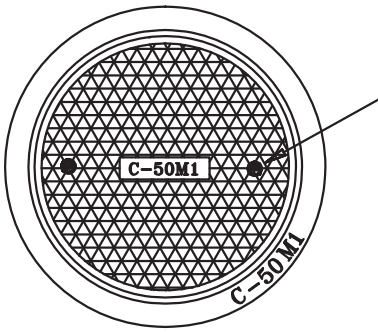
ADJUSTABLE MANHOLE FRAME & COVER

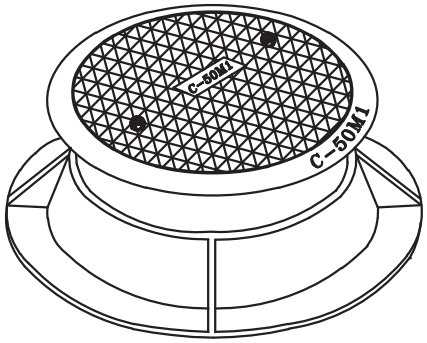
C–50M1 CONE SHAPED FRAME AUTOSTABLE OR APPROVED EQUAL.

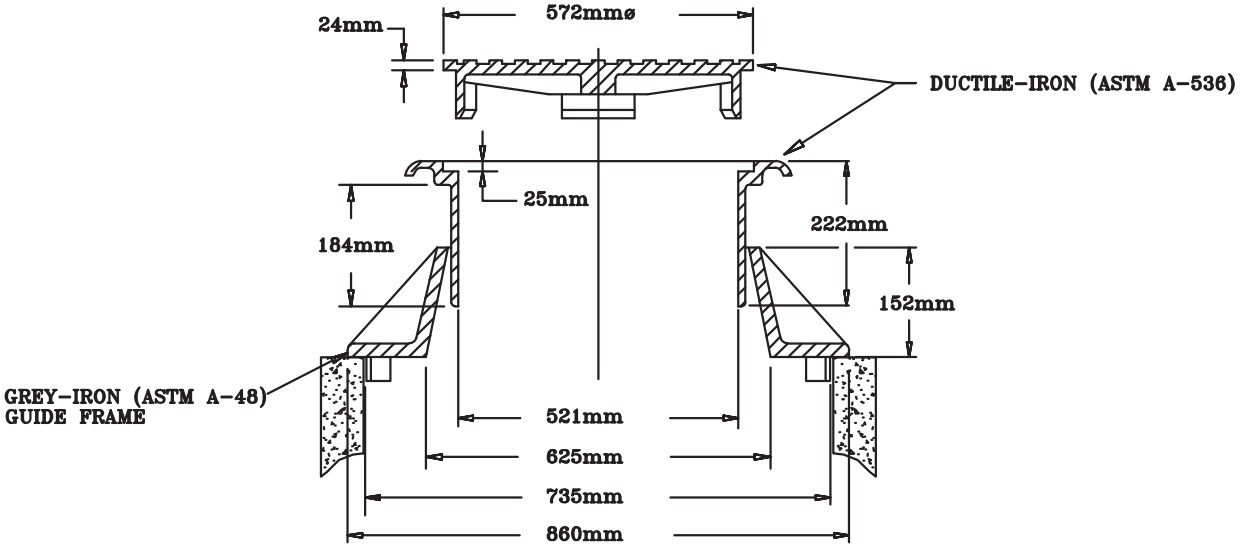
IMPORTANT: WHEN IN USE, THE AUTOSTABLE FRAME SHOULD NOT REST ON THE GUIDE FRAME. A 51m MINIMUM SPACE MUST BE RESPECTED.

ALL CASTINGS MUST HAVE A PERMANENT MARKING IDENTIIFYING THE MANUFACTURER AND MAKE OR MODEL NUMBER OF THE CASTING.

ONE 51mm OR 102mm GUIDE FRAME RISER ALLOWED FOR HEIGHT ADJUSTMENT.





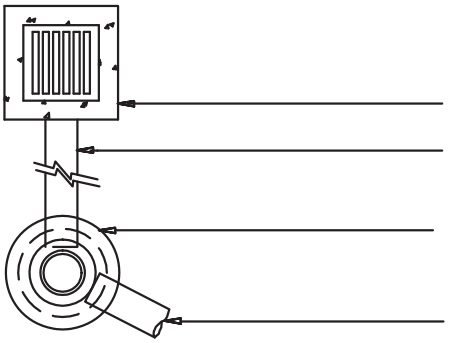


NOTES:

1. BOTTOM OF GUIDE FRAME/TOP OF CONCRETE. 20cm – 30cm BELOW PAVEMENT GRADE.
2. MINIMUM WEIGHT
   COVER 55Kg – 120 lbs
   GUIDE & FRAME 98Kg – 216 lbs
3. ADJUSTABLE FRAME AND COVER TO HAVE MACHINED SEATS.
4. ASPHALT DENSITY UNDER THE FRAME IS OF UTMOST IMPORTANCE.
5. TO BE USED ON 750mmø CONCRETE FLAT TOP RISER SECTIONS.

SCALE: N.T.S.	ADJUSTABLE MANHOLE FRAME AND COVER	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013	FOR USE WITHIN THE PAVEMENT SURFACE	DRAWING N° 7

SCHEMATIC



SLUICE BOX GRATE MUST LIE PERPENDICULAR TO DIRECTION OF TRAFFIC.

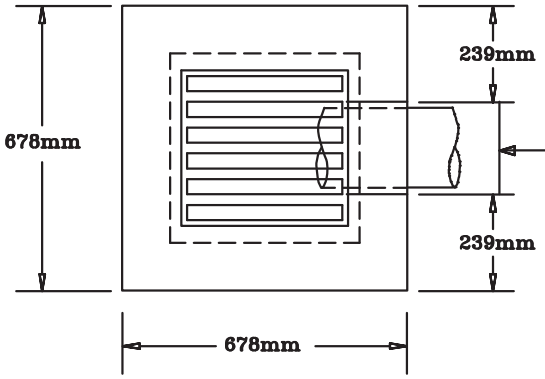
SLUICE BOX

150mmø PVC PIPE, DR 28
(COLOR CODED WHITE)

CATCH BASIN

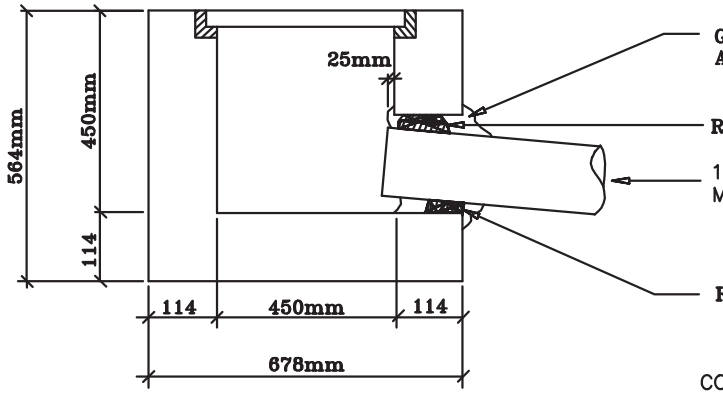
LEAD TO MANHOLE
150mmø PVC PIPE DR 28
(COLOR CODED WHITE)

PLAN



200mmø PIPE OPENING
150mmø PVC PIPE, DR 28
(COLOR CODED WHITE)

CROSS-SECTION



TOWN OF SHEDIAC STANDARD
COVER AND FRAME
AS BY IMP CASTINGS LTD.
OR APPROVED EQUAL. (see DWG. N° 9)

GROUT AROUND OPENING AFTER INSERTION OF PIPE.

RAMNEK GASKET

150mmø PVC PIPE DR28 (WHITE)
MIMINUM SLOPE 2% TO CATCH BASIN.

RAMNEK GASKET

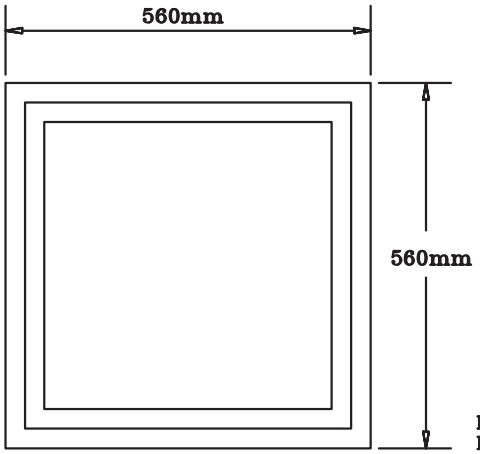
CONCRETE TO BE AIR-ENTRAINED
32MPa (4640 psi) TO CAN/CSA A23.1

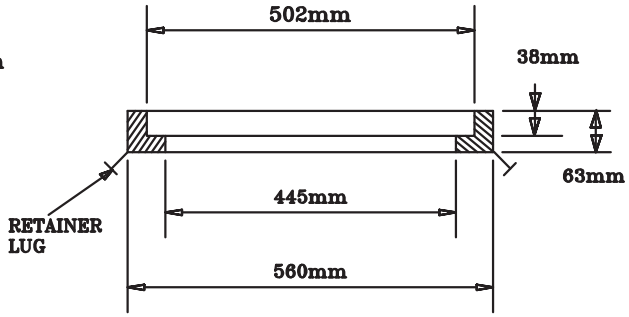
SCALE: **N.T.S.**	SLUICE BOX DETAIL	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013		DRAWING N° 8

FRAME N° 405

NOTES:
ALL CASTINGS MUST HAVE A PERMANENT MARKING, MODEL NUMBER OF THE CASTING, IDENTIFYING THE MANUFACTURER AND MAKE.

FRAME IS CAST IRON, TO ASTM A48, CLASS 30.
MINIMUM WEIGHT 36.3kg (80 LBS)

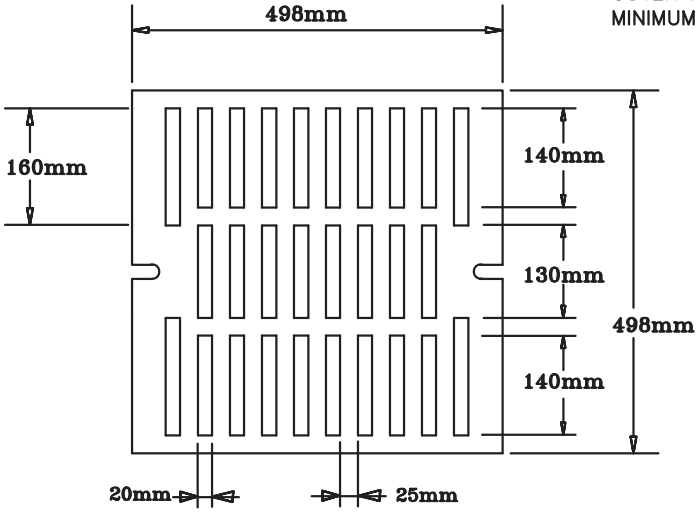


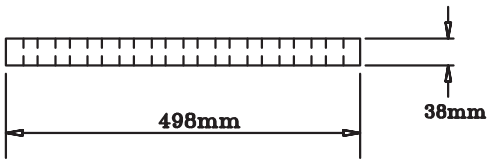


COVER N° 405

NOTE:

COVER IS CAST IRON, TO ASTM A48, CLASS 30.
MINIMUM WEIGHT 36.3kg (80 lbs.)



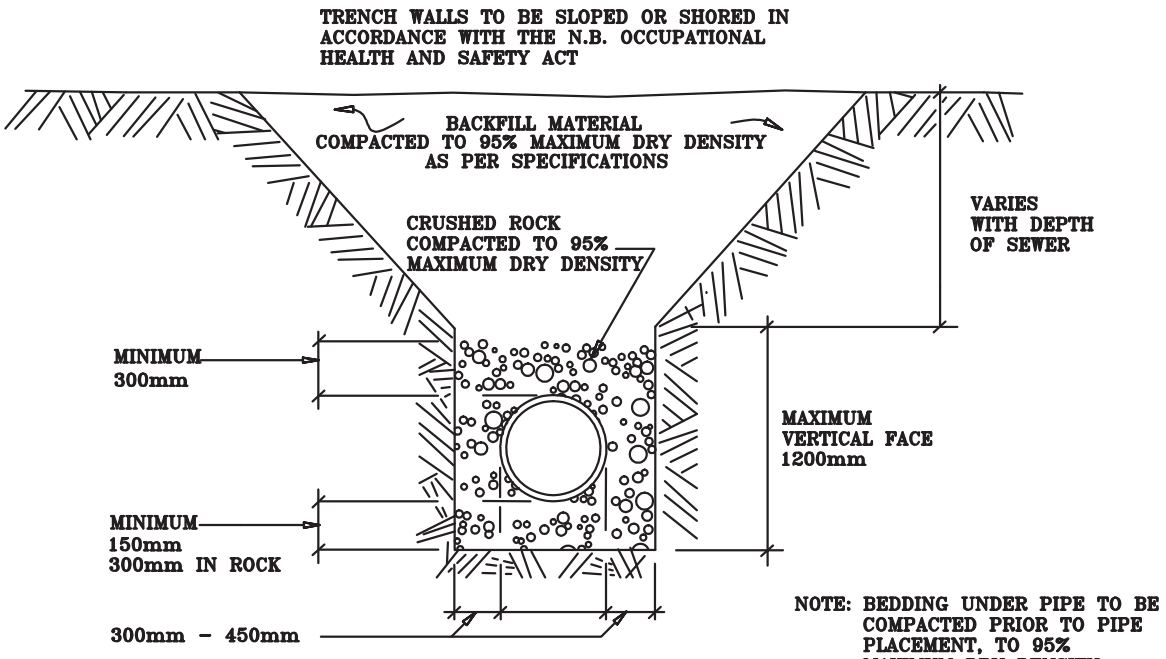


SLUICE BOX FRAME AND COVER AS MANUFACTURED BY IMP CASTINGS LTD. OR APPROVED EQUAL.

SCALE: N.T.S.	SLUICE BOX	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	FRAME AND COVER	
DATE: March 2013		DRAWING N° 9

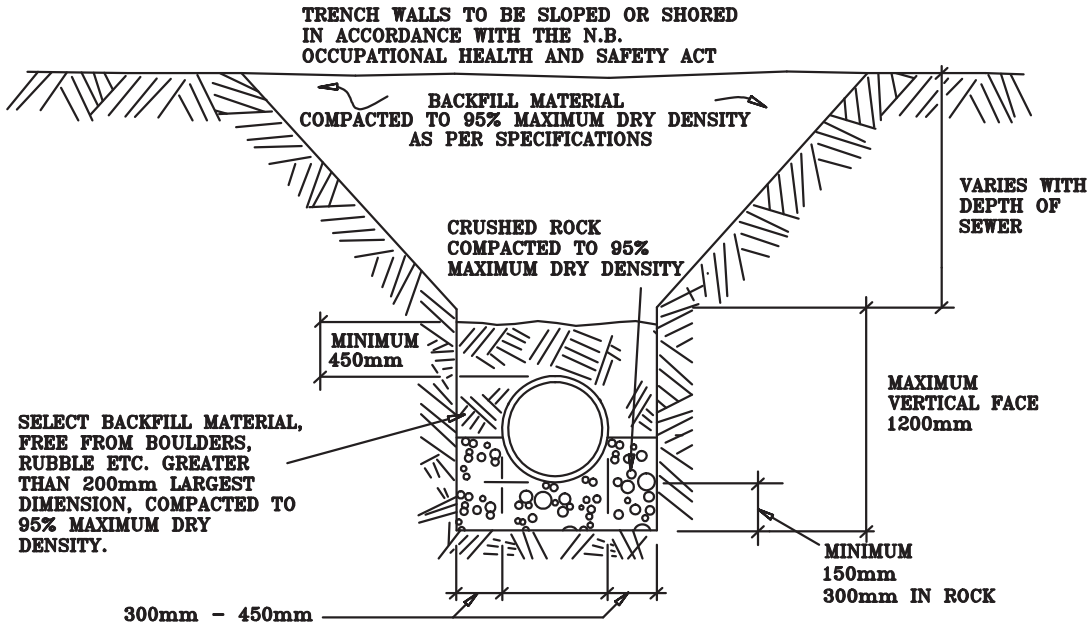
CLASS "B" BEDDING

FOR ALL PVC, DUCTILE IRON, and LATERALS PIPES.



MODIFIED CLASS "B" BEDDING:

FOR CONCRETE PIPE



NOTE:
BEDDING UNDER PIPE TO BE COMPACTED PRIOR TO PIPE PLACEMENT, TO 95% MAXIMUM DRY DENSITY.

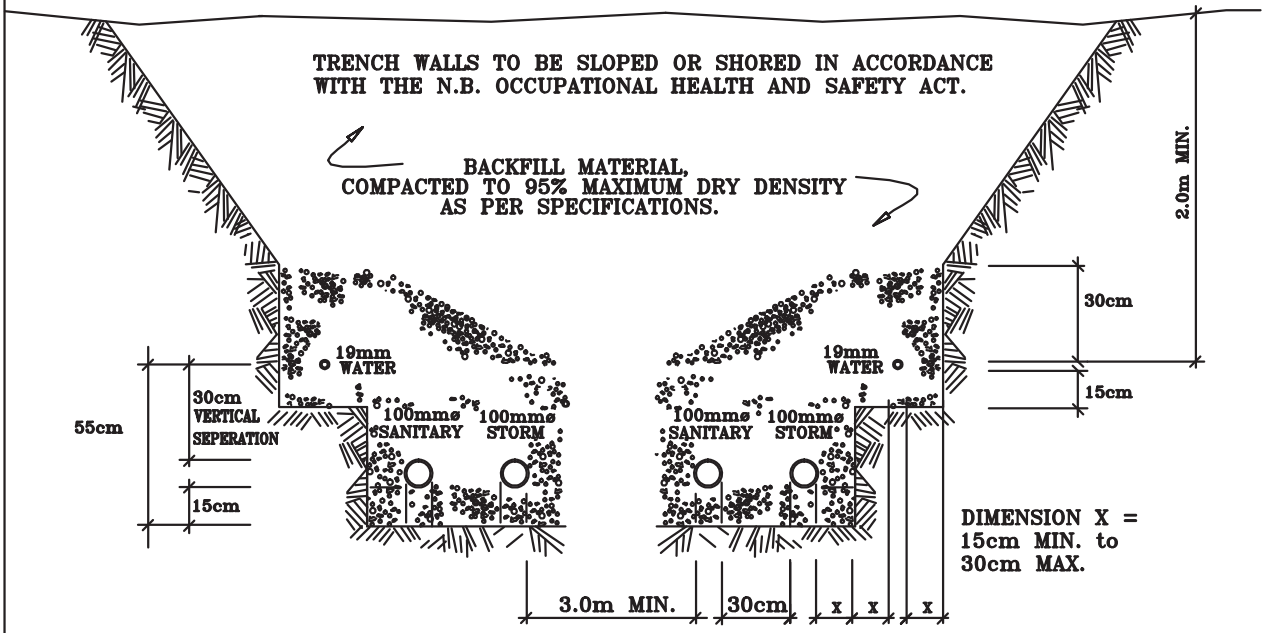
SCALE: N.T.S.	PIPE BEDDING AND BACKFILL DETAIL	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	CLASS "B" AND MODIFIED CLASS "B"	
DATE: March 2013		DRAWING N° 10

NOTE:
THIS IS A CROSS-SECTION VIEW OF A DOUBLE SERVICE APPLICATION, AS VIEWED FROM THE PROPERTY LINE LOOKING TOWARDS THE HOUSE.

FOR SINGLE SERVICE APPLICATION, USE RIGHT SIDE CONFIGURATION BELOW

GENERAL RULE-STORM SEWER ON THE RIGHT.

ALSO SEE DRAWING N° 13



NOTES:

ALL SEWER LATERALS TO BE PVC PIPE,
STORM – DR28 COLOR CODED WHITE
SANITARY – DR35 COLOR CODED GREEN

BEDDING UNDER SERVICE PIPES TO BE COMPACTED PRIOR TO PIPE PLACEMENT, TO 95% MAXIMUM DENSITY.

SEMI-DETACHED DWELLINGS SHALL HAVE 2 SEPARATE SANITARY SEWER, STORM SEWER AND WATER SERVICES; ONE ON EACH SIDE OF THE COMMON PROPERTY LINE. A MINIMUM OF 3m SHALL SEPARATE THE SETS OF SERVICES AND SHALL BE INSTALLED IN THE SAME TRENCH OR IN SEPARATE TRENCHES.

SCALE: **N.T.S.**	SERVICE DETAIL	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	CROSS-SECTION AT STREET LINE	
DATE: March 2013		DRAWING N° 11

SCALE: N.T.S.

REVISION N°:

DATE: March 2013

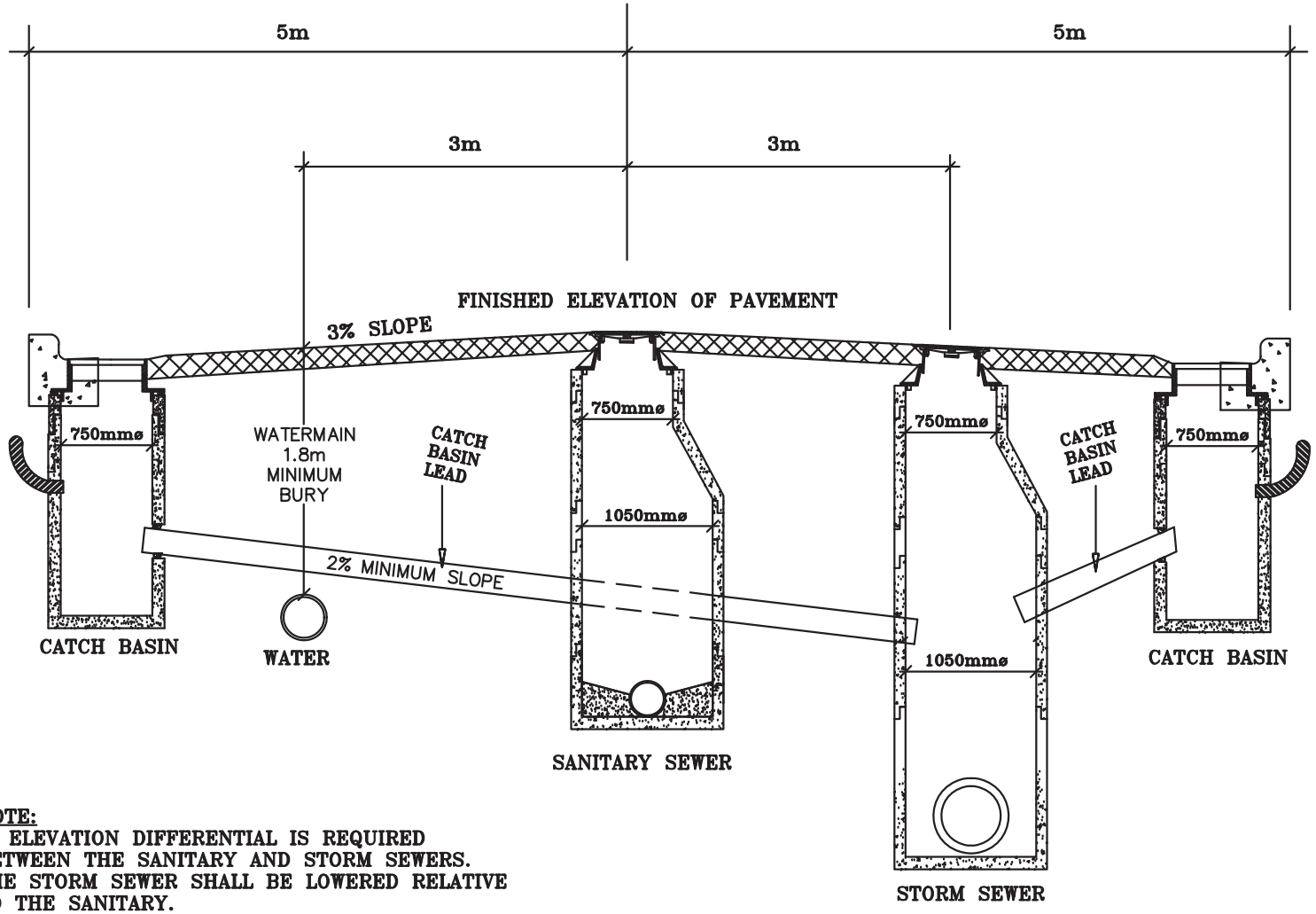
TYPICAL STREET CROSS-SECTION

LOCATION OF SERVICES

TOWN OF SHEDIAC
ENGINEERING
DEPARTMENT

DRAWING N° 12

TYPICAL 10m WIDE STREET



NOTE:
IF ELEVATION DIFFERENTIAL IS REQUIRED BETWEEN THE SANITARY AND STORM SEWERS. THE STORM SEWER SHALL BE LOWERED RELATIVE TO THE SANITARY.

THE AMOUNT OF PROTRUSION OF ANY PIPE INTO A MANHOLE OR CATCH BASIN SHALL BE NOT MORE THAN 10CM AND NOT LESS THAN 5CM.

SCALE: N.T.S.

REVISION N°:

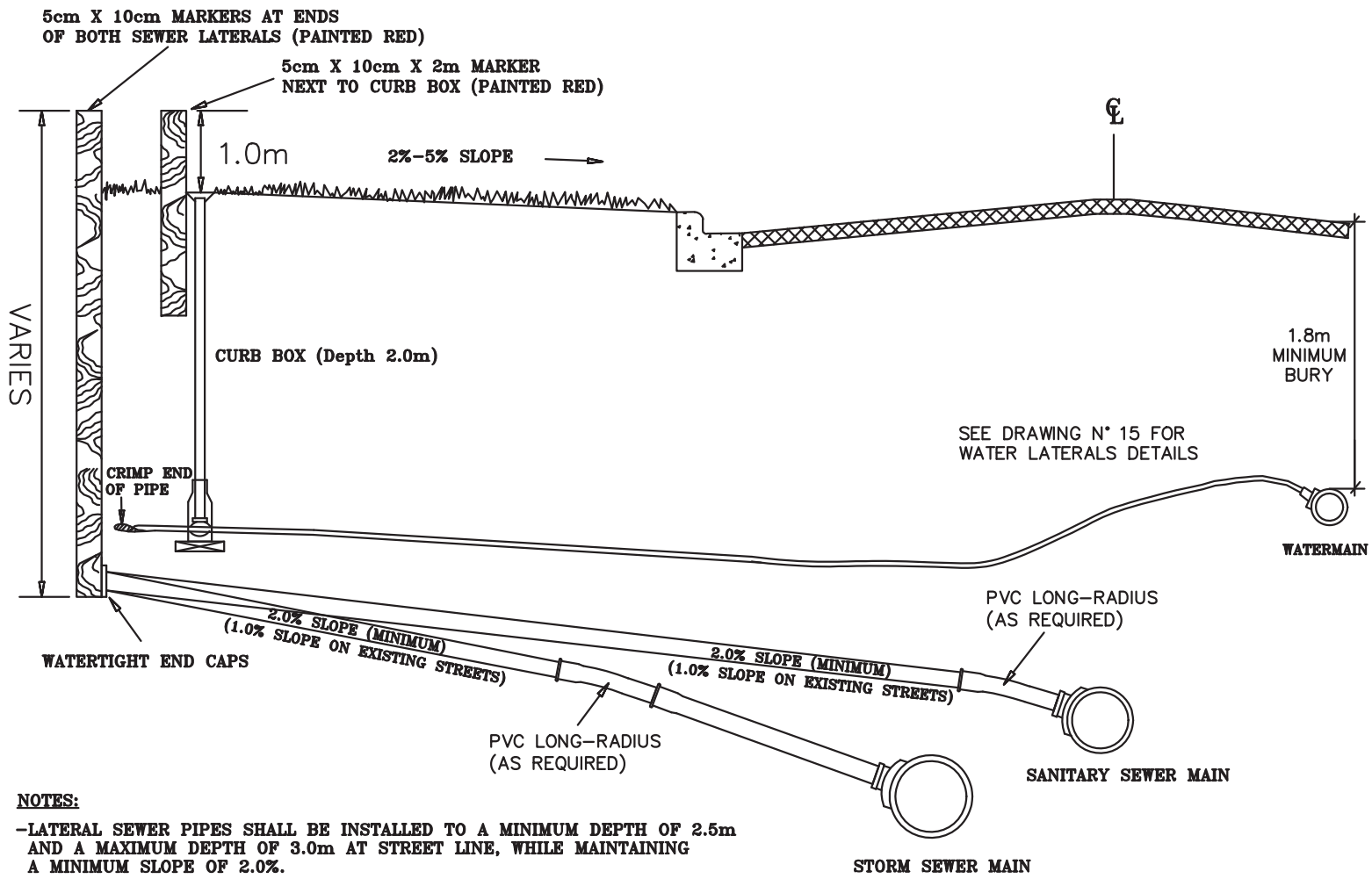
DATE: March 2013

TYPICAL STREET CROSS-SECTION

LATERAL SERVICES

TOWN OF SHEDIAC
ENGINEERING
DEPARTMENT

DRAWING N° 13



NOTES:

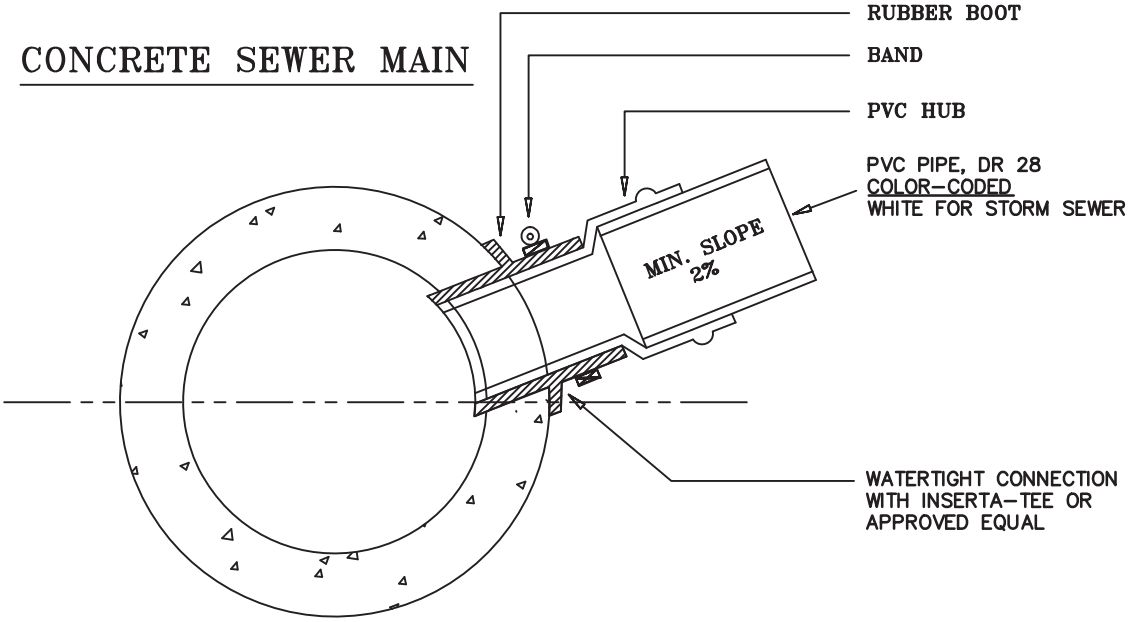
-LATERAL SEWER PIPES SHALL BE INSTALLED TO A MINIMUM DEPTH OF 2.5m AND A MAXIMUM DEPTH OF 3.0m AT STREET LINE, WHILE MAINTAINING A MINIMUM SLOPE OF 2.0%.

-WHEN INSTALLATION OF SEWER MAIN IS ON A STREET WITH EXISTING HOUSES, LATERALS MUST BE OF ADEQUATE DEPTH TO PROVIDE DRAINAGE FROM ALL SUMP ELEVATIONS.

-BENDS SHALL BE OF LONG RADIUS TYPE ONLY.

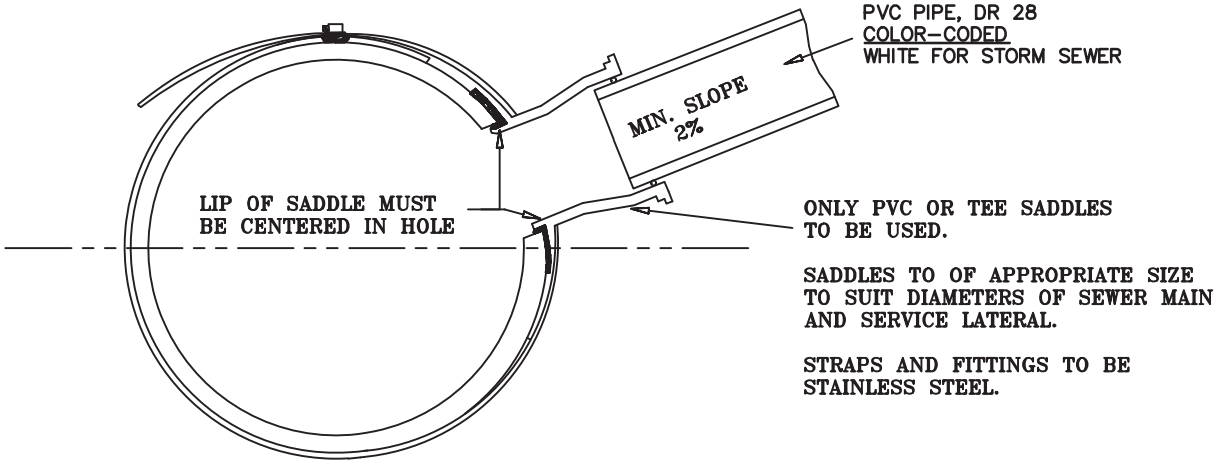
-REFER TO DRAWING N° 11 FOR DETAILS OF SERVICE TRENCH (CROSS-SECTION).

CONCRETE SEWER MAIN



NOTE: BENDS SHALL BE OF LONG RADIUS TYPE ONLY.

PVC SEWER MAIN



NOTE: BENDS SHALL BE OF LONG RADIUS TYPE ONLY.

SCALE: N.T.S.	TYPICAL SERVICE CONNECTIONS	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	CROSS–SECTIONS THROUGH PIPES	
DATE: March 2013		DRAWING N° 14

SCALE: N.T.S.

REVISION N°:

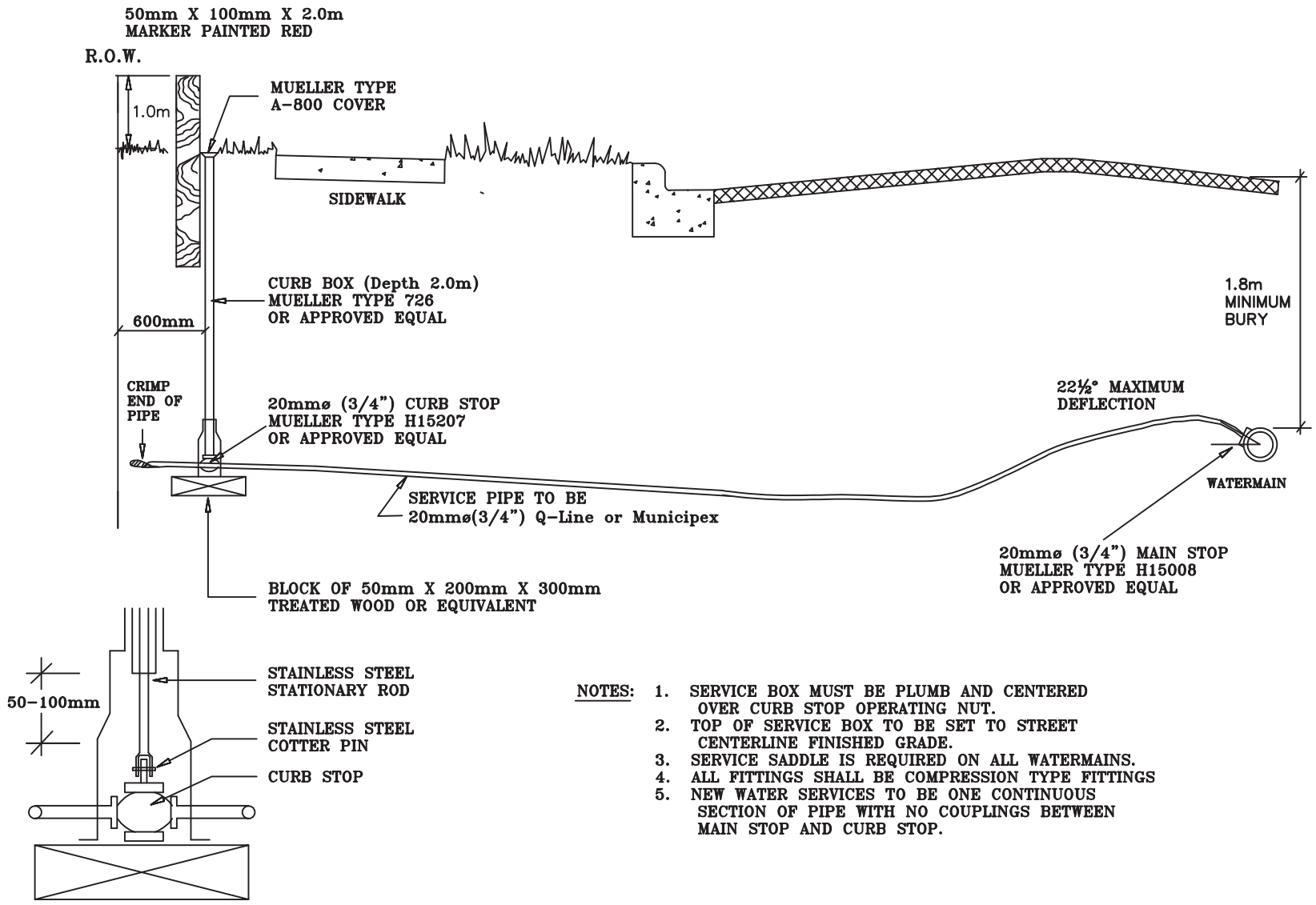
DATE: March 2013

TYPICAL WATER SERVICE

BRANCH LATERAL

TOWN OF SHEDIAC
ENGINEERING
DEPARTMENT

DRAWING N° 15



NOTES:

1. SERVICE BOX MUST BE PLUMB AND CENTERED OVER CURB STOP OPERATING NUT.
2. TOP OF SERVICE BOX TO BE SET TO STREET CENTERLINE FINISHED GRADE.
3. SERVICE SADDLE IS REQUIRED ON ALL WATERMAINS.
4. ALL FITTINGS SHALL BE COMPRESSION TYPE FITTINGS
5. NEW WATER SERVICES TO BE ONE CONTINUOUS SECTION OF PIPE WITH NO COUPLINGS BETWEEN MAIN STOP AND CURB STOP.

STANDARD HYDRANT, LEAD AND VALVE

INSTALLATION DIAGRAM

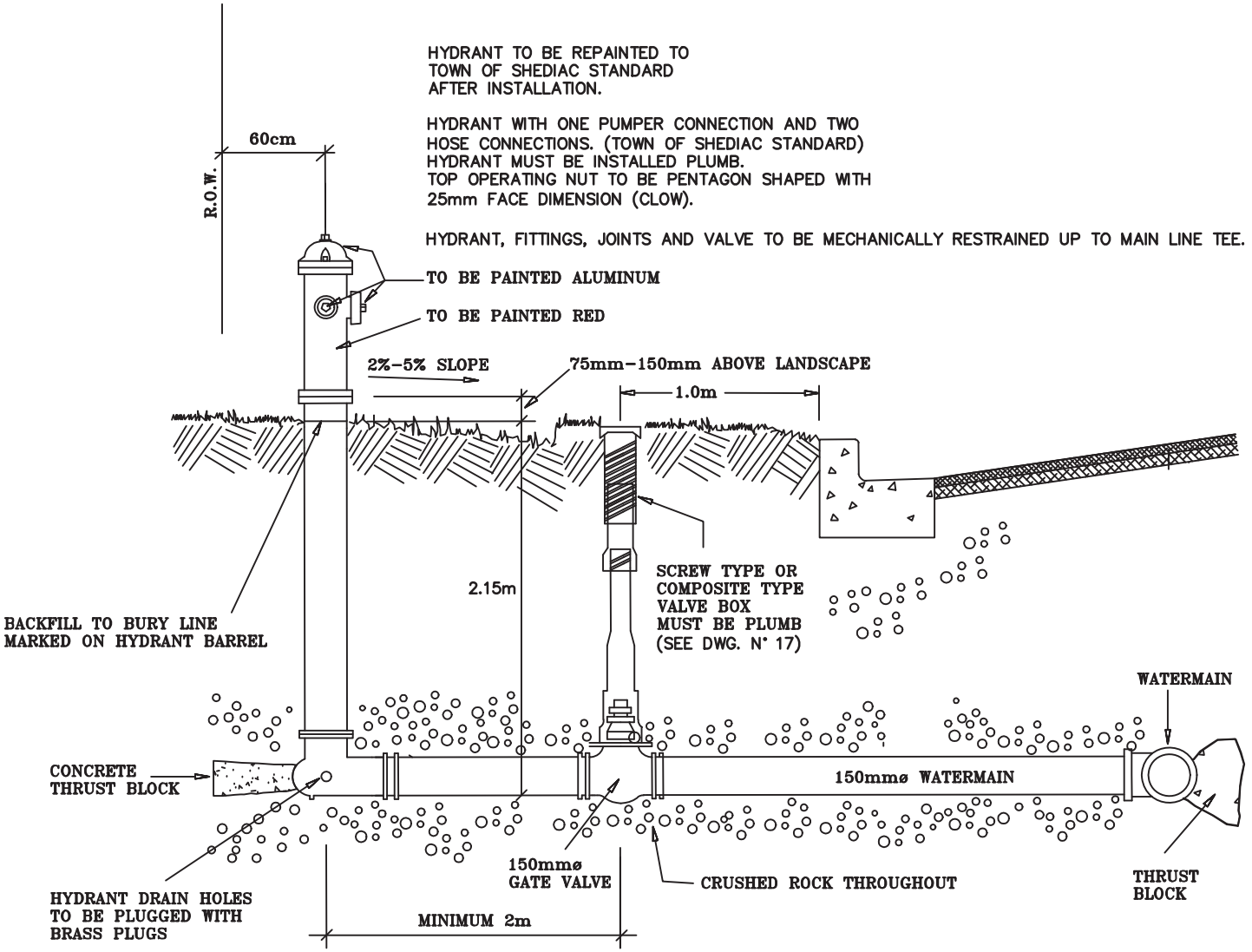
SCALE: N.T.S.

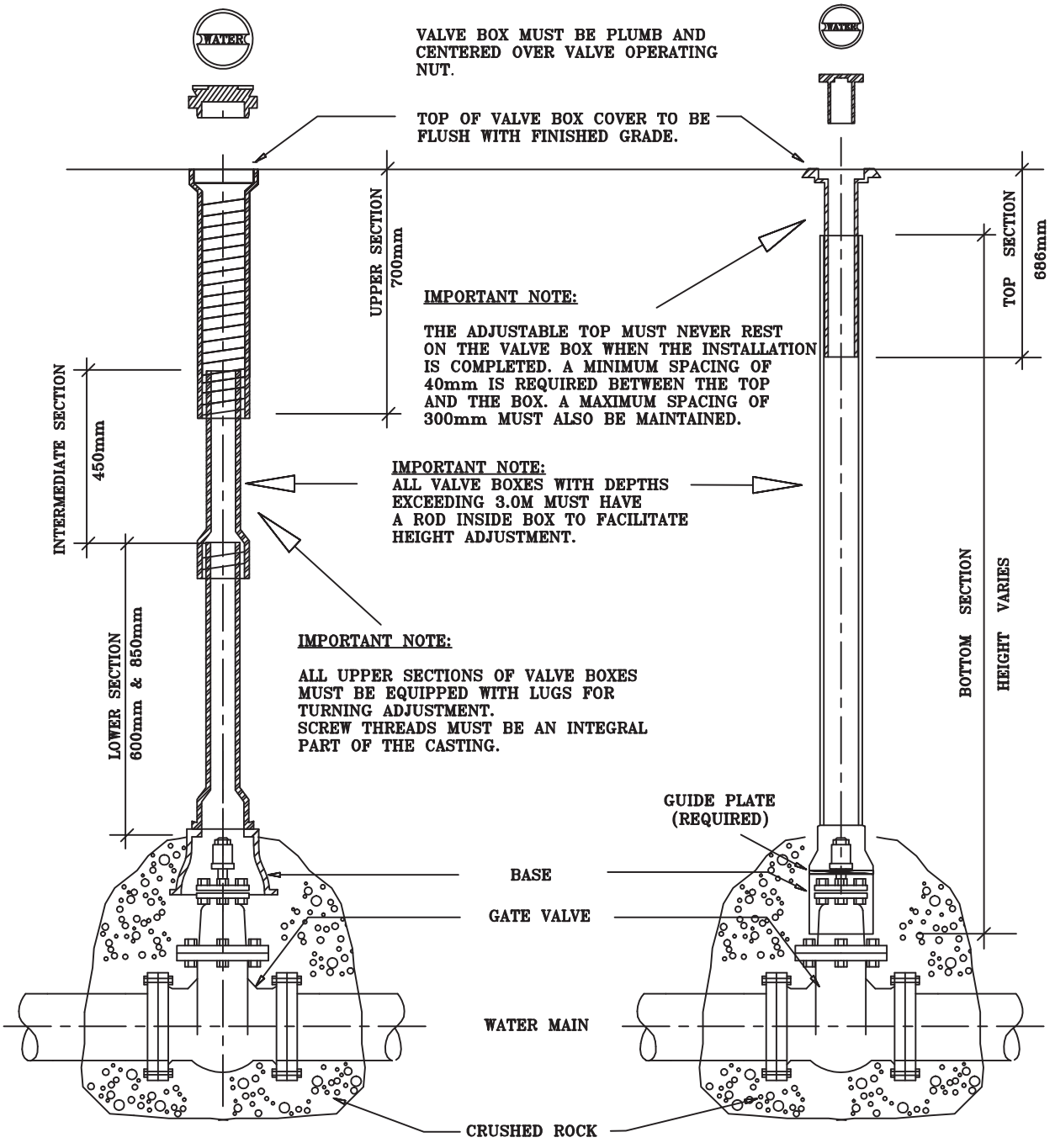
REVISION N°:

DATE: March 2013

TOWN OF SHEDIAC
ENGINEERING
DEPARTMENT

DRAWING N° 16

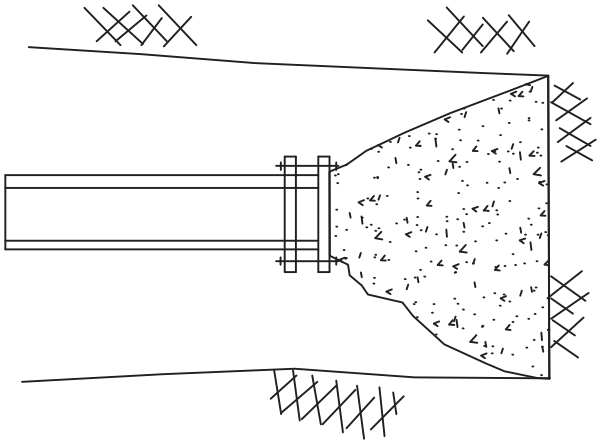




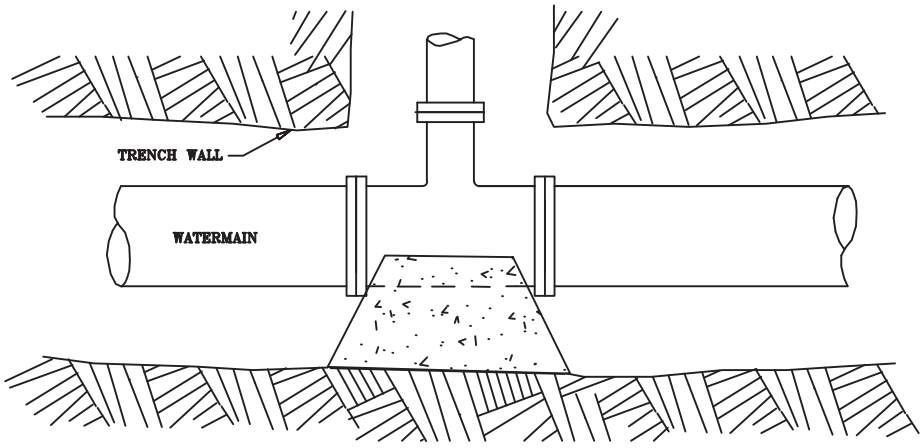
SCREW–TYPE

COMPOSITE TYPE

SCALE: N.T.S.	VALVE BOXES	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013		DRAWING N° 17



TYPICAL END CAP DETAIL

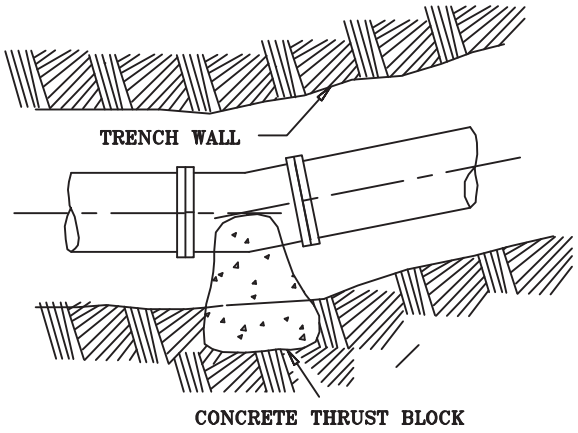


TYPICAL TEE DETAIL

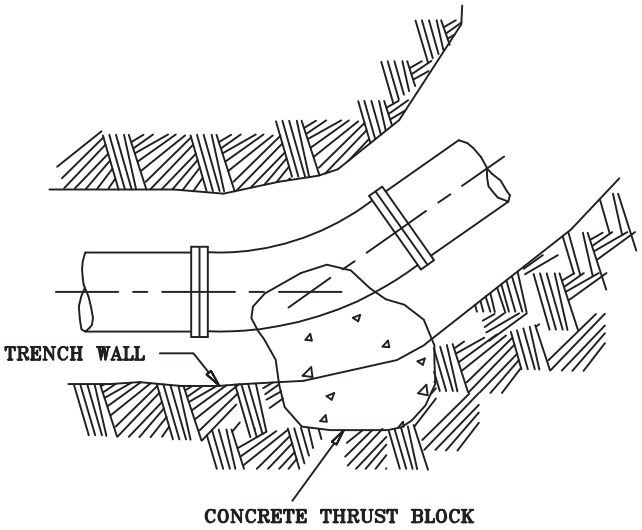
NOTE:
SEE DRAWING N° 21 FOR IMPORTANT NOTES AND MINIMUM CONTACT AREAS FOR CONCRETE THRUST BLOCKS.

THE TEE DETAIL ALSO APPLIES TO TAPPING SLEEVE INSTALLATION.

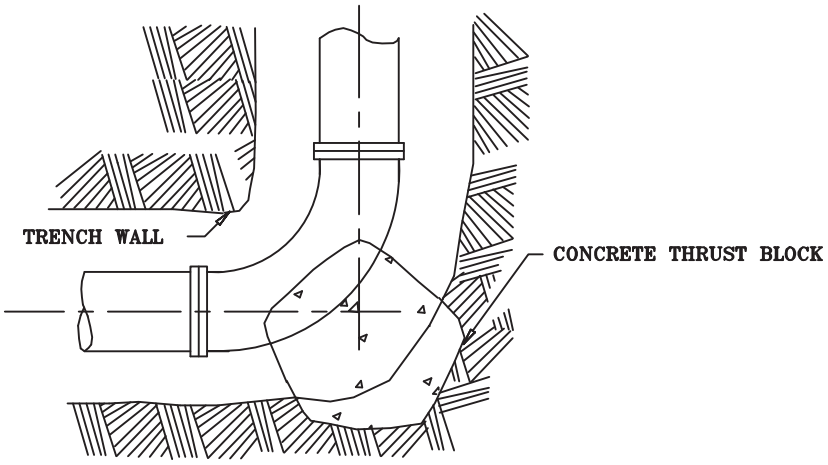
SCALE: N.T.S.	CONCRETE THRUST BLOCK DETAIL	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	TYPICAL END CAP & TEE	
DATE: March 2013		DRAWING N° 18



11¼° – 22½° BEND



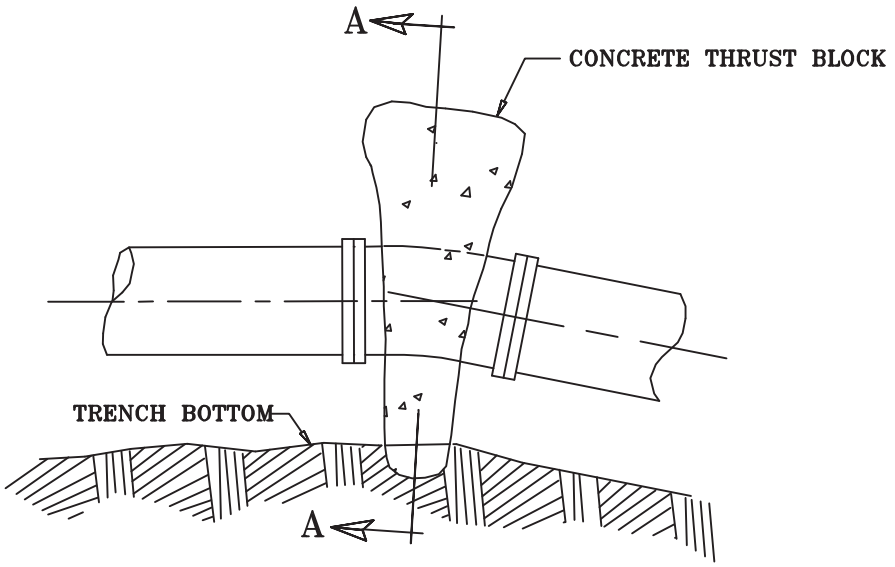
22½° – 45° BEND



90° BEND

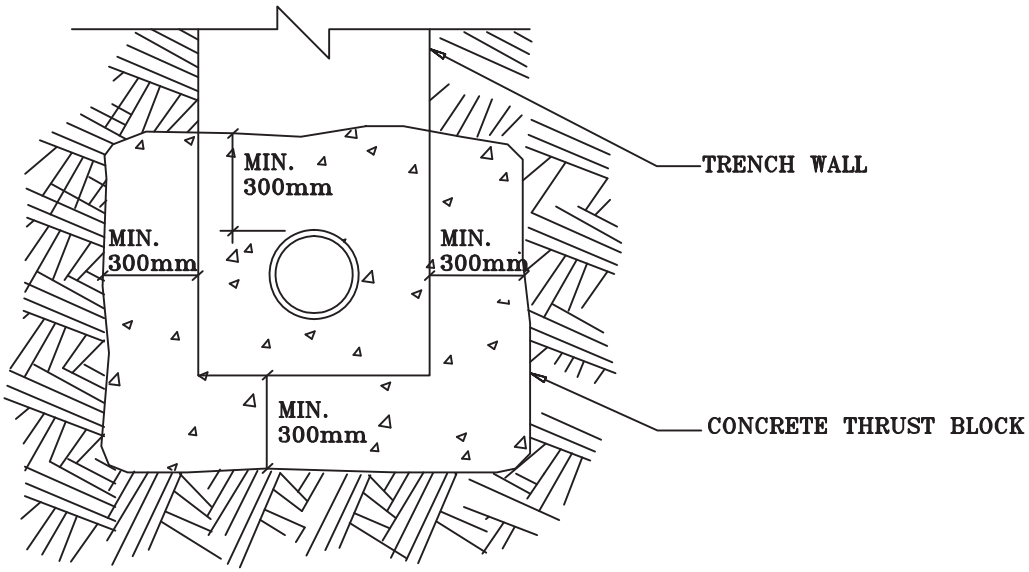
NOTE:
SEE DRAWING N° 21 FOR IMPORTANT NOTES
AND MINIMUM CONTACT AREAS FOR
CONCRETE THRUST BLOCKS.

SCALE: N.T.S.	CONCRETE THRUST BLOCK DETAIL	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	HORIZONTAL BENDS	
DATE: March 2013		DRAWING N° 19



ELEVATION

NOTE:
SEE DRAWING N° 21 FOR IMPORTANT NOTES AND MINIMUM CONTACT AREAS FOR CONCRETE THRUST BLOCKS.



SECTION A–A

SCALE: N.T.S.	CONCRETE THRUST BLOCK DETAIL	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	VERTICAL BENDS	
DATE: March 2013		DRAWING N° 20

MINIMUM CONTACT AREAS FOR CONCRETE THRUST BLOCKS:

PIPE ø	AREA (m^2) FOR SOIL SUPPORTING CAPACITY OF 100 kPa (2,000 p.s.f.)					
mm	CAP or PLUG	TEE	90° BEND	45° BEND	22½° BEND	11¼° BEND
150	0.48	0.48	0.64	0.40	0.24	0.16
200	0.80	0.80	1.12	0.64	0.32	0.16
250	1.28	1.28	1.76	0.96	0.48	0.24
300	1.76	1.76	2.56	1.44	0.72	0.40
350	2.40	2.40	3.52	1.92	0.96	0.48
400	3.20	3.20	4.48	2.56	1.28	0.64
450	4.16	4.16	5.76	3.20	1.60	0.80

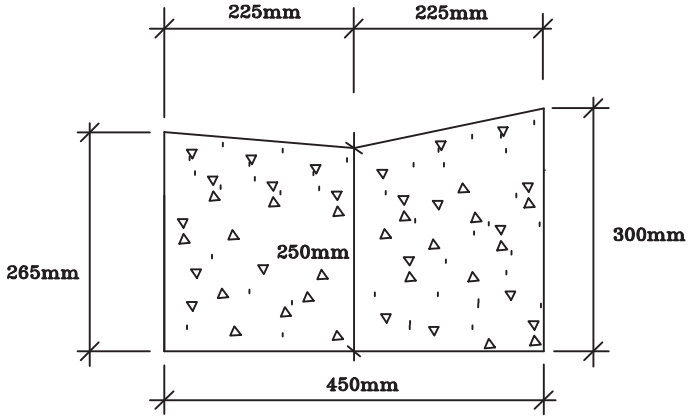
PIPE ø	AREA (m^2) FOR SOIL SUPPORTING CAPACITY OF 200 kPa (4,000 p.s.f.)					
mm	CAP or PLUG	TEE	90° BEND	45° BEND	22½° BEND	11¼° BEND
150	0.24	0.24	0.32	0.24	0.16	0.16
200	0.40	0.40	0.56	0.32	0.16	0.16
250	0.64	0.64	0.88	0.48	0.24	0.24
300	0.88	0.88	1.28	0.72	0.40	0.24
350	1.20	1.20	1.76	0.96	0.48	0.24
400	1.60	1.60	2.24	1.28	0.64	0.32
450	2.08	2.08	2.88	1.60	0.80	0.40

CONVERSION FACTOR: 1 sq.m = 10 sq.ft.

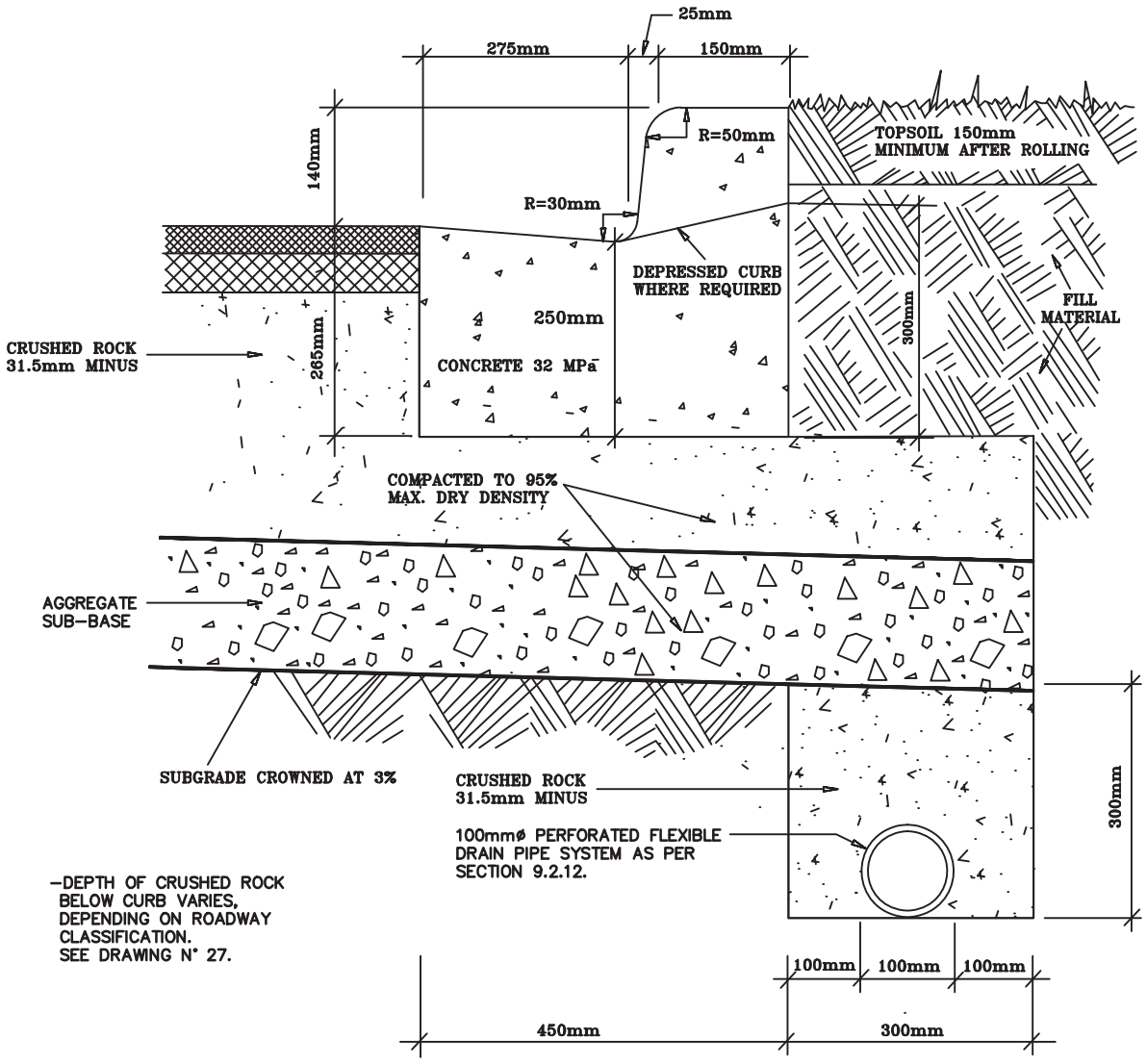
NOTES:

1. SEE DRAWING N° 16 and N° 17 FOR THRUST BLOCK CONFIGURATIONS.
2. THESE CHARTS ARE BASED ON SOIL SUPPORTING CAPACITIES OF 100 kPa (2,000 p.s.f.) 200 kPa (4,000 p.s.f.), AND AN INTERNAL PIPE PRESSURE OF 1000 kPa (145 p.s.i.). WHERE DIFFERENT SUPPORTING CAPACITIES OR INTERNAL PRESSURES ARE ENCOUNTERED, CONTACT AREAS SHOULD BE CALCULATED ACCORDINGLY. SAFE SUPPORTING CAPACITY SHOULD BE DETERMINED BY THE DESIGN ENGINEER, AND INCLUDE AN APPROPIATE FACTOR FOR SAFETY.
3. CONCRETE FOR THRUST BLOCKS TO BE A MINIMUM OF 32 MPa (32 MPa EQUALS 4500 p.s.i.) AT 28DAYS.
4. THRUST BLOCKS TO EXTEND INTO BOTTOM AND SIDES OF TRENCH, AND ALSO ABOVE THE PIPE: A MINIMUM OF 150mm (6") FOR HORIZONTAL BENDS, AND A MINIMUM OF 300mm (12") FOR VERTICAL BENDS.
5. ALL CONCRETE MUST RUN OVER, UNDER AND AGAINST THE BODY OF THE FITTING, AND INTO THE TRENCH WALL; HOWEVER, THE MECHANICAL JOINTS MUST BE LEFT EXPOSED.

SCALE: N.T.S.	CONCRETE THRUST BLOCK REQUIREMENTS	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	MINIMUM CONTACT AREAS	
DATE: March 2013		DRAWING N° 21



MOUNTABLE CURB



BARRIER CURB

SCALE: N.T.S.	CONCRETE CURB AND GUTTER	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	BARRIER AND MOUNTABLE TYPES	
DATE: March 2013		DRAWING N° 22

SCALE: N.T.S.

REVISION N°:

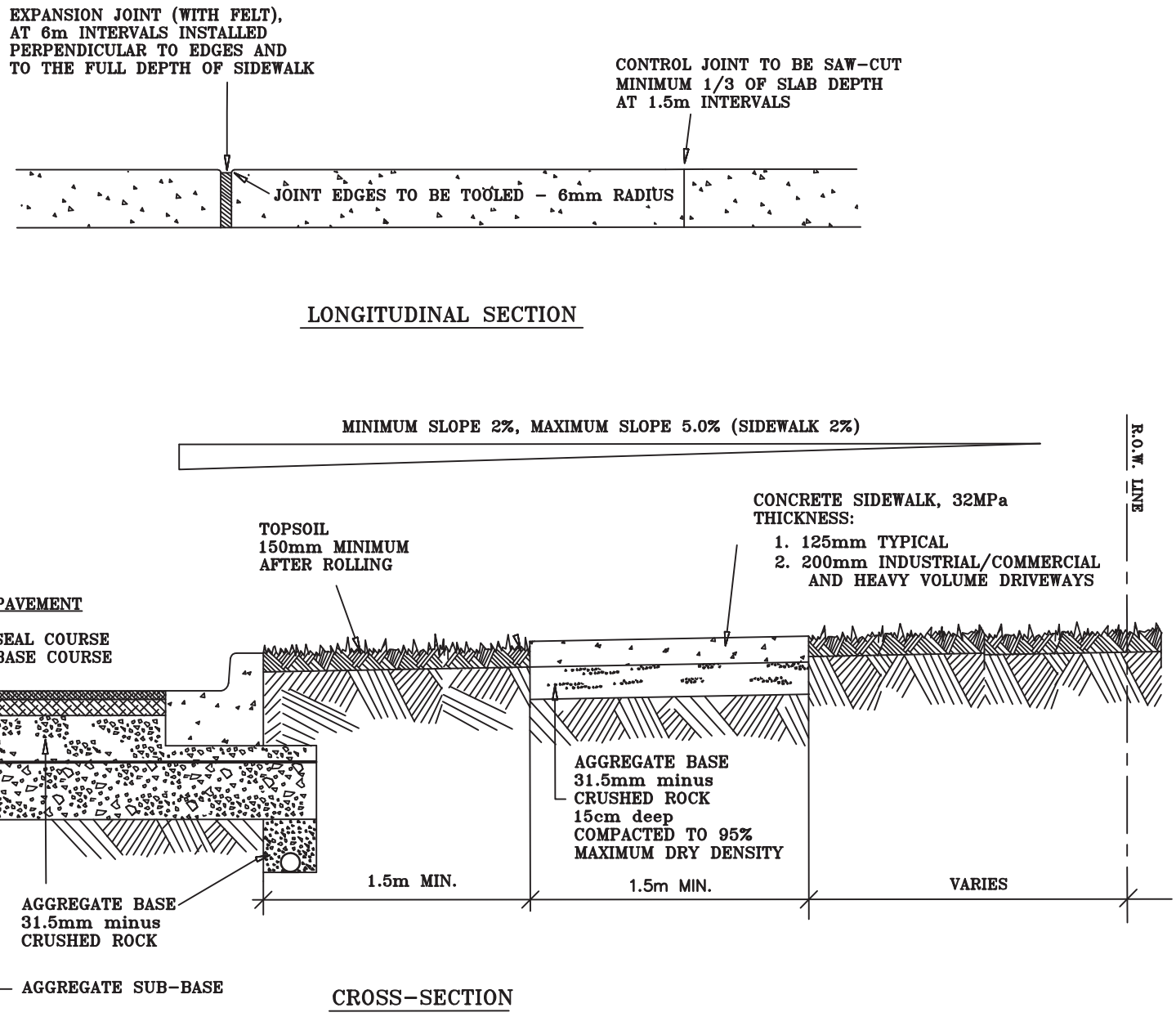
DATE: March 2013

SIDEWALK AND BOULEVARD DETAIL

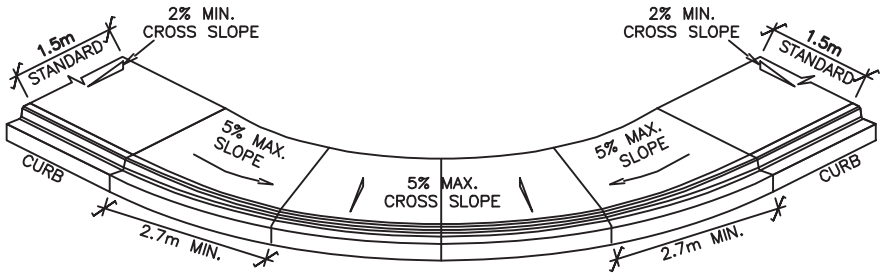
SECTIONS

TOWN OF SHEDIAC
ENGINEERING
DEPARTMENT

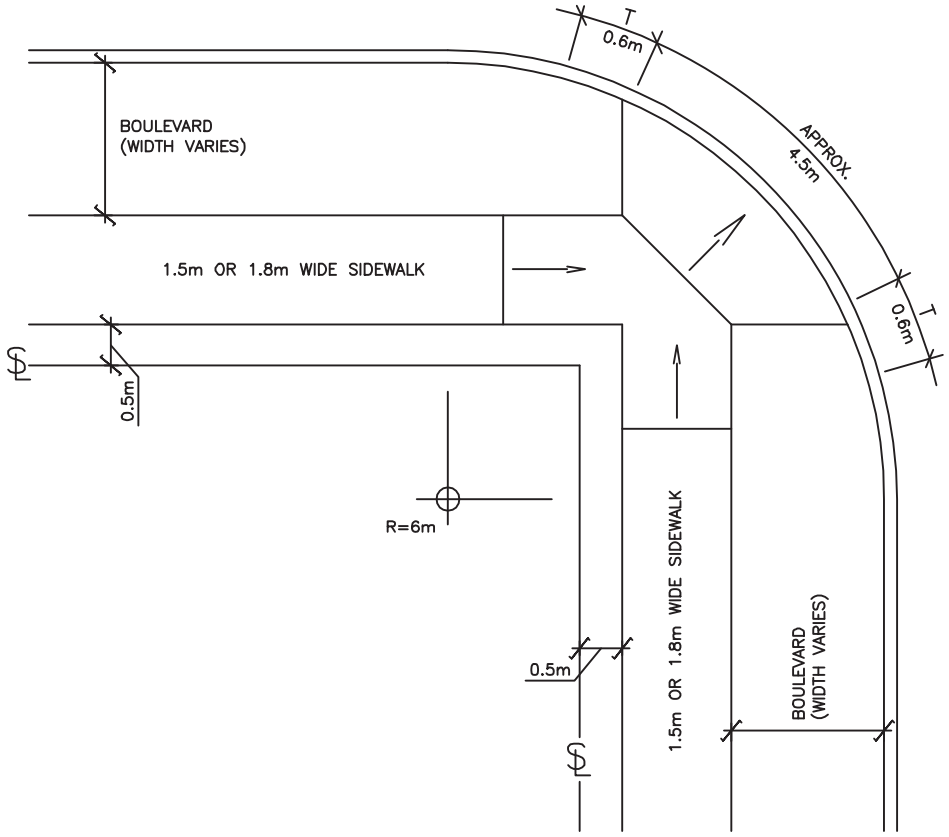
DRAWING N° 23



INTEGRATED CURB AND SIDEWALK



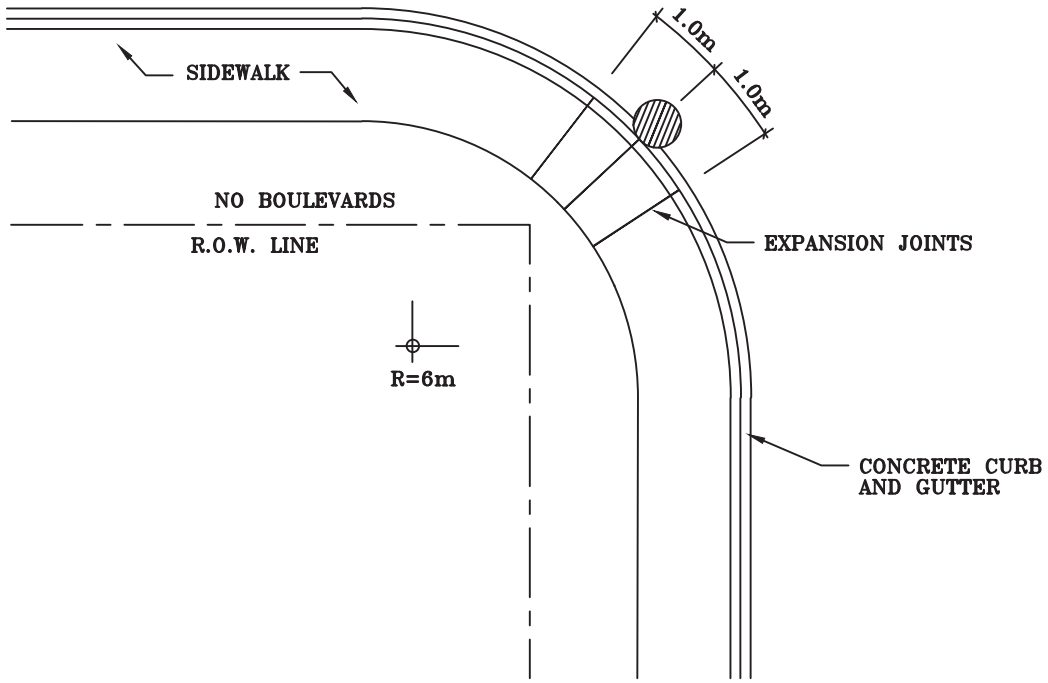
CURB AND SIDEWALK WITH BOULEVARD



NOTES:

1. 'T' DENOTES AREA WHERE CURB IS TAPERED DOWN TO GUTTER ARROWS (→) DENOTE AREA WHERE SIDEWALK IS SLOPED DOWN TO GUTTER (WHEELCHAIR RAMPS)
2. MAXIMUM SLOPE AT ANY LOCATION ON SIDEWALK IS 5%.

SCALE: N.T.S.	TYPICAL WHEELCHAIR RAMPS	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	FOR STANDARD 6m CURB RETURNS	
DATE: March 2013		DRAWING N° 24

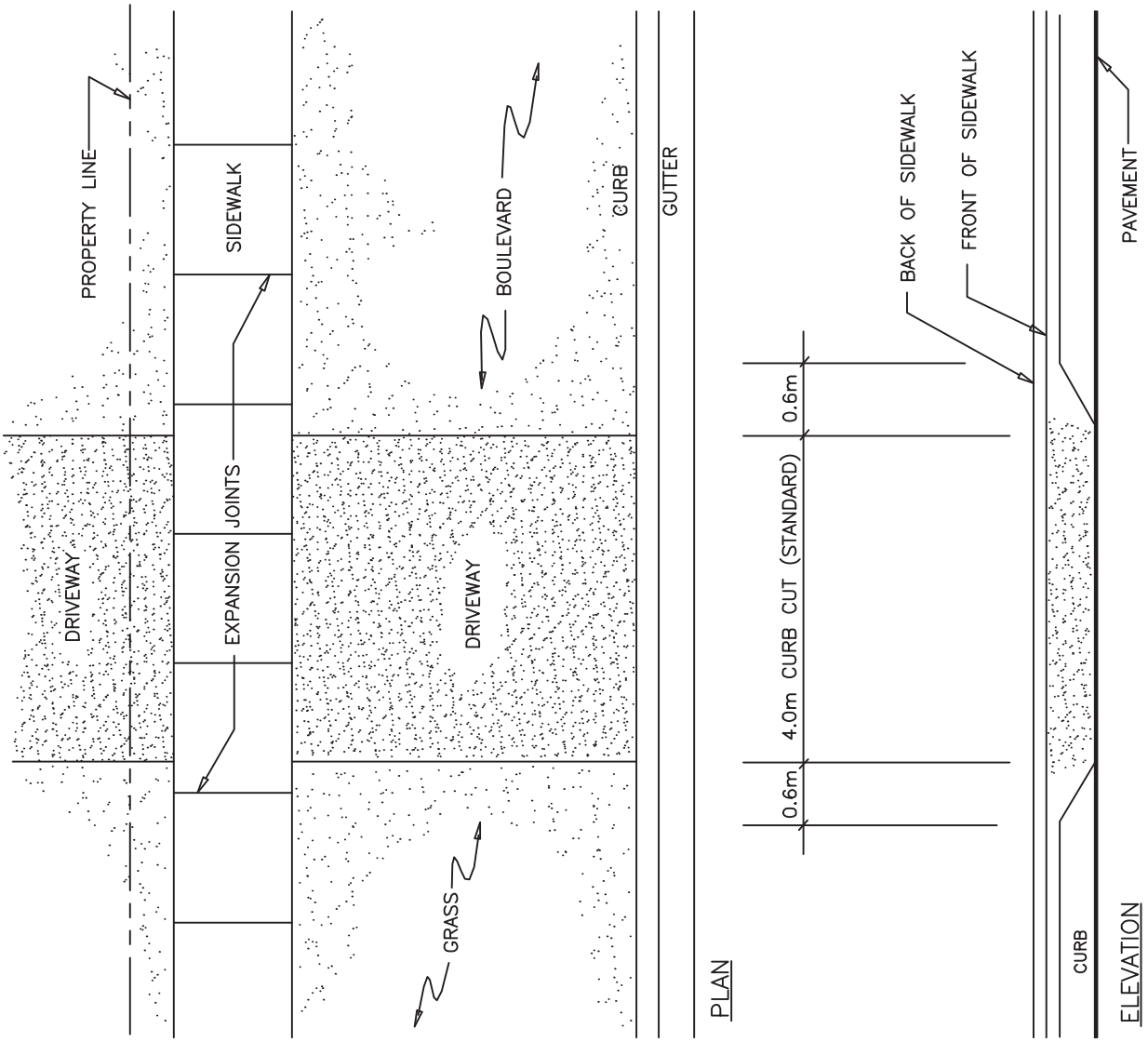


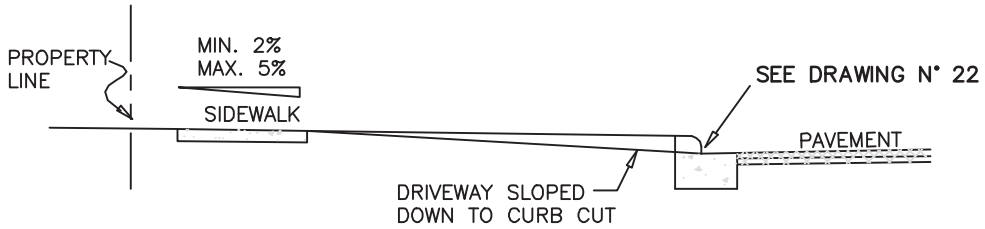
NO BOULEVARD

NOTES:

- SIDEWALK MUST BE SLOPED TO ENSURE THAT THERE IS A MAXIMUM 5% SLOPE ACROSS THE WIDTH (FROM BACK TO FRONT)
- FOR CURB & GUTTER PROFILE, SEE DRAWING N° 22

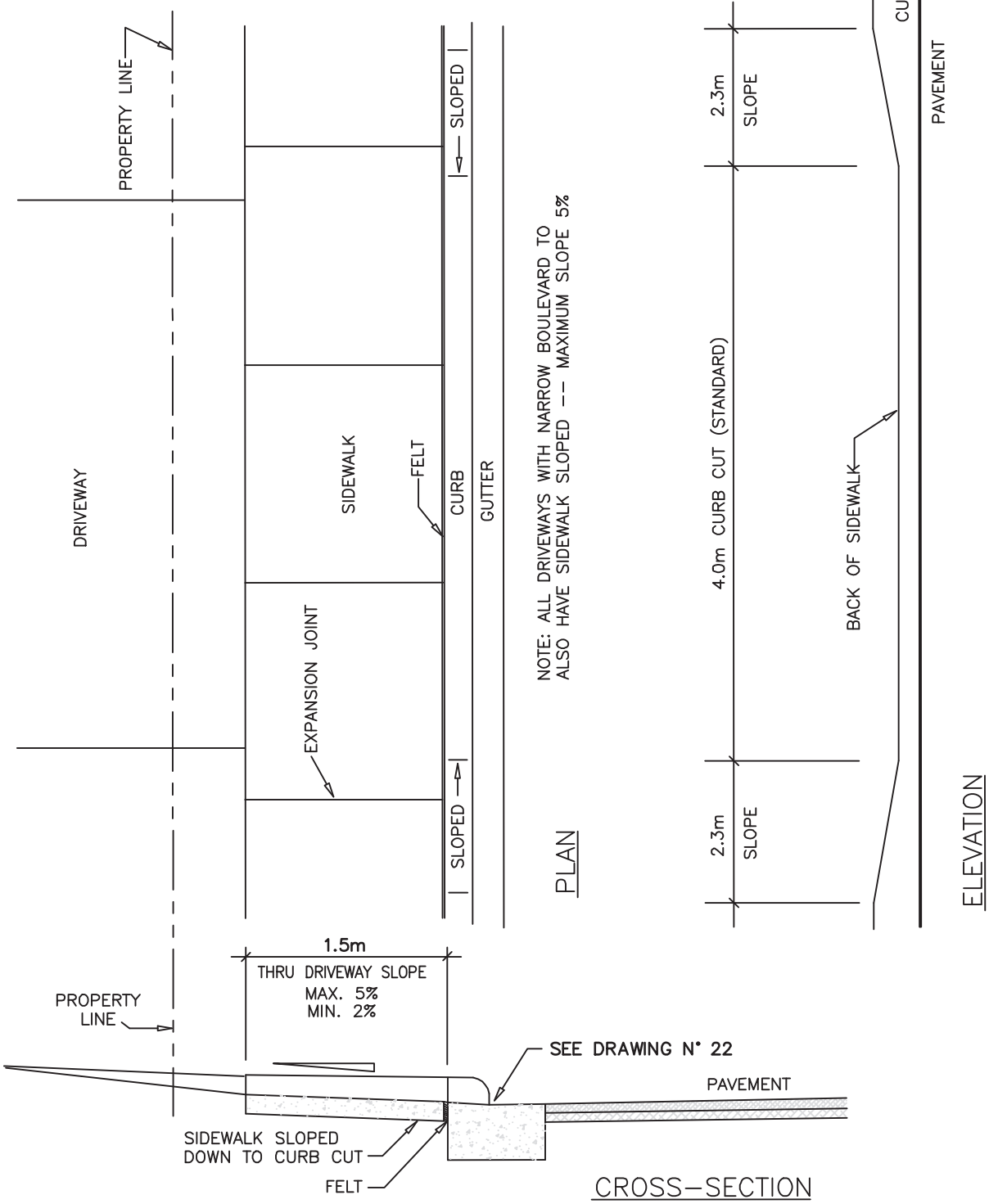
SCALE: N.T.S.	TYPICAL EXPANSION JOINTS AT CURB RADIUS	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	FOR STANDARD 6m CURB RETURNS	
DATE: March 2022		DRAWING N° 24A



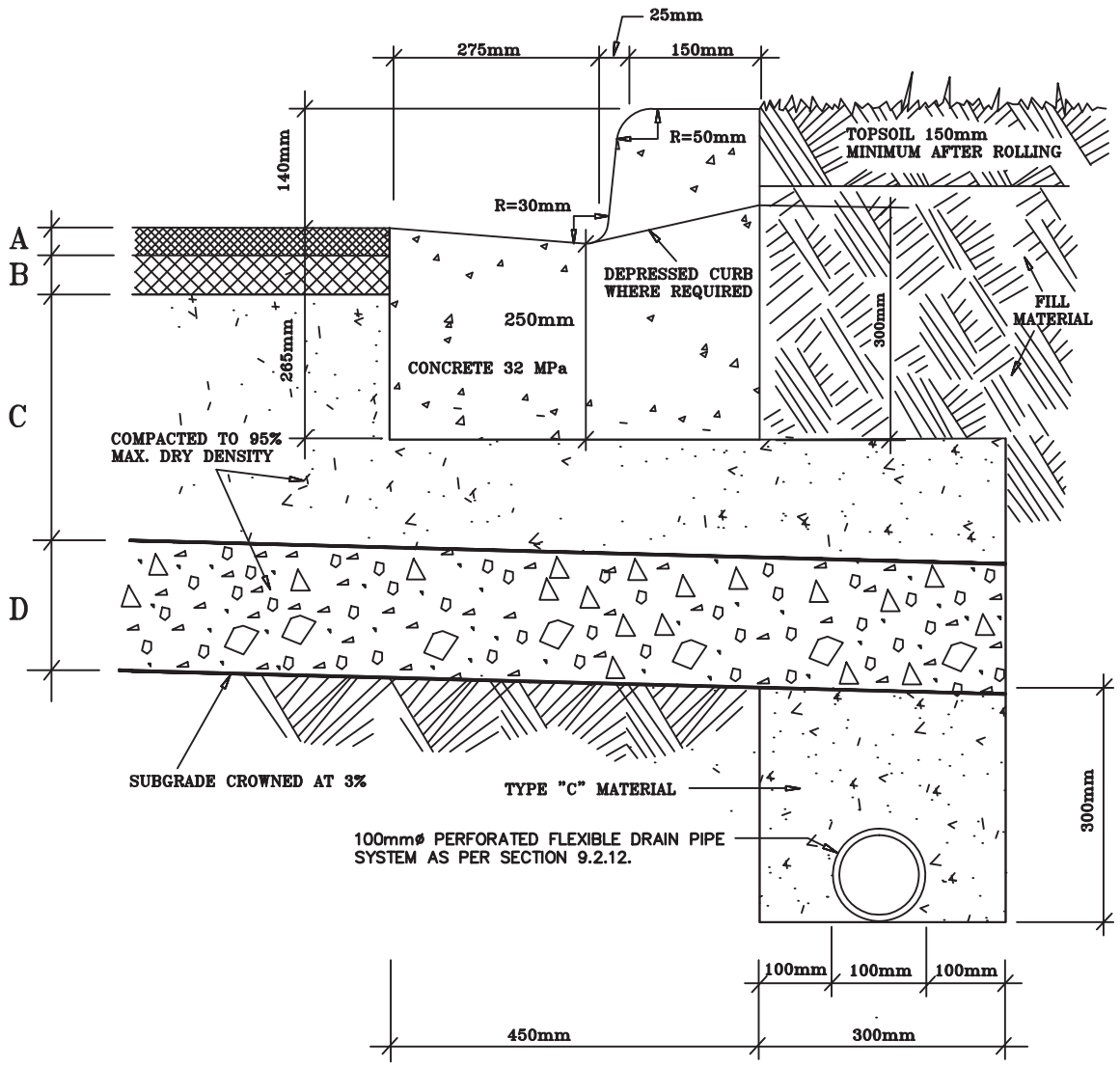


CROSS–SECTION

SCALE: N.T.S.	TYPICAL DRIVEWAY ENTRANCE	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	FOR STREETS WITH A BOULEVARD	
DATE: March 2013		DRAWING N° 25



SCALE: N.T.S.	TYPICAL DRIVEWAY ENTRANCE	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	FOR STREETS WITH SIDEWALK ADJACENT TO THE CURB	
DATE: March 2013		DRAWING N° 26



MINIMUM LONGITUDINAL SLOPE TO BE 0.5% AS PER TAC STANDARD

ITEM		DESCRIPTION	MATERIAL THICKNESSES			
			LOCAL ROADWAYS & PARKING LOTS		COLLECTOR ROADWAYS	ARTERIAL & INDUSTRIAL ROADWAYS
			Option A	Option B		
A	ASPHALT SURFACE COURSE	NBDTI TYPE "D"	40mm	40mm	40mm	40mm
B	ASPHALT BASE COURSE	NBDTI TYPE "B"	60mm	60mm	100mm	110mm
C	AGGREGATE BASE	CRUSHED ROCK 31.5mm MINUS	400mm	250mm	200mm	200mm
D	AGGREGATE SUB-BASE	CRUSHED SANDSTONE		400mm		
		CRUSHED ROCK 75mm MINUS			350mm	400mm

SCALE: N.T.S.	TYPICAL ROADBED CONSTRUCTION	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	RESIDENTIAL STREETS AND COLLECTOR / ARTERIAL STREETS	
DATE: March 2013		DRAWING N° 27

SCALE: N.T.S.

REVISION N°:

DATE: March 2013

TYPICAL ROAD CROSS-SECTION

OPEN DRAINAGE

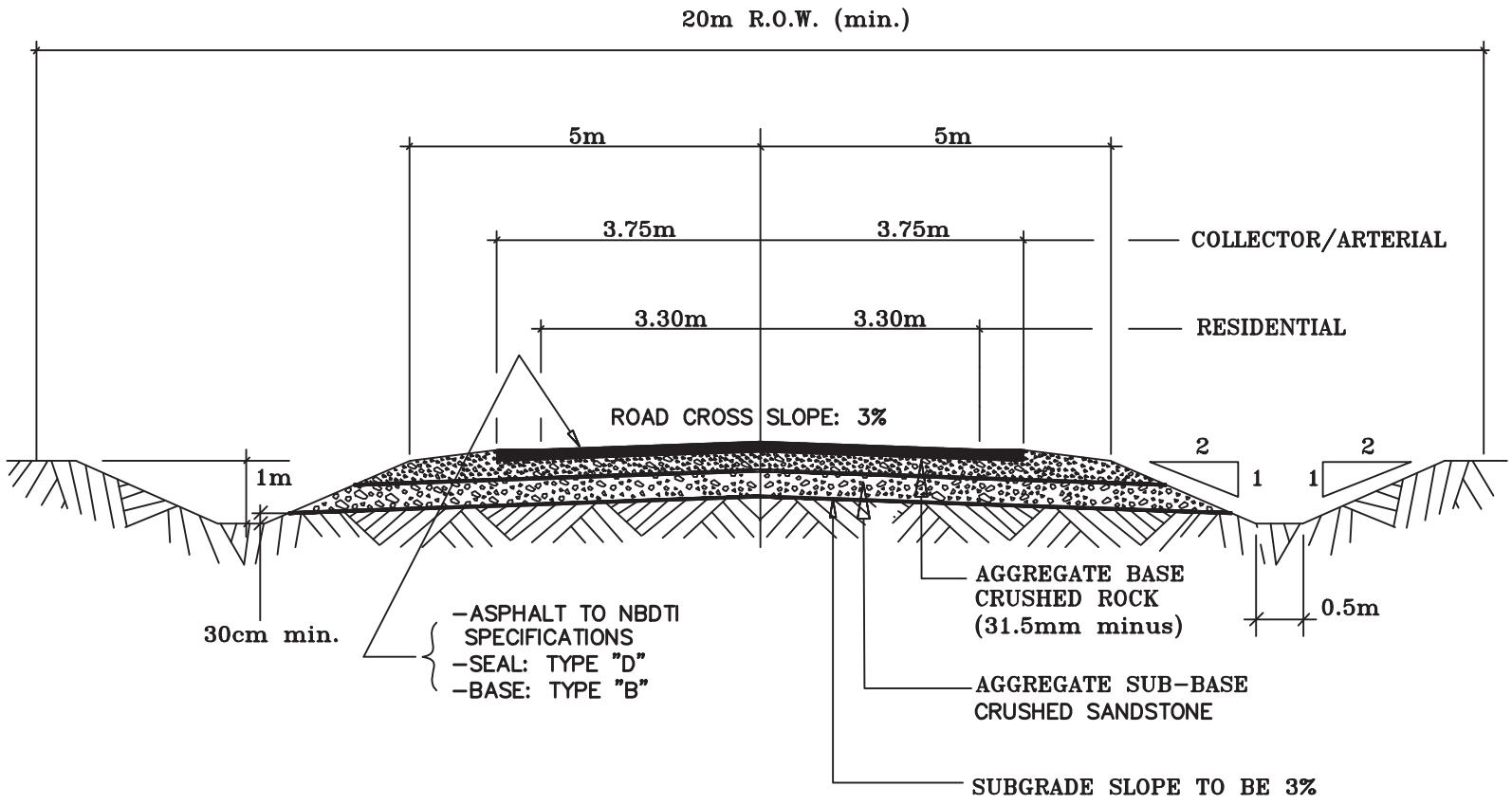


TABLE OF THICKNESSES

TYPE OF STREET	SEAL	BASE	AGGREGATE BASE	AGGREGATE SUB-BASE
RESIDENTIAL	40mm	60mm	300mm	300mm
COLLECTOR/ ARTERIAL	40mm	100mm	300mm	375mm

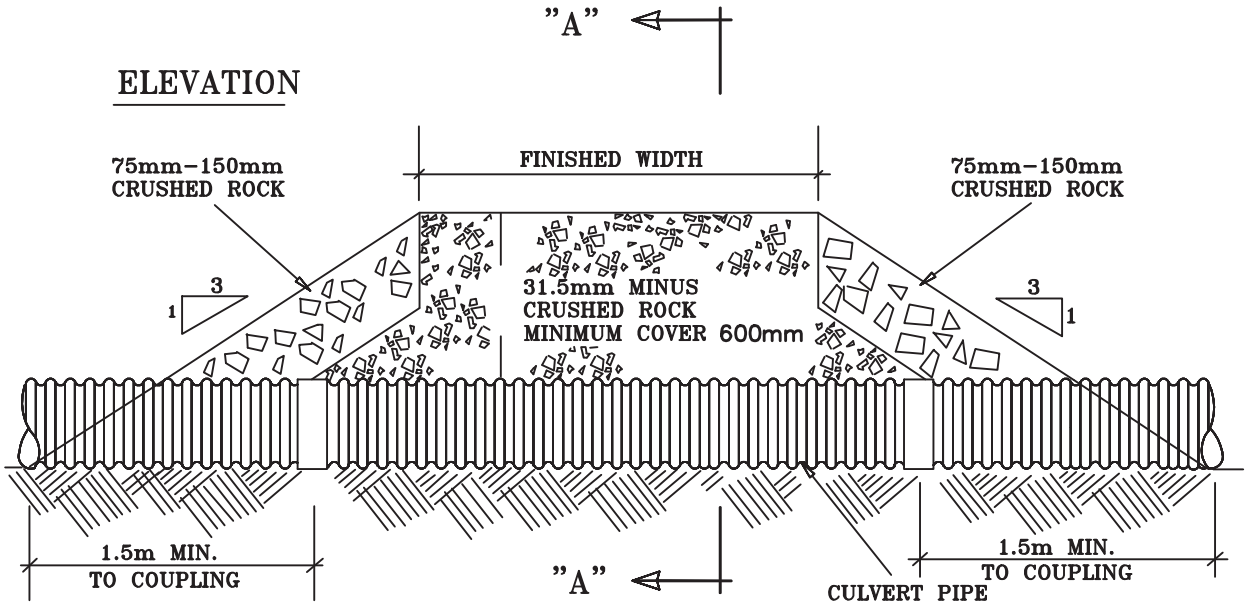
TOWN OF SHEDIAC
ENGINEERING DEPARTMENT

DRAWING N° 28

STANDARD DRIVEWAY ACCESS

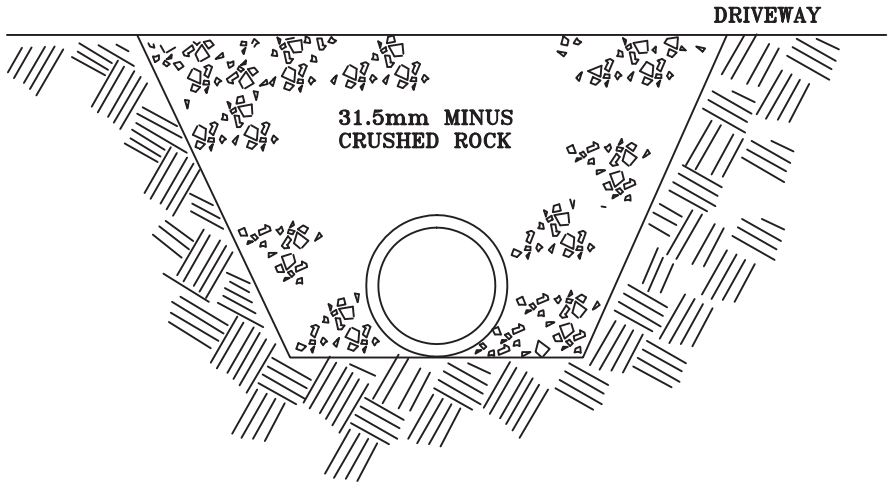
TYPE	FINISHED WIDTH
RESIDENTIAL	6m
COMMERCIAL	8m

ELEVATION



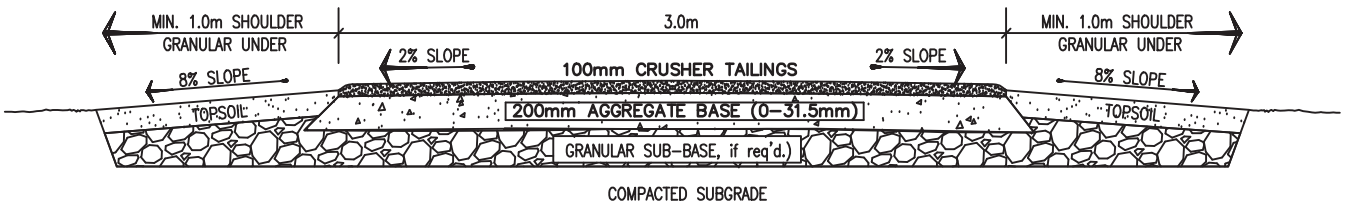
NOTES:
CULVERT PIPE TO BE HIGH DENSITY POLYETHYLENE DUAL–WALL PIPE.

NOTES:
CULVERT PIPE TO BE MINIMUM 450mmø. PIPE OF 600mmø AND LARGER TO HAVE ENDS BEVELLED AT 45°.

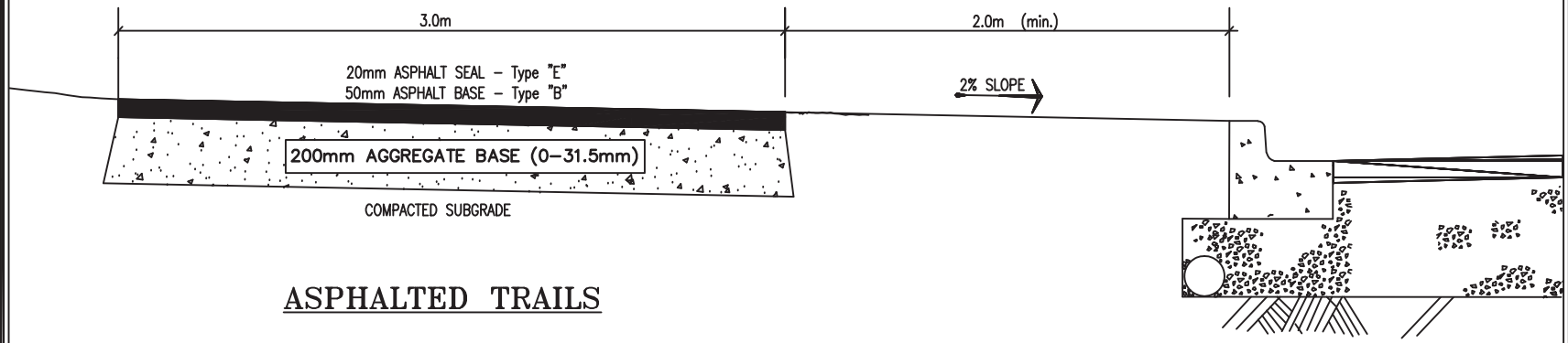


SECTION "A–A"

SCALE: N.T.S.	DRIVEWAY CULVERT	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2013		DRAWING N° 29



GRAVEL TRAILS



ASPHALTED TRAILS

MULTI-PURPOSE TRAILS

CROSS-SECTIONS

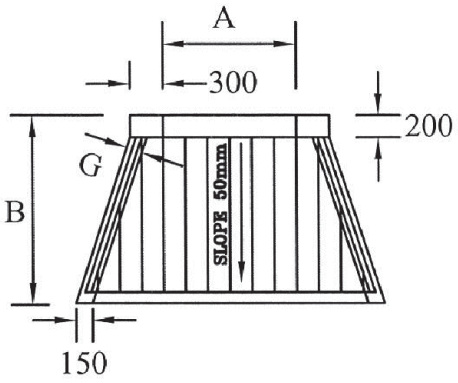
SCALE: N.T.S.

REVISION N°:

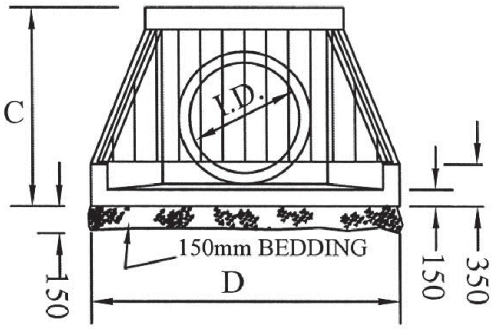
DATE: March 2013

TOWN OF SHEDIAC
ENGINEERING
DEPARTMENT

DRAWING N° 30



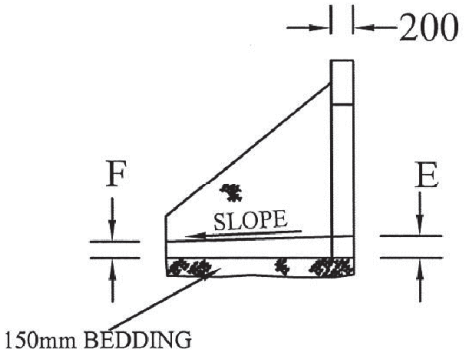
PLAN



FRONT

GENERAL SPECIFICATIONS

1. REINFORCEMENT: 15M AT 200mm c/c E.W./E.F. AND CONFORM TO CAN / CSA G30.18
2. MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS: 35 MPa.
3. AIR CONTENT: 6 TO 8%.
4. GRATE BARS TO BE GALVANIZED STEEL, OR APPROVED EQUAL TO SECTION 6.7.3.5, SPACED @ 200 O/C MAX. FASTENED TO TOP OF SLOPI WITH 6 X 50 FLAT PLATE, HINGES, AND LOCKING MECHANISM . VERTICAL BARS FOR INLETS AND HORIZONTAL BARS FOR OUTLETS
5. 450mm THICK RIPRAP AT END OF HEADWALL.
6. ALL CONCRETE WORK TO CONFORM TO CAN/CSA STANDARD A23



SIDE VIEW

Minimum Dimensions (mm)	PIPE I.D. (mm)		
	600	900	1200
A (PIPE O.D.)	850	1200	1525
B (LENGTH)	1450	1500	1900
C (HEIGHT)	1450	1500	1900
D (WIDTH)	2450	2800	3300
E (SLAB)	200	200	200
F (SLAB)	150	150	150
G (SIDE WALLS)	150	150	200

525mmø **375mmø & 450mmø**

INLET GRATE DETAIL

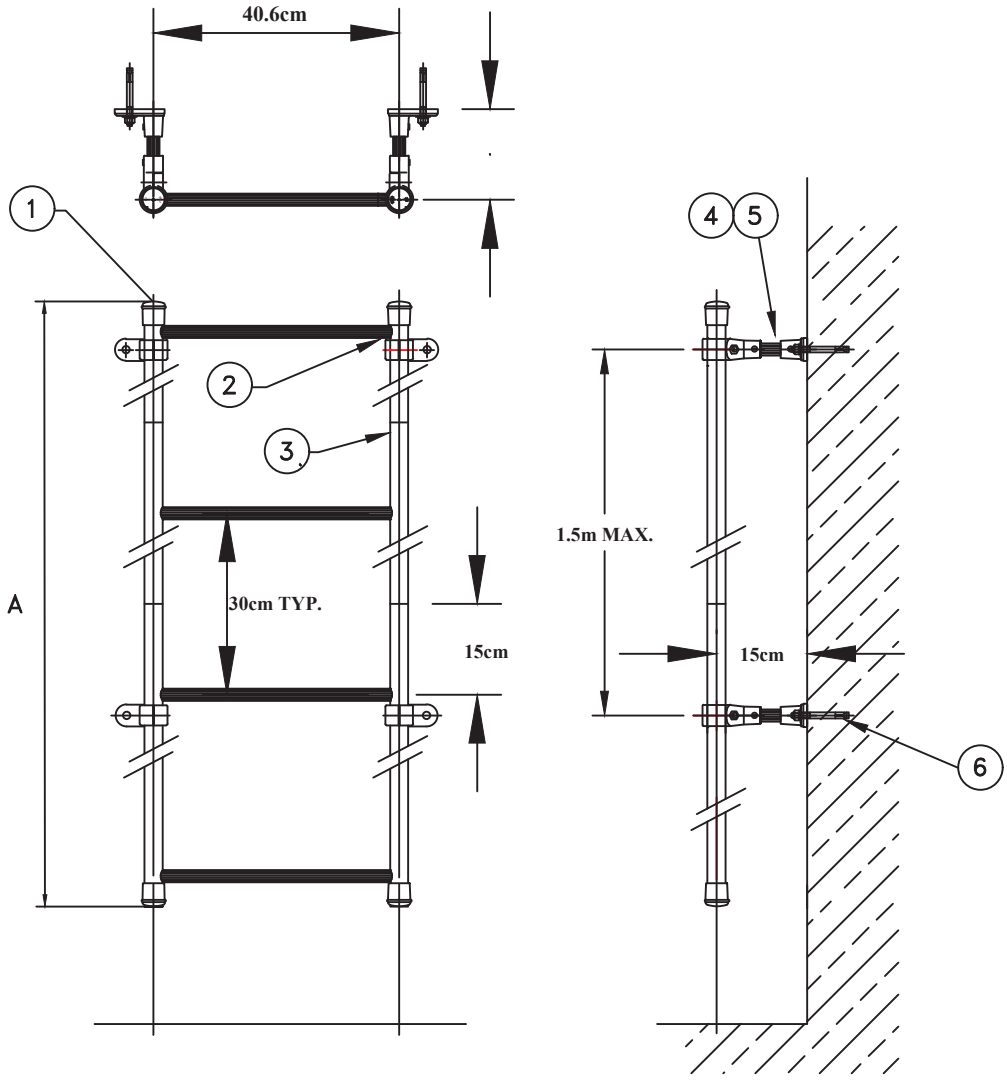
525mmø **375mmø & 450mmø**

OUTLET GRATE DETAIL

NOTES:

1. STEEL GRATE OF 15 M BARS SPACED AT EQUAL INTERVALS.
2. DRILLED HOLES FOR GRATE TO BE GROUTED AROUND BARS.

SCALE: N.T.S.	STORM SEWER	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	HEADWALL & GRATE DETAILS	
DATE: March 2022		DRAWING N° 31

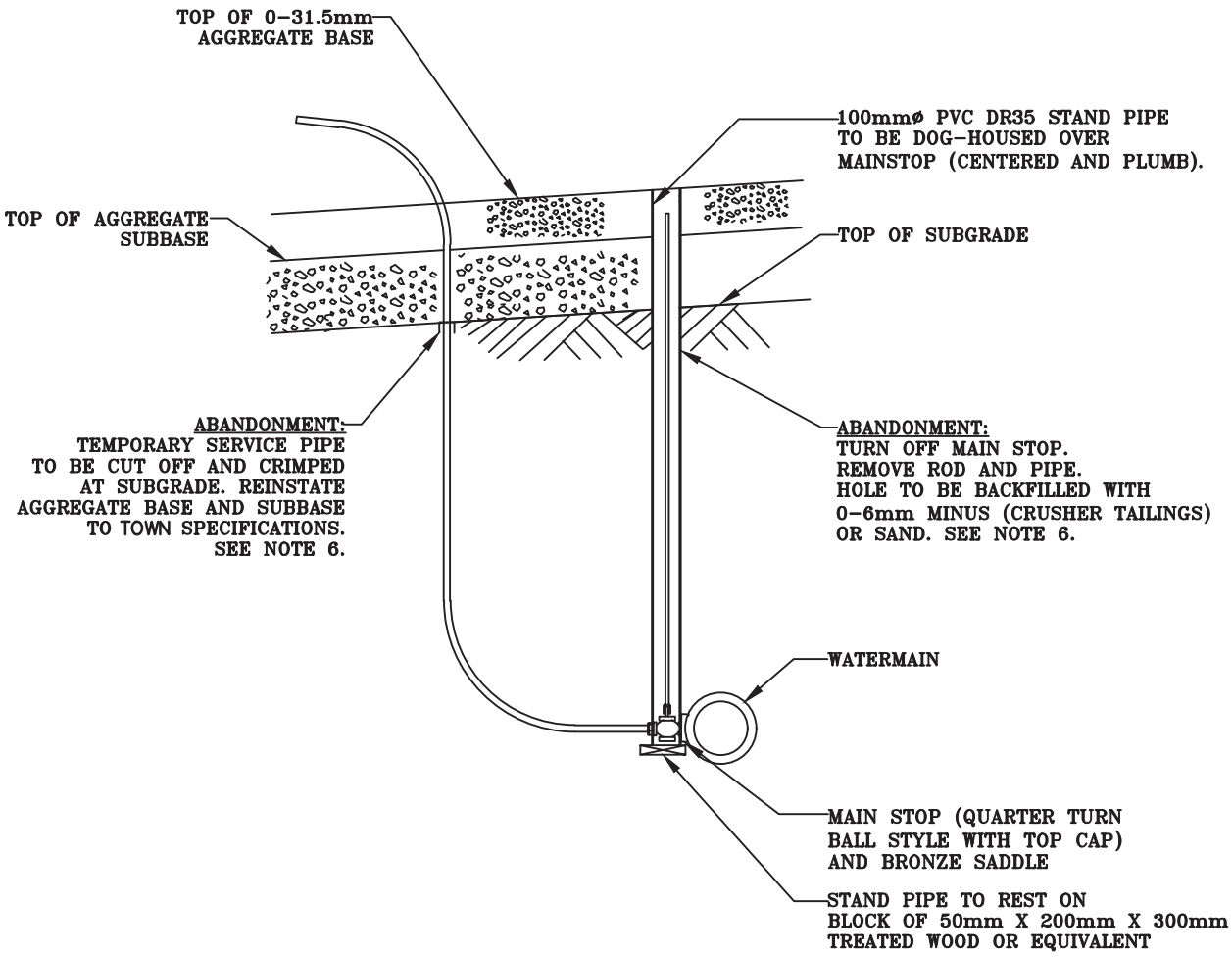


	QTY.	MATERIAL	DESCRIPTION
1	4	GREY POLYETHYLENE	30.0 I.D END CAP
2	AS REQ'D	ALUM. EXT. 6351-T6	20.0 O.D X 14.0 I.D H-5744 ALUMINUM EXTRUSION RUNGS
3	2	ALUM. EXT. 6351-T6	30.0 O.D X 24.0 I.D A-8368 ALUMINUM EXTRUSION LADDER RAIL
4	AS REQ'D	BLACK BITUMINOUS	ISOLATION PAINT
5	AS REQ'D	MODEL N° 8120	LADDER BRACKET BOLT ON STYLE
6	AS REQ'D	STAINLESS STEEL 304	3/8" X 3 3/4" HILTI K.B. II ANCHOR C/W NUT, FLAT AND LOCK WASHERS

NOTES:

1) **WELDING SHALL CONFORM TO CSA W47.2 AND W59.2**
2) **WELDED SUFACES REMAIN AS WELDED.**
3) **SURFACE FINISH - CLEAR SATIN ANODIZED (OPTIONAL).**
4) **"A" DISTANCE 6.4m MAX. LENGTH IN ONE PC. CONSTRUCTION.**
5) **TO BE USED IN VALVE CHAMBERS ONLY**

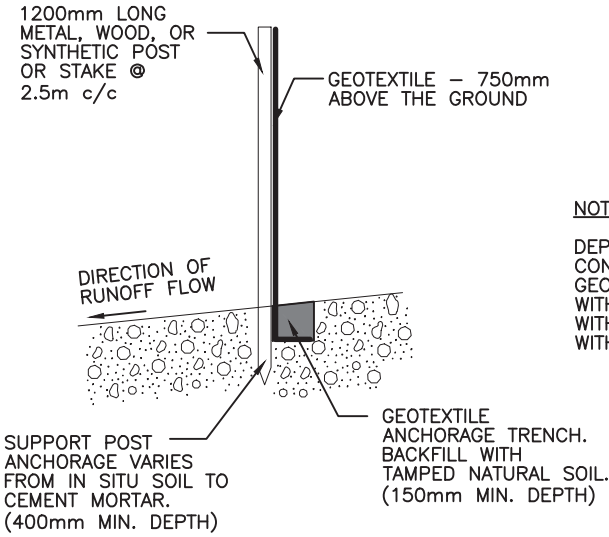
SCALE: N.T.S.	STANDARD MANHOLE LADDER	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	MODEL MSU 1105 ACCESS LADDER	
DATE: March 2022		DRAWING N° 33



NOTES:

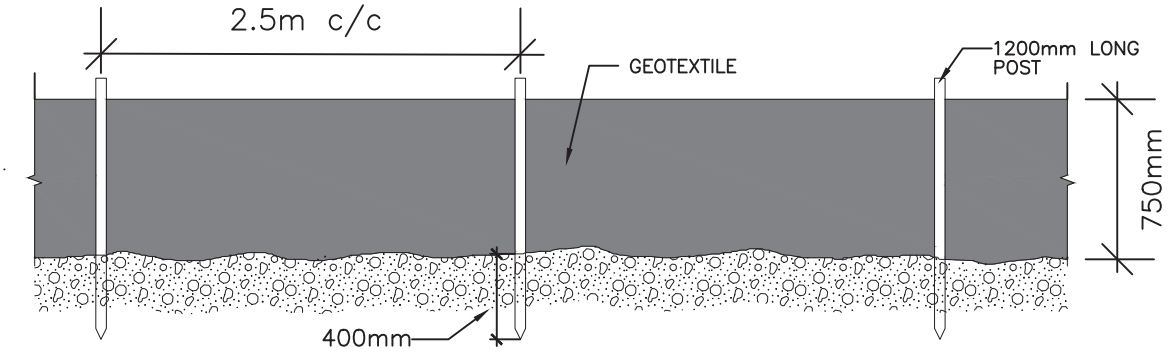
1. BRONZE SERVICE SADDLE IS REQUIRED ON ALL WATERMAINS.
2. ALL FITTINGS SHALL BE COMPRESSION TYPE FITTINGS.
3. TEMPORARY SERVICE PIPE TO BE Q-LINE, MUNICIPEX OR APPROVED EQUAL.
4. INJECTION OR FLUSHING SERVICE PIPE DIAMETER AS PER CONSTRUCTION PLANS.
5. PLACEMENT OF 0-31.5mm AGGREGATE BASE TO BE COMPLETE PRIOR TO WATERMAIN TESTING AND DISINFECTION.
6. ABANDONMENT OF TEMPORARY WATER SERVICE TO BE DONE ONCE ALL WATERMAIN TESTING AND DISINFECTION HAS BEEN COMPLETED AND APPROVED BY THE TOWN.

SCALE: N.T.S.	TYPICAL INJECTION/FLUSHING POINT	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:	TEMPORARY SERVICE	
DATE: March 2022		DRAWING N° 34



NOTE:

DEPENDING UPON CONFIGURATION, ATTACH GEOTEXTILE TO WIRE MESH WITH HOG RINGS, STEEL POST WITH TIE WIRES, WOOD POST WITH STAPLES.



SCALE: N.T.S.	SEDIMENT CONTROL FENCE	TOWN OF SHEDIAC ENGINEERING DEPARTMENT
REVISION N°:		
DATE: March 2022		DRAWING N° 35

APPENDIX "B"

TENDER FORM

TOWN OF SHEDIAC
ENGINEERING DEPARTMENT

SAMPLE

Tender Submitted By: _____

Address: _____

Telephone Nº _____

Administrator/Clerk
Town of Shediac
290 Main Street, unit 300
Shediac, NB
E4P 2E3

Dear Sir/Madam:

We, the undersigned, hereby offer and agree to furnish all and every kind of labour, tools, implements, machinery, plant, maintenance, materials and incidental items that may be required to execute and complete all work embraced in the construction of the above names project and in accordance with the plans, the Tender Form, the Town "Standard Municipal Specifications", supplementary specifications and such revisions, 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 full compliance with all plans and specifications for the performance of the work for the unit or fixed prices tendered herein.

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

APPENDIX "B"

TENDER FORM

TYPICAL UNIT PRICE
QUANTITY SHEET

SPEC. ITEM N°	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT BID PRICES (IN FIGURES)	TOTAL (IN FIGURES)
UNIT PRICES TO BE EITHER TYPEWRITTEN, PRINTED OR WRITTEN IN INK IN WORDS AS WELL AS IN FIGURES					

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

APPENDIX "B"

TENDER FORM

SUBCONTRACTORS

It is hereby agreed the following subcontractor(s) will be employed to complete portions of the work and that upon acceptance of this tender any additions or deletions hereto are subject to prior written approval of the Engineer.

SUB-TRADE CONTRACTOR ADDRESS

_____

_____

_____

_____

MACHINERY AND EQUIPMENT

It is hereby agreed the following trucks and equipment will be provided to complete the work within the time allowed and that exclusive of trucks, all major pieces of equipment will not be removed from the job site without prior written approval.

MACHINE	MAKE	MODEL NO. & YEAR	LICENSE Nº	GAS / DIESEL	NET ENGINE HORSE-POWER	BUCKET SIZE EXCAVATOR OR G.V.C. (TRUCK)

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

APPENDIX "B"

TENDER FORM

LISTING OF OTHER JOBS

The following is a listing of on-going projects that have been publicly awarded to this contractor prior to this tender. This includes any projects that are incomplete from the previous year; these projects being all of a Municipal, Provincial or Federal nature.

Project: ____

Owner: ____________________ Location ____________________

Approximate Value: ____________________ % Complete ____________________

Project Superintendent: ____________________ Project Foreman: ____________________

Project: ____

Owner: ____________________ Location ____________________

Approximate Value: ____________________ % Complete ____________________

Project Superintendent: ____________________ Project Foreman: ____________________

Project: ____

Owner: ____________________ Location ____________________

Approximate Value: ____________________ % Complete ____________________

Project Superintendent: ____________________ Project Foreman: ____________________

Project: ____

Owner: ____________________ Location ____________________

Approximate Value: ____________________ % Complete ____________________

Project Superintendent: ____________________ Project Foreman: ____________________

Project: ____

Owner: ____________________ Location ____________________

Approximate Value: ____________________ % Complete ____________________

Project Superintendent: ____________________ Project Foreman: ____________________

______________________________ ______________________________

Contractor's Name Authorized Signature

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

TENDER FORM

FOREMAN / SUPERINTENDENT

It is hereby agreed that subject to approval, the following person(s) will be employed under this contract until completion.

IF ONLY ONE PERSON OF AUTHORITY WILL BE RESPONSIBLE FOR THIS CONTRACT, THE NAME MUST BE STATED IN THE APPROPRIATE PLACE.

FOREMAN QUALIFICATIONS & EXPERIENCE

_____

_____

Telephone No. after normal working hours: _____

Summer Residence: _____

JOB SUPERINTENDENT QUALIFICATIONS & EXPERIENCE

_____

_____

Telephone No after Normal working hours: _____

Summer Residence: _____

COMMENCEMENT AND COMPLETION DATES

This contract provides for ____ number of "working days" as defined in the General Conditions paragraph l.10. The Contractor shall commence the works on or before the ____ day of _____, 20____. The date fixed for Completion is the ___ day of _____.

SECURITY DEPOSIT

Tenders must be submitted on this Tender Form and each tender must be "Properly Signed" by the tenderer and accompanied by a _____ in the amount of _____ as a guarantee that, if accepted, the tenderer will execute the contract, in full, as specified.

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

APPENDIX "B"

TENDER FORM

It is hereby agreed that this offer is irrevocable for sixty (60) working days from the date on which tenders are opened and if accepted, I (we) undertake to enter into a contract for the execution of the work and to complete the work within the time allowed.

The undersigned hereby declares that this tender is made without any connection or collusion with any persons making any tender or estimate for this work and no person employed by or holding office under the Town has any interest in this tender or in supplies for work to which it relates or in any portion of the profits thereof.

DATED
AT _____

THIS _____ DAY OF _____, 20_____

NAME OF
FIRM _____

ADDRESS _____

SIGNATURE OF
WITNESS _____

NAME
(PRINTED) _____

SIGNATURE OF
REPRESENTATIVE _____

NAME
(PRINTED) _____

TITLE
(PRINTED) _____

SIGNATURE OF
WITNESS _____

NAME
(PRINTED) _____

SIGNATURE OF
REPRESENTATIVE _____

NAME
(PRINTED) _____

TITLE
(PRINTED) _____

THE LOWEST OR ANY TENDER WILL NOT NECESSARILY BE ACCEPTED.

THE TOWN RESERVES THE RIGHT TO REJECT ANY OR ALL TENDERS.

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

APPENDIX "B"

TENDER FORM

IN MAKING A DECISION TO AWARD A CONTRACT, PURSUANT TO THIS INVITATION TO TENDER, THE TOWN MAY TAKE INTO ACCOUNT THE FOLLOWING:

1. THE TENDERER'S HISTORY OF WORK PERFORMED ON SIMILAR OR DIFFERENT TYPES OF WORK IN PRIOR CONTRACTS WITH THE TOWN.

2. THE TENDERER'S HISTORY PERTAINING TO HEALTH AND SAFETY PERFORMANCE.

3. THE COMPETENCE OF THE TENDERER WITH RESPECT TO HIS QUALIFICATIONS TO PERFORM THE WORK, THE QUALITY OF HIS PAST WORK, AND HIS FINANCIAL CAPABILITY TO COVER THE WORK.

4. WETHER OR NOT THE TENDER CONTAINS AN UNBALANCED BID.

THE TENDER MUST BE "PROPERLY SIGNED" IN ACCORDANCE WITH SECTION 4.1.3. OF THE INSTRUCTIONS TO TENDERERS CONTAINED IN THE TOWN OF SHEDIAC STANDARD MUNICIPAL SPECIFICATIONS.

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

APPENDIX "B"

TENDER SUBMISSION CHECKLIST

BEFORE SUBMITTING YOUR TENDER, CHECK THE FOLLOWING IMPORTANT POINTS:

1. ARE YOU IN POSSESSION OF AND HAVE READ THE LATEST EDITION OF THE "TOWN OF SHEDIAC STANDARD MUNICIPAL SPECIFICATIONS" AND LATEST REVISIONS THERETO? _____

2. HAVE YOU READ AND UNDERSTOOD THE DEFINITION OF "**PROPERLY SIGNED**" AS DEFINED IN THE INSTRUCTIONS TO TENDERERS PARAGRAPH 4.1.3.? _____

3. HAVE YOU SUMITTED PRICES FOR ALL ITEMS AND COMPLETED ALL SCHEDULES AND PRICES IN THE FORM OF TENDER? _____

4. HAVE YOU WRITTEN EACH UNIT PRICE OR LUMP SUM PRICE OUT IN WORDS INCLUDING THE WORDS "DOLLARS" AND "CENTS"? _____

5. HAVE YOU INCLUDED A SECURITY DEPOSIT OF THE SPECIFIED TYPE AND AMOUNT? _____

6. HAVE YOU LISTED YOUR SUBCONTRACTORS, MACHINERY AND EQUIPMENT AND FOREMAN/SUPERINTENDENT? _____

7. HAVE YOU COMPLETED THE CONSTRUCTION SCHEDULE INDICATING YOUR WORK ACTIVITIES AND LENGTH OF TIME REQUIRED TO COMPLETE THE JOB? (THIS APPLIES ONLY IF THE CONSTRUCTION SCHEDULE IS CALLED FOR IN THE TENDER FORM.) _____

8. HAVE YOU INCLUDED WITH YOUR TENDER SUBMISSION, A LETTER INDICATING THAT THE BID BOND (IF REQUIRED) HAS BEEN OBTAINED FROM AN AGENT LICENSED TO DO BUSINESS IN NEW BRUNSWICK? _____

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

TENDER SUBMISSION CHECKLIST

9. HAVE YOU ENCLOSED WITH YOUR TENDER A COPY OF ALL ADDENDA ISSUED, EACH ONE "**PROPERLY SIGNED**"? _____

10. HAVE YOU INCLUDED WITH YOUR TENDER SUBMISSION A COPY OF THE RESOLUTION FROM YOUR BOARD OF DIRECTORS REGARDING SIGNING AUTHORITY; SAID COPY MUST BE "**PROPERLY SIGNED**"? _____

11. IS YOUR TENDER FORM "**PROPERLY SIGNED**"? _____

12. ARE YOU SUBMITTING YOUR TENDER IN AN ENVELOPE HAVING ON THE FACE OF IT THE NAME OF THE TENDERER AND IDENTIFICATION OF THE CONTRACT FOR WHICH THE TENDER IS SUBMITTED? _____

13. ARE YOU SUBMITTING WITH YOUR TENDER A CURRENT LETTER OF GOOD STANDING UNDER THE CERTIFICATE OF RECOGNITION PROGRAM ISSUED BY THE NB CONSTRUCTION SAFETY ASSOCIATION OR AN ACCEPTABLE EQUIVALENT? _____

14. HAVE YOU INCLUDED WITH YOUR TENDER SUBMISSION, A CLEARANCE CERTIFICATE FROM **WORKSAFE NB**? _____

THIS CHECKLIST IS PROVIDED FOR YOUR CONVENIENCE ONLY A REMINDER OF THE MAJOR REQUIREMENTS FOR THE SUBMISSION OF TENDERS. IT IN NO WAY RELIEVES THE BIDDER FROM THE OBLIGATION TO READ AND BECOME THOROUGHLY FAMILIAR WITH ALL REQUIREMENTS OF THE TOWN OF SHEDIAC STANDARD MUNICIPAL SPECIFICATIONS AND TENDERING PROCEDURES.

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

TOWN OF SHEDIAC

STATUTORY DECLARATION

FOR PROGRESS CLAIM PAYMENTS

CONTRACT NAME: _____

CONTRACT Nº: _____

CONTRACTOR: _____

I SOLEMNLY DECLARE THAT ALL PERSONS WHO HAVE BEEN EMPLOYED TO DO THE WORK, OR WHO HAVE FURNISHED EQUIPMENT, MATERIALS OR SERVICES FOR THE WORK, OR PERSONS ENTITLED TO A LIEN UNDER THECONSTRUCTION REMEDIES ACT, HAVE BEEN FULLY PAID AND THAT, ATTACHED HERETO, IS A CERTIFICATE FROM WORKSAFE*NB* STATING THAT ALL REQUIRED PAYMENTS RELATING TO THIS CONTRACT HAVE BEEN PAID.

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, AND BY VIRTUE OF THE EVIDENCE ACT.

I/WE, THE UNDERSIGNED, ALSO DECLARE THAT THE FIRM OF _____, HAS NO FURTHER CLAIMS WHATSOEVER, AGAINST THE TOWN OF SHEDIAC WITH RESPECT TO THIS CONTRACT, EXCEPT FOR THIS PROGRESS CLAIM AND RETAINED HOLDBACKS TO DATE.

DECLARED BEFORE ME

IN THE _____ OF _____)
)
IN THE PROVINCE OF _____)
)
THIS _____ DAY OF _____, 20_____)
) _____
) SIGNATURE OF CONTRACTOR
)
)
)_____
) NAME (PRINTED)
)
)
) _____
) TITLE
)
)
_____
A COMMISSIONER OF OATHS OR NOTARY) AFFIX COMPANY SEAL

APPENDIX "C"

TOWN OF SHEDIAC

STATUTORY DECLARATION

FOR RELEASE OF HOLDBACK

CONTRACT NAME: _____

CONTRACT Nº: _____

CONTRACTOR: _____

I SOLEMNLY DECLARE THAT ALL PERSONS WHO HAVE BEEN EMPLOYED TO DO THE WORK, OR WHO HAVE FURNISHED EQUIPMENT, MATERIALS OR SERVICES FOR THE WORK, OR PERSONS ENTITLED TO A LIEN UNDER THE CONSTRUCTION REMEDIES ACT, HAVE BEEN FULLY PAID AND THAT, ATTACHED HERETO, IS A CERTIFICATE FROM WORKSAFE*NB* STATING THAT ALL REQUIRED PAYMENTS RELATING TO THIS CONTRACT HAVE BEEN PAID.

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, AND BY VIRTUE OF THE EVIDENCE ACT.

I/WE, THE UNDERSIGNED, ALSO DECLARE THAT THE FIRM OF _____, HAS NO FURTHER CLAIMS WHATSOEVER, AGAINST THE TOWN OF SHEDIAC WITH RESPECT TO THIS CONTRACT.

DECLARED BEFORE ME

IN THE _____ OF _____)
)
IN THE PROVINCE OF _____)
)
THIS _____ DAY OF _____, 20_____)
) _____
) SIGNATURE OF CONTRACTOR
)
)
)_____
) NAME (PRINTED)
)
)
) _____
) TITLE
)
_____)
A COMMISSIONER OF OATHS OR NOTARY) AFFIX COMPANY SEAL

APPENDIX "D"

CERTIFICATE OF SUBSTANTIAL PERFORMANCE OF THE CONTRACT
(Construction Remedies Act, S.N.B 2020, c.29, s.42)

_____

(*Town in which land is located*)

_____

(*civic address*)

Name of owner: _____

Address for service: _____

Name of contractor: _____

Address for service: _____

Name of payment certifier *(if applicable)*: _____

Address: _____

I/We certify that the contract for the improvement described below to the identified land was substantially performed on (*date the contract was substantially performed*): _____

_____

_____

(*short description of the improvement*)

Date certificate signed: _____

_____

(*payment certifier if there is one*)

_____

(*owner and contractor, if there is no payment certifier*)

The name and address of the office where or the person to whom a copy of the claim for lien must be given: _____

APPENDIX "E"

(LEFT BLANK)

APPENDIX "F"

CERTIFICATE OF FINAL ACCEPTANCE

CONTRACT NAME: _____

CONTRACT Nº: _____

CONTRACTOR: _____

I, _____, PROJECT MANAGER, HEREBY CERTIFY THAT ALL WORK REQUIRED UNDER THIS CONTRACT IS ACCEPTED AS OF THE _____ DAY OF _____, 20_____.

1. **A "CERTIFICATE OF SUBSTANTIAL PERFORMANCE" WAS ISSUED ON _____.**

2. **A COMPETED STATUTORY DECLARATION FOR FINAL ACCEPTANCE, PERTAINING TO THIS CONTRACT, DATED _____, IS ATTACHED HERETO, INCLUDING A LETTER FROM WORKSAFE*NB*.**

3. **A FINAL INSPECTION OF THE WORK WAS CARRIED OUT ON_____ AND THOSE PRESENT WERE:**
   _____
   _____

4. **A FINAL DEFICIENCY LIST WAS PREPARED YES___ NO ___ (IF YES, ATTACH)**

   THE ATTACHED DEFICIENCY LIST HAS BEEN ADDRESSED BY THE CONTRACTOR AND AN ADDITIONAL INSPECTION CONDUCTED ON _____ BY _____CONFIRMED THAT ALL ITEMS NOW MEET TOWN REQUIREMENTS.

5. **PORTION OF WORK IN DISPUTE YES ____ NO ____**
   CONTRACT ENTIRELY COMPLETED YES ____ NO ____

6. **AS-BUILT DRAWINGS ARE COMPLETED YES ____ NO ____ AND ON FILE AS NUMBER _____. (IF NO, EXPLAIN)**
   _____

I FURTHER CERTIFY THAT ALL MATTERS RELATING TO THIS CONTRACT HAVE BEEN COMPLETED TO MY SATISFACTION AND THAT THE "CERTIFICATE OF FINAL ACCEPTANCE" CAN BE ISSUED.

DATE: _____ SIGNED: _____
PROJECT MANAGER

I, THE UNDERSIGNED, DO HEREBY ACKNOWLEDGE THAT ALL MATTERS RELATING TO THIS CONTRACT HAVE BEEN COMPLETED AND HEREBY ISSUE THIS "CERTIFICATE OF FINAL ACCEPTANCE".

DATE:_____ SIGNED: _____
DIRECTOR OF ENGINEERING

cc: CONTRACTOR

APPENDIX "G"

(LEFT BLANK)

APPENDIX "H"

WATERMAIN LEAKAGE TEST

GENERAL INFORMATION

CONTRACT NAME _____

SECTION OF TEST _____

LOCATION OF TEST PUMP STATION _____

DATE _____ WEATHER _____

CONTRACTOR _____

CONSULTANT _____

ALLOWABLE LEAKAGE in LITRES

Q = ALLOWABLE LEAKAGE (litres/hr) **L** = LENGTH OF PIPE (m) = _____

D = DIAMETER OF PIPE (mm) = _____ **P** = AVG. TEST PRESSURE (kPa) = _____

1st main (150ø), $Q = \frac{L\,D\,\sqrt{P}}{795000} = \frac{(\quad m)(\quad mm)\sqrt{1030\ kPa}}{795000} =$ _____ (A) litres/hr

2nd main (200ø), $Q = \frac{L\,D\,\sqrt{P}}{795000} = \frac{(\quad m)(\quad mm)\sqrt{1030\ kPa}}{795000} =$ _____ (B) litres/hr

(A) + (B) _____ litres/hr

TOTAL ALLOWABLE LEAKAGE (x) 2hrs. _____ litres

CONDITIONS FOR TESTING	TEST RESULTS
☐ **Duration of test is 2 hours**	TIME STARTED _____ rdg. _____ cm
☐ **All water valves within test section are fully open**	TIME FINISHED _____ rdg. _____ cm
☐ **All main valves and hydrant valves within test section operated by Contractor during test**	difference in readings _____ cm
☐ **All hydrants closed during test**	$L_{actual} = \frac{\pi\, r^2\, h}{1000} = \frac{\pi(\quad cm)^2(\quad cm)}{1000} =$ _____ litres

SECTION OF TEST HAS : PASSED ☐ **FAILED** ☐

INSPECTOR (signature) _____
(print below)

Comments

_____

_____

_____

_____

APPENDIX "H"

WATERMAIN DISINFECTION

GENERAL INFORMATION

LOCATION _____

SECTION OF TEST _____

DATE _____ WEATHER _____

CONTRACTOR _____

CONSULTANT _____

PART ONE - FLUSHING

All hydrants and branch lines shall be individually flushed using the main control valve to regulate the water flow through the hydrants.

SWAB REMOVAL DATE: _____

WATERMAIN FLUSHED... (See table " A ") **YES** ☐ **NO** ☐

PART TWO - DISINFECTION

A sodium hypochlorite solution shall be injected into the watermain at a point not more than 3 metres from the main control valve. This injection shall be done with the watermain flushing through a hydrant carrying the solution throughout the watermain. The injection shall be complete when a concentration of 50mg/L free residual chlorine is achieved through all the watermain. Free residual testing shall be done by the Town of Shediac. The disinfection period shall be 24 hours, after which free residual testing shall again be done; all samples must have not less than 10mg/L. All valves to be operated during the disinfection period.

where, *Vp = Volume of pipe (cu. m.)*, *r = radius (m)*, *l = length (m)*

primary watermain size, $Vp = \pi r^2 l = \pi (\_\_\_\_ m)^2 (\_\_\_\_ m) =$ _____ *cu. m*

secondary watermain size, $Vp = \pi r^2 l = \pi (\_\_\_\_ m)^2 (\_\_\_\_ m) =$ _____ *cu. m*

TOTAL _____ *cu. m*

where, ***Vc*** = Volume of chlorine needed to disinfect

$$Vc = Vp \times 1{,}000 \text{ litres} \times \frac{50}{1{,}000{,}000} = \frac{Vp}{20} = \left(\frac{\quad}{20}\right) = \_\_\_\_ \text{ litres of 100\% chlorine}$$

where, **x** = % chlorine concentration (ex: 12% = 0.12)

Volume of chlorine required to disinfect according to % of concentration = $\frac{Vc}{x}$ = $\frac{(\_\_\_\_)}{(\quad)}$ = _____ *litres*

Total Residual Chlorine = _____ **mg/L** *(* not less than **50 mg/L** *)*

Free Residual Chlorine after 24 hrs. = _____ **mg/L** *(* not less than **10 mg/L** *)*

APPENDIX "H"

WATERMAIN DISINFECTION TABLES

CHLORINE INJECTION CALCULATIONS

WATERMAIN DISCHARGE = **114** *l* /min (25 *igpm*) or **227** *l* /min (50 *igpm*)

WATERMAIN DISCHARGE TIME = $\frac{\textit{watermain volume}}{\textit{watermain discharge}}$ example : $\frac{\textbf{2650}\ l}{\textbf{114}\ l/min} = \textbf{23}\ minutes$

$$\frac{\_\_\_\_\_\ l}{l/min} = \_\_\_\_\_\ minutes$$

INJECTION RATE FOR CHLORINE SOLUTION = $\frac{\textit{chlorine solution (l)}}{\textit{discharge time (min)}}$ example : * $\frac{\textbf{205}\ l}{\textbf{23}\ min} = \textbf{8.9}\ l/min\ (\ \textbf{2}\ igpm\ )$

$$\frac{\_\_\_\_\_\ l}{min.} = \_\_\_\_\_\ l/min\ (\quad igpm\ )$$

* Note : Chlorine solution mixed in 205 *l* (45 imperial gallon) drum.

PART THREE - BACTERIOLOGICAL TESTING

Water samples for bacteriological testing shall be taken by the Town after disinfection and flushing of the watermain is successful.

Free Residual Chlorine taken below to be less than 2 *mg/L*

Date

1st Bacteriological Test Result **passed** ☐ **failed** ☐ **Free residual Chlorine =** _____ *mg/L* _____

2nd Bacteriological Test Result **passed** ☐ **failed** ☐ **Free residual Chlorine =** _____ *mg/L* _____

Attached bacteriological test results to this form ☐

PART FOUR - COMMISSIONNING OF WATERMAIN

DISINFECTED BY: _____ (NAME) _____ (NAME) _____ (NAME)

DATE WATERMAIN PLACED IN SERVICE _____ **APPROVED** _____

APPENDIX "H"

WATERMAIN DISINFECTION TABLES

TABLE " A " - REQUIRED FLOWS TO PRODUCE 0.8m/s (2.5 ft/s)

PIPE DIAMETER &		REQ'D FLOW 0.8m/s (2.5ft/s)		NUMBER OF 2 ½"
(in.)	(mm)	IGPM	*l* / s	HYDRANT OUTLETS
4	100	83	6.3	1
6	150	167	12.6	1
8	200	333	25.2	1
10	250	500	37.9	1
12	300	750	56.8	2
16	400	1330	100.9	2

TABLE " B " - PITOT GUAGE READING FOR FLOWS

PITOT GAUGE	NOZZLE DIAMETER IN INCHES coeff= 0.99				coeff. 0.90
READING	1 ½	1 ¾	2	2 ½	2 ½
(psi)	DISCHARGE - GALLONS PER MINUTE (IGPM)				
5	124	169	222		313
6	136	186	243		343
7	147	201	262		370
8	157	214	280		396
9	167	227	297		420
10	176	240	314	488	442
12	193	264	342	538	485
14	208	283	370	577	524
16	223	303	396	618	560
18	236	322	420	655	594
20	249	339	443	690	626
30				846	767

STANDARD PROCEDURE FOR COMMISSIONING NEW WATERMAINS

GENERAL

All tests, disinfection and commissioning of watermains are to be in accordance with AWWA Standard C651 Disinfecting Water Mains, the Town of Shediac Standard Municipal Specifications, and the following procedures.

- The Contractor is to make all arrangements with the site Inspector and the Town's Engineering Department at least 48 hours prior to the start of any testing.

- The Contractor is not to operate any existing valves or hydrants.

- The Contractor is to supply all labour, equipment and materials necessary to carry out pressure and leakage tests, swabbing, sterilization and flushing of all watermains and appurtenances. There must be a Contractor's representative on site at all times when watermain disinfection, flushing and bacteriological testing takes place.

- Swabs of appropriate size are to be supplied and inserted by the Contractor. The Contractor shall insert a swab into first pipe section of the new watermain at start of construction, for each section to be tested.

  Initial flushing to remove swab requires a temporary pipe section at end of test section, to be brought up to grade with a 45 degree bend and pipe of same size and type as being installed, or a modified hydrant installed as a standpipe at the end of the main. (As shown in figure 1)

- At the discharge at the end of the main to be tested, if there is no hydrant available within the test section, the Contractor shall provide a temporary standpipe (see Figure 1), consisting of a minimum 100mm pipe with a smooth, unthreaded ½ inch sampling faucet so that water leaving the main can be tested without disturbing the flow.

- A completed Watermain Leakage Test and Disinfection form (Appendix "H" of Town of Shediac Specs) must be filled out.

GENERAL SEQUENCE FOR TESTING AND ACCEPTANCE

1. Filling and Initial Flushing
   Public Works crew to operate valves for filling the main.
   (48 hour notice to the Engineering Department at 532-7000 or 533-4037)

   Flushing shall be via permanent hydrant (if available at end of new line), by a temporary 45 degree bend and pipe installed by the Contractor. (This bend to be removed and standpipe installed as soon as swab is expelled from pipe.)

2. Pressure and Leakage Tests
   Perform pressure and leakage tests.

3. Disinfection
   System shall then be sterilized / disinfected by the Contractor and tested for chlorine residual by the Water Control Technicians. (48 hour notice to the Public Works Water Department at 532-7000 or 533-4037).

   Contractor must supply standpipe together with the necessary valves and piping, if no permanent hydrant is available at the end of the line.

4. Flushing
   Heavily chlorinated water to be discharged into the sanitary sewer through a hose connection with an air gap, and water must be de-chlorinated prior to discharge.

5. Bacteriological Testing by the Public Works Water Department
   Two tests taken 24 hours apart. Test results usually take a minimum of 48 hours. All new watermains disinfection shall commence only on the days of Monday, Tuesday and Wednesday. There must be a 48-hour notice to the Engineering Department prior to disinfection.

6. Final Flushing
   Flushing shall be carried out to remove any stagnant water allowing a Free Available Chlorine Residual to be taken of the water distribution system.

1. FILLING AND INITIAL FLUSHING

The Contractor is not to operate any existing valves or hydrants; Public Works Water staff will operate them.

Preliminary flushing shall be carried out in conjunction with swabbing operations, using relatively high flow rates (a minimum velocity of 0.9 m/sec or 3 ft/sec) by the Public Works Water Department staff opening existing valves. Standpipe to be in open position; hydrants within test section are to be closed until swab is expelled.

Once the swab is expelled, all hydrants within the section shall be opened in order to expel air.

As system fills, close fire hydrants from the low end to the high and flush main using the standpipe, or end hydrant. This standpipe or end hydrant is the last utility to be closed; it remains in the open position until all valves are closed so as not to have water from the new section of main mixing with the existing water system.

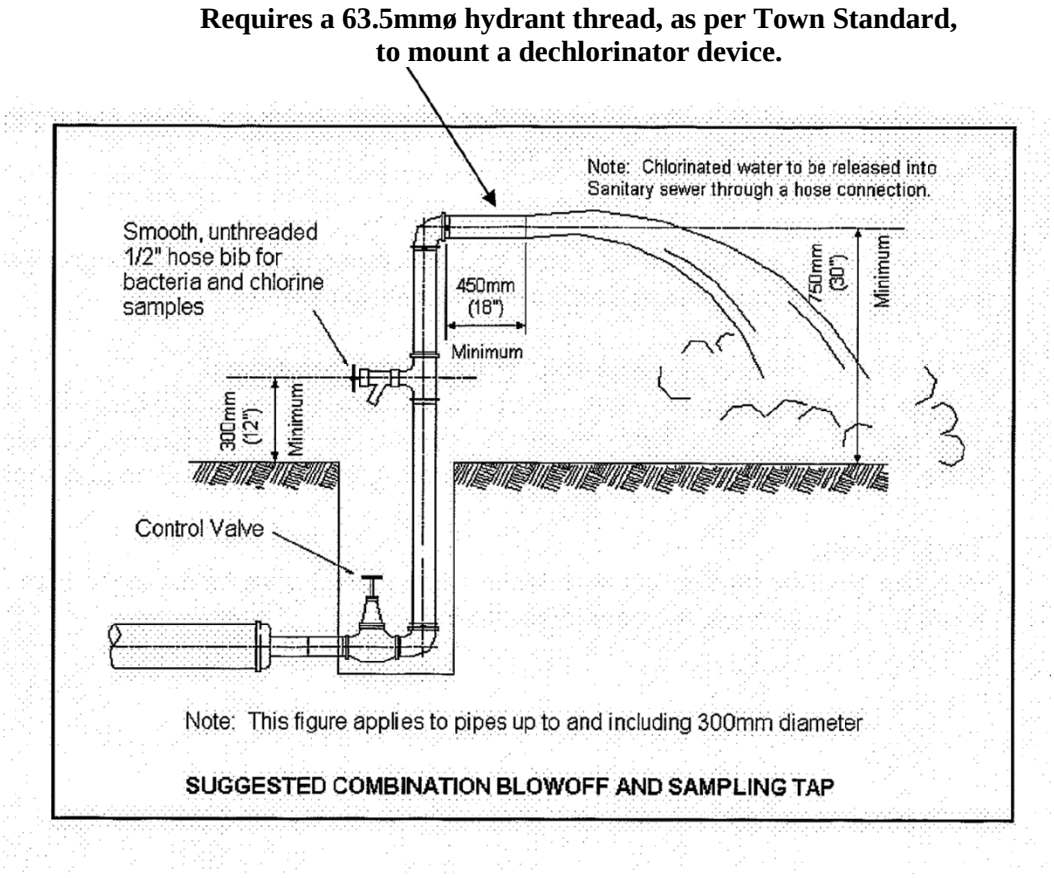


Figure 1

This standpipe is to be used when no hydrant is available at end of new main.

2. PRESSURE AND LEAKAGE TESTS

The Contractor shall provide complete testing equipment (suitable pump and storage tank, pressure gauge, relief valve and check valve), and shall provide and install the necessary piping to connect to the main.

The watermain shall be filled with water from the Town Distribution System by Town of Shediac's Public Works Water crews via existing valves.

Test Pressure: Apply hydrostatic pressure of 1030kPa (150 psi) for 2 hours.

Measure water volume required to maintain this pressure and compare to allowable leakage. This can be done by measuring the amount of water reduction in the storage tank, or by means of a calibrated water meter.

Test Allowance: Take readings every 15 minutes over a period of 2 hours. If the average leakage for the 2-hour period exceeds the allowable rate, the Contractor shall examine all parts of the main for leakage and shall take the necessary steps to reduce the leakage to the allowable rate.

The "WATER MAIN – LEAKAGE TEST AND DISINFECTION" form of this Appendix "H" must be filled out and signed the site inspector.

3. DISINFECTION

a. General Procedures

Induce a controlled flow by opening the standpipe or end hydrant and cracking gave valve at beginning of new watermain (slowly) to allow the air to escape at the hydrants and standpipe.

No valves are to be opened until hydrants and standpipes are open.

Using the 20mm service tubing (previously installed by the Contractor), inject chlorine solution (Javex 12 + Water) into the new main immediately downstream of valve being operated. Continue to move highly chlorinated water through the new pipes until required chlorine level is detected at flowing hydrant(s). Each hydrant will be concurrently closed when required chlorine level is detected.

Town of Shediac Public Works Water Department will measure chlorine residual at the open hydrant(s); when it reaches 50mg/L, shut down the water supply valve and then the hydrants. All valves and hydrants within the new section are required to be operated after the introduction of chlorine to ensure their disinfection.

Let stand for a minimum of 24 hours; at that time, Town of Shediac Public Works Water Department will take samples and retest for chlorine residual from dead ends to confirm at least 10mg/L free chlorine.

Note: Heavily chlorinated water shall never stand in the pipe for more than 48 hours, in order to prevent damage to the pipe lining or corrosion damage to the pipe itself.

b. REPAIRS – Disinfection Procedures

If repairs are made with the line under full pressure, or when cutting into or repairing an existing pipe, disinfection is required as per AWWA Standard C651.

Basic disinfection and contamination prevention procedures include:

- Preventing contaminants from entering pipe;
- Inspecting and cleaning pipe, followed by disinfection by spraying or swabbing with minimum 1% chlorine solution;
- Advising affected customers to adequately flush their service lines upon return to service.

4. FLUSHING

If greater than 10mg/L, flush system down to 2mg/L or less. **Again, hydrants and standpipe must be open prior to opening valves.** If less than 10mg/L, repeat chlorination procedure.

Chlorinated water shall be dechlorinated and discharged into the sanitary sewer via hose connections, unless written approval is received from the Town Engineer.

5. BACTERIOLOGICAL TESTING BY PUBLIC WORKS WATER DEPARTMENT

Samples will be taken from each branch (i.e. side streets) and at end of each section via 20mm service tubing; second set 24 hours later. They will forward the samples to lab for testing of Total Coli form, E-coli, and HPC if required. Recommended days for bacteriological tests are Tuesday, Wednesday and Thursday, as test results take a minimum of 48 hours.

If test fails, flush and repeat chlorination and sampling procedure.

6. NEW WATER MAIN COMMISSIONING

The Public Works Water Department will remove "out of service" hydrant markers, verify that all valves are fully open or closed as may be required, perform static tests on all hydrants, and install hydrant numbers, ensuring that the system is fully operational and functional.

7. CONNECTIONS TO EXISTING WATERMAINS

For connections equal to or less than one complete pipe length (20ft or 6m), the new pipe, fittings, and valves required for the connection are required to be spray disinfected or swabbed with a minimum of 1% solution of chlorine prior to being installed.

APPENDIX "I"

LIST OF STANDARDS

ASTM	**AMERICAN SOCIETY FOR TESTING AND MATERIALS**
A 48	**GRAY IRON CASTINGS**
A 536	**DUCTILE IRON CASTINGS**
B 88	**SEAMLESS COPPER WATER TUBE**
C 131	**STANDARD TEST METHOD FOR RESISTANCE TO DEGRADATION OF SMALL SIZE COARSE AGGREGATE BY ABRASION AND IMPACT IN THE LOS ANGELES MACHINE**
C 260	**AIR ENTRAINING ADMIXTURES FOR CONCRETE**
C 309	**LIQUID MEMBRANE FORMING COMPOUNDS FOR CURING CONCRETE**
C 443	**JOINTS FOR CIRCULAR CONCRET SEWER AND CULVERT PIPE, USING RUBBER GASKETS.**
C 478	**PRECAST REINFORCED CONCRETE MANHOLE SECTIONS**
C 902	**PEDESTRIAN AND LIGHT TRAFFIC PAVING BRICK**
C1244	**STANDARD TEST METHOD FOR SEWER MANHOLES BY THE NEGATIVE AIR PRESSURE (VACUUM) TEST.**
D98	**STANDARD SPECIFICATION FOR CALCIUM CHLORIDE**
D 698	**TEST METHOD FOR LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING STANDARD EFFORT (12,400 ft-lbf/ft^3 (600kN/m^3)**
D 946	**PENETRATION GRADED ASPHALT CEMENT FOR USE IN PAVEMENT CONSTRUCTION**
D3034	**TYPE PSM POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS**
D6690	**JOINT AND CRACK SEALANTS, HOT APPLIED, FOR CONCRETE AND ASPHALT PAVEMENTS**
F 794	**PVC PROFILE GRAVITY SEWER PIPE AND FITTINGS BASED ON CONTROLLED INSIDE DIAMETER**

AWWA	**AMERICAN WATER WORKS ASSOCIATION**
B 300	**HYPOCHLORITES**
C 104	**CEMENT MORTAR LINING FOR DUCTILE-IRON PIPE AND FITTINGS FOR WATER**
C 110	**DUCTILE-IRON AND GRAY-IRON FITTINGS, 3 INCHES THROUGH 48 INCHES (75mm through 1200mm) FOR WATER AND OTHER LIQUIDS**
C 111	**RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS**
C 151	**DUCTILE-IRON PIPE, CENTRIFUGALLY CAST, FOR WATER AND OTHER LIQUIDS**
C 153	**DUCTILE-IRON COMPACT FITTINGS, 3 INCHES THROUGH 24 INCHES (76mm THROUGH 610mm) AND 54 INCHES THROUGH 64 INCHES (1,400mm THROUGH 1,600mm), FOR WATER SERVICE**

C 500	**METAL-SEATED GATE VALVES FOR WATER SUPPLY SERVICE**
C 502	**DRY-BARREL FIRE HYDRANTS**
C 504	**RUBBER-SEATED BUTTERFLY VALVES**
C 509	**RESILIENT-SEATED GATE VALVES FOR WATER SUPPLY SERVICE**
C 515	**REDUCED-WALL, RESILIENT-SEATED GATE VALVES FOR WATER SYPPLY SERVICE**
C 651	**DISINFECTING WATER MAINS**
C 800	**UNDERGROUND SERVICE LINE VALVES AND FITTINGS**
C 900	**POLYVINYL CHLORIDE (PVC) PRESSURE PIPE, 4 INCHES THROUGH 12 INCHES FOR WATER DISTRIBUTION**
C 905	**POLYVINYL CHLORIDE (PVC) WATER TRANSMISSION PIPE, NOMINAL DIAMETERS 14 INCHES THROUGH 36 INCHES**
C 907	**POLYVINYL CHLORIDE (PVC) PRESSURE FITTINGS FOR WATER – 4 INCHES THROUGH 8 INCHES (100mm THROUGH 200mm)**
CSA	**CANADIAN STANDARDS ASSOCIATION**
A 5	**(CAN/CSA) PORTLAND CEMENT**
A 23.1	**CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION**
A 23.2	**METHODS OF TEST FOR CONCRETE**
A23.2-16	**RESISTANCE TO DEGRADATION OF SMALL SIZE COARSE AGGREGATE BY ABRASION AND IMPACT IN THE LOST ANGELES MACHINE**
A82.1	**(CAN/CSA) BURNED CLAY BRICK (SOLID MASONRY UNITS MADE FROM CLAY OR SHALE)**
A179	**MORTAR AND GROUT FOR UNIT MASONRY**
A257.2	**(CAN/CSA) REINFORCED CIRCULAR CONCRETE CULVERT, STORM DRAIN, SEWER PIPE AND FITTINGS**
A257.3	**(CAN/CSA) JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE, MANHOLE SECTIONS, AND FITTINGS USING RUBBER GASKETS**
A257.4	**(CAN/CSA) PRECAST REINFORCED CIRCULAR CONCRETE MANHOLE SECTIONS, CATCH BASINS AND FITTINGS**
B137.2	**PVC INJECTION-MOULDED GASKETED FITTINGS FOR PRESSURE APPLICATIONS**
B137.3	**(CAN/CSA) RIGID POLYVINYL CHLORIDE (PVC) PIPE FOR PRESSURE APPLICATIONS**
B137.10	**CROSSLINKED POLYETHLYENE/ALUMINUM/CROSSLINKED POLYETHLYENE COMPOSITE PRESSURE PIPE SYSTEMS**
B182.1	**(CAN/CSA) PLASTIC DRAIN AND SEWER PIPE AND PIPE FITTINGS**
B182.2	**(CAN/CSA) PVC SEWER PIPE AND FITTING (PSM TYPE)**

APPENDIX "I"

B182.4 (CAN/CSA) PROFILE PVC SEWER PIPE AND FITTINGS

G30.18 (CAN/CSA) BILLET-STEEL BARS FOR CONCRETE REINFORCING

G401 CORRUGATED STEEL PIPE PRODUCTS

CGSB CANADIAN GENERAL STANDARDS BOARD

16.2 EMULSIFIED ASPHALTS, ANIONIC TYPE FOR ROAD PURPOSES

APPENDIX "J"

NBDTI WORK AREA TRAFFIC CONTROL MANUAL
Urban Work Areas

Table of Contents

9 Urban Work Areas

9.1 Introduction

This Chapter provides supplemental information on temporary traffic control devices for work carried out on urban roads within New Brunswick municipalities. It focuses on roads with **speed limits of 50 and 60 km/h.** Many of the guidelines presented in previous chapters of this manual are not applicable to urban roads due to factors such as:

- Space limitations caused by more frequent driveways, intersections, and existing roadside signage;
- The presence of additional road cross section features such as turning lanes, curbs, gutters, bicycle lanes, and sidewalks (as opposed to shoulders and ditches); and
- Higher volumes of pedestrians, cyclists, and other road users.

This chapter is intended to supplement, not contradict, the previous chapters of WATCM. As a result, **the guidelines from the previous chapters are valid for urban roads with the few exceptions noted below:**

- **Approvals are required by the Municipality** rather than the Department of Transportation and Infrastructure's Maintenance and Traffic Branch;
- The process for selecting the appropriate traffic control layout has been revised to better reflect urban conditions. As a result, Chapter 6 - Selecting the Appropriate Traffic Control Layout has been replaced by new guidelines presented in Section 9.13;
- Minimum threshold values for sign sizes, device spacing, and work area component lengths have been revised for 50 and 60 km/h speed zones to better accommodate the space constraints often present in urban environments. These revised thresholds are contained in Sections 9.6, 9.10, and 9.11.
- Buffer Vehicles (i.e. trucks equipped with Truck Mounted Attenuators as described in Section 3.11) are not required on Urban Roads with posted speed limits of 50 and 60 km/h.

Additional guidance is also provided on the following aspects of urban work areas:

- Definitions;
- Legal Authority;
- Planning and Preparation;
- Traffic Control Principals;
- Urban Work Area Components;
- Intersecting Roads (including roundabouts);
- Night Work;
- Urban Traffic Control Signs and Devices;
- Sign Installation; and
- Work Area Personnel.

Finally, Section 9.14 contains 31 typical layouts for work on urban roads with speed limits of 50 and 60km/h.

9.2 Definitions

The terms previously defined in this manual remain applicable to urban roads. However, a few additional terms are defined below.

Bypass Highway – A highway in a municipality where the administration and control are under the jurisdiction of the Minister of Transportation and Infrastructure. A bypass is usually a controlled access highway.

Central Island – The raised areas in the center of a roundabout around which traffic circulates. The central island does not necessarily need to be circular in shape. In the case of mini-roundabouts, the central island is traversable.

Circulatory Road – The curved path used by vehicles to travel in a counter-clockwise fashion around the central island in a roundabout.

Local Road – A subset of municipal roads as defined by each municipality. Typically, local roads consist of residential roads and public lanes where volumes are lowest and the primary function is land access rather than traffic movement.

Major Road – A subset of municipal roads as defined by each municipality. Typically, major roads consist of arterial and collector roads where traffic volumes are highest and traffic movement is of equal or greater importance than land access.

Lane Closure Taper – A transition taper used to reduce the number of travelled lanes in a single direction.

Municipal Road – All roads, streets or lanes in a municipality intended for public use, excepting provincial highways.

Provincial Highway – Roads, streets or highways designated by the Minister under Section 15 of New Brunswick's *Highway Act*, lying within a municipality. The primary consideration for designation is whether, in the Minister's opinion, the roadway is a necessary link in a comprehensive provincial network.

Shifting Taper – A transition taper used to deviate traffic from its normal path without reducing the number of lanes (e.g. in Diversions)

Splitter Island – A raised or painted area on an approach used to separate entering from exiting traffic, deflect and slow entering traffic, and allow pedestrians to cross the road in two stages.

Traffic Controlled Taper – A transition taper used for lane closures on single lane roads in conjunction with yield signs, traffic control persons, or traffic signals.

Truck Apron – The traversable portion of a roundabout's central island adjacent to the circulatory roadway that may be needed to accommodate the wheel tracking of large vehicles. An apron is sometimes provided on the outside of the circulatory roadway.

Urban Road – All of the roads in a municipality with the exception of bypass highways.

9.3 Legal Authority (*Supplement to Section 1.2*)

New Brunswick's *Motor Vehicle Act* states that the Minister of Transportation and Infrastructure shall provide a manual and specifications to local authorities for a uniform system of traffic control devices for use upon highways within the Province. *The Transportation Association of Canada`s Manual of Uniform Traffic Control Devices for Canada (MUTCDC)* is the manual currently specified by the Department.

New Brunswick`s Work Area Traffic Control Manual has been developed as a supplement to the MUTCDC providing more specific guidelines for the use of work area traffic control devices. Individuals engaged in work within the Right of Way of ***urban roads*** are expected to utilize and comply with the MUTCDC and this chapter of WATCM. This chapter of WATCM shall also be applied where the guidelines are referenced in contract documents and agreements between Contractors and a Municipality.

Responsibility for maintenance and construction activities on urban roads in New Brunswick depends on the road's designation under the *Highway Act*. DTI's policy regarding provincial and municipal responsibilities is described in *A Reference Manual to Department of Transportation Involvement in New Brunswick Municipalities* (1986). According to the manual, municipalities are responsible for all maintenance and construction activities undertaken on all ***municipal roads*** and ***provincial highways*** located within municipal boundaries, with the following exceptions (which fall under DTI's jurisdiction):

- Bypass highways
- Bypass interchanges including the ramps;
- Railway crossings on provincial highways;
- Bridges on provincial highways, and on municipal roads at the Minister's discretion;
- Extruded signs on provincial highways;
- Signs on provincial highways related to their function as a designated highway;
- Signs on provincial highways in villages (not cities or towns) except for those related to parking and pedestrians; and
- Highway markings on provincial highways in villages (not cities or towns).

9.4 Planning & Preparation (*Supplement to Section 1.3*)

A ***Traffic Control Plan*** shall be prepared prior to undertaking any maintenance, construction, or utility work on an urban road. The required level of detail for the plan shall be determined in consultation with the governing Municipality.

Urban roads are often characterized by additional complexities and/or constraints that must be considered in the Traffic Control Plan. Consequently, a site visit is strongly recommended prior to preparing the plan to identify specific work area characteristics such as those listed below.

Items from Section 1.3	Additional Considerations for Urban Roads
• Traffic volumes and speeds • Sight distance limitations • Sidewalks or other pedestrian routes • Conflicts with driveways or intersecting roads • Existing signs which may need to be removed or covered • The amount of shoulder space available	• Road type (i.e. local or major) • Type of intersection control • Transit, truck, and bicycle routes • Potential alternate routes for road users • Emergency vehicle access • Other utility infrastructure • School zones • Bus stop locations • Parking • Level of encroachment on travel lanes • Available roadside space for placing signs • Existing lighting if night work is required

In many cases, the plan may consist of a reference to a typical layout contained in this manual showing the required devices, their placement and location, and possibly the location of traffic control persons. However, some situations will require a more detailed design combining elements from more than one layout. The plan should also specify appropriate procedures for sign and device installation and removal; required personal protective equipment; and procedures for the safe and efficient passage of emergency vehicles.

The plan may also include:

- Public advisory notices as determined by the municipality;
- Detours for different roadway users such as commercial vehicles, pedestrians, or cyclists;
- Scheduling to avoid or limit work area activity during peak hours;
- Temporary bus stops, waiting areas, and pull-outs;
- Removal of parking spaces; and
- Lighting requirements if working at night.

9.5 Traffic Control Principles (*Supplement to Section 2.1*)

The traffic control principles listed in Section 2.1 all apply to urban work areas. However, an fourth principle is presented below that recognizes the wider range of road users affected by urban work areas.

4. Accessibility should be maintained for all users within an urban road right-of-way.

- Bicyclists and pedestrians, including those with disabilities, should be provided with a detour, or access and safe passage through the work area;
- Signs and devices shall be placed so that they do not interfere with vehicular, pedestrian, or bicycle flows;
- Traffic control devices that are accessible to, and usable by, pedestrians with disabilities should be considered;
- Access shall be maintained to the fullest extent possible to abutting residences, businesses, and properties;
- Emergency vehicles shall be able to access the site and adjacent residences and businesses; and
- The needs of rail, transit, and commercial vehicles shall be assessed and appropriate accommodations made (where applicable).

9.6 Urban Work Area Components (*Supplement to Section 2.3*)

Urban work area components are the same as in rural areas. However, the MUTCDC allows some of the areas to be reduced or eliminated when spacing is limited and traffic volume, speed, and visibility permit. For example:

- The advance warning area may be eliminated, when active devices such as flashing arrow boards or flashers are used (MUTCDC Section D1.9).
- The longitudinal buffer area can be reduced or eliminated after alternatives such as relocating the taper and buffer area upstream of the intervening obstruction have been considered and deemed impractical. In this situation, additional advance warning and delineation devices should be considered (MUTCDC Section D4.2.2)
- The lengths of tapers in transition areas used to divert road users from their normal path should only be compromised as a last resort (MUTCDC Section D4.2.2).

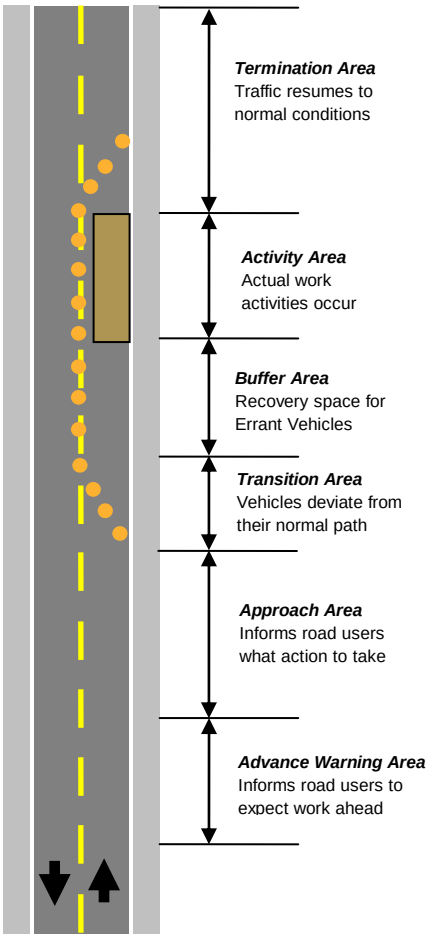


Table 9-1 presents minimum lengths for various Work Area components on Urban Roads. **The distances shown are applicable for both 50 and 60 km/h posted speed limits.**

Table 9-1: Minimum Work Area Component Measurements for Urban Roads

Work Area Component Measurements	Minimum Length (m)
Advanced Warning Distance[1]	100 m
Transition Taper Length[2]	
• Lane Closure Taper	40 m
• Shifting Taper	20 m
• Traffic Controlled Taper	15 m
Buffer Area	40 m

1. Advanced Warning Distance is measured from the first Traffic Control Sign to the start of the Activity Area.
2. See Section 9.2 for definitions of Lane Closure, Shifting, and Traffic Controlled Taper.

Where longitudinal space in restricted, the minimum recommended sign spacing of 50 m may be reduced to 30 m *provided the first warning sign is located at least 100 m from the Activity Area*.

9.7 Intersecting Roads (*Supplement to Section 2.5*)

Work areas on urban road networks often affect traffic flows at intersections. Installing temporary traffic control at an intersection is more complicated than on a road segment due to the presence of pre-existing traffic control devices such as signals and stop signs. Furthermore, a basic four-legged intersection consists of 12 possible directional movements, compared to just two for a road segment. As a result, supplemental signs and devices may be required when undertaking work at or near an intersection.

Section 9.14 includes 11 typical traffic control layouts for work areas in the vicinity of intersections. General guidelines are also provided below.

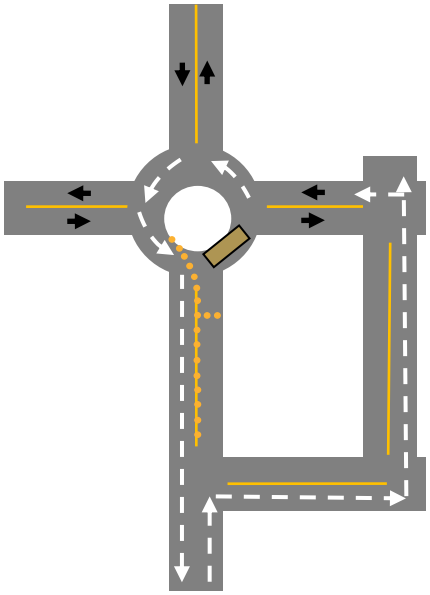
- Typical layouts for intersections should be used whenever a road intersects the Work Area between the first warning sign and the Activity Area.
- Warning signs should be placed on all intersection approaches as shown in the typical layouts. If practical, warning signs on the road containing the work area should be placed at the next closest intersection to give drivers the opportunity to detour around the site.
- Traffic control can be simplified by closing one or more of the approaches to turning traffic or, if possible, all traffic.
- Whenever possible, turning lanes on intersection approaches should be used to divert traffic around work areas rather than closing lanes and using traffic control persons.
- Traffic control persons should be positioned as shown in the typical layouts. They shall not stand in the centre of an intersection to direct traffic.
- Traffic control persons should not give signals to drivers that conflict with other traffic control devices such as stop signs or traffic signals.
- A lead traffic control person should be designated in all instances.
- Peace officers should be used to regulate traffic whenever drivers must be directed in a manner that conflicts with existing traffic control devices.

9.8 Roundabouts (*Supplement to Section 2.5*)

Roundabouts present unique challenges for implementing temporary traffic control because their successful operation is contingent upon having continuous and self-regulated traffic flows. They are not designed to accommodate stopped or waiting traffic within the ***circulatory road***. A wide range of factors must be considered when designing a temporary traffic control plan for a roundabout. **Therefore, typical layouts for traffic control at roundabouts are not provided in Section 9.14. All temporary traffic control plans for work on roundabout approaches or circulatory roadways require consultation with, and approval by, the Municipality.** General considerations for temporary traffic control at roundabouts are provided below.

As with other facilities, the level of traffic control will depend on where the work area is located within the roundabout footprint and the available road width for vehicles to safely drive by the area. Work areas can be located on the approach roads, ***splitter islands, circulatory road, truck apron***, or ***central island***. The following information may assist in the preparation of a temporary traffic control plan.

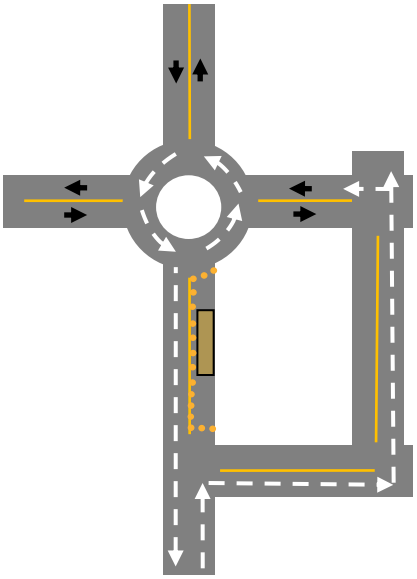
- Priority should be given to traffic exiting the roundabout to avoid delays on the circulatory road.
- Large trucks need the full width of the circulatory road plus the truck apron to travel in the roundabout. Therefore, if the work area encroaches on the truck apron or circulatory road, then trucks should be detoured.
- A lane width of 4.0 m (including the truck apron) is required for passenger vehicles to travel through a roundabout with a minimum circle diameter. As the diameter of the circle increases, the required lane width decreases.
- At multilane roundabouts, a work area in one lane of the circulatory road usually requires the entire roundabout to be converted to a single-lane roundabout.



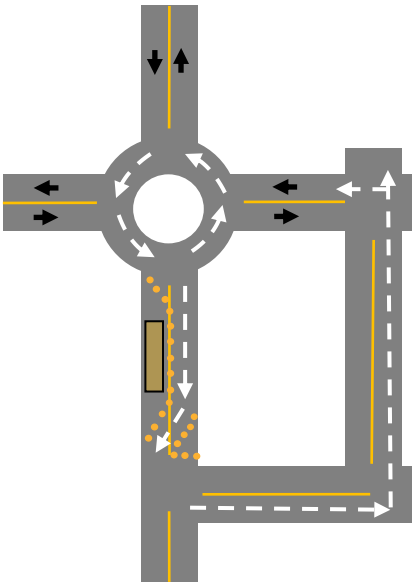
Work area in circulatory road, detour approaching traffic

- There are several options available if the circulatory road must be closed to accommodate the work area:
  - Detour all traffic;
  - Detour traffic that would use the section of the circulatory road that is closed;
  - Allow one approach to proceed at a time travelling clockwise and counterclockwise to reach the exit leg (using Traffic Control Persons); or
  - Work at night to minimize impacts on traffic flows.

- If two-way traffic cannot be maintained on an approach, it is recommended that traffic entering the roundabout be detoured and the circulatory road be used for exiting traffic as shown below.



Work area in approach lane, detour approaching traffic



Work area in departure lane, detour approaching traffic

9.9 Night Work (*Supplement to Section 2.6*)

In addition to the guidelines contained in Section 2.6, the following are also important considerations when working on Urban Roads at night:

- If temporary pedestrian or bicycle facilities are implemented, or obstructions or surface hazards are introduced, check that the path provided is adequately lighted.
- In residential areas, avoid aiming work space lights into homes or yards.
- Municipalities shall be consulted before working at night to ensure compliance with local noise bylaws.

9.10 Urban Traffic Control Signs and Devices *(Supplement to Section 3)*

Traffic Control Signs

Standardization of traffic control signs and devices is important to ensure they are recognizable and comprehensible by road users at a glance. In addition to the signs contained in Section 3.1, the following signs have also been approved for work on urban roads.

Lane Closure Arrow

Description: The *Lane Closure Arrow* sign indicates that traffic must pass either to the left or the right of a close travelled lane. This sign represents a less costly alternative compared to flashing arrow boards on low-speed roads.

Minimum Size: 50 - 60 km/h . . . . . 60 cm x 120 cm (TC-7)

Colour / Sheeting: Black on Orange, High Intensity

Bicycle Lane Closed

Description: The *Bicycle Lane Closure* sign indicates that the temporary closure of a dedicated bicycle lane. Cyclists are to merge with other motorized traffic.

Minimum Size: 50 - 60 km/h . . . . . 45 cm x 75 cm

Colour / Sheeting: Black on Orange, High Intensity

Bicycle Lane Detour

Description: The *Bicycle Lane Detour* sign indicates a temporary shift of the normal alignment on a dedicated bicycle lane.

Minimum Size: 50 - 60 km/h . . . . . 45 cm x 45 cm

Colour / Sheeting: Black on Orange, High Intensity

Sidewalk Closed

Description: The *Sidewalk Closed* sign indicates a complete closure of the pedestrian pathway.

Minimum Size: 50 - 60 km/h . . . . . 45 cm x 45 cm

Colour / Sheeting: Black on Orange, High Intensity

Pedestrian Detour

Description: The *Pedestrian Detour* sign is used to direct pedestrian to an alternate route in advance of a sidewalk closure.

Minimum Size: 50 - 60 km/h . . . . . 45 cm x 45 cm

Colour / Sheeting: Black on Orange, High Intensity

Table 9-3 lists the signs and devices included in the typical layouts in Section 9.14 by both the MUTCD Reference Number and DTI Catalogue Number. Most of the signs are diamond shaped temporary warning signs. **The minimum size for temporary warning signs in work areas on 50 - 60 km/h urban roads is 75 cm x 75 cm.** Custom signs not included in Section 3.1 or the MUTCDC require approval from the municipality responsible for the roadway.

Table 9-2: Temporary Traffic Control Signs for Urban Work Areas

Sign Name and Image		DTI Reference(s)	MUTCDC Reference
Construction Ahead		#4300-S, #4347-L, #4344-R	TC-1
Road Work		#4364	TC-2
Traffic Control Person Ahead		#4604	TC-21
Lane Closed Ahead		#4370-L, #4375-R	TC-5L, TC-5R
Road Narrows		#4398-L, #4399-R	n/a
Road Diversion		#4160-L, #4159-R	TC-13L, TC-13R
Road Realignment		#4144-L, #4145-R	TC15-L, TC15R
Two-Way Traffic Ahead		#4203	TC-24
Traffic Signals Ahead		#3031	WB-4
Yield Ahead		#3011	WB-2
Construction Zone Ends		#4316	n/a
Stop Here on Red		#4393	n/a
Detour Ahead		#4110	TC-10
Detour		n/a	TC-11

Delineation Devices

The guidelines on delineation devices in Section 3.7 apply in urban areas with the exception of the ones related to traffic cones. The MUTCDC permits a wider range of uses for traffic cones where the speed limit is 60 km/h or less. The following table compares the guidelines from Section 3.7 to the MUTCDC guidelines.

Traffic Cone Guidelines from Section 3.7	MUTCDC Guidelines on Traffic Cones for 60 km/h or less Speed Zones
• Minimum height of 70 cm • May be placed along the tangent sections of the road adjacent to the Buffer and Activity Areas for Very Short and Short Duration Work only. • Not used for night time operations • Not recommended for delineation along tapers although may be used provided they are spaced at half the distance for other devices (see Table 3-3).	• 45 or 70 cm cones may be used during day time • 70 cm cones must be used for nighttime work operations • May be used for diversions, channelizing tapers, and to delineate a separation between road work and the flow of traffic. • Maximum spacing of 8 m for 50 km/h zones, and 12 m for 60 km/h zones except for tapers for lane closures on 2-lane roadways where the spacing is reduced to 6 m.

Barricades

Section 3.9 provides guidelines on heavy barricades which are used to provide a complete closure of a road, street, lane or shoulder for an extended period. The MUTCDC also permits the use of light barricades for short duration work. Standard dimensions for these devices are depicted in Figure 9-1. Light barricades may have a reduced length whenever they are used to close narrow shoulders, lanes, or sidewalks.

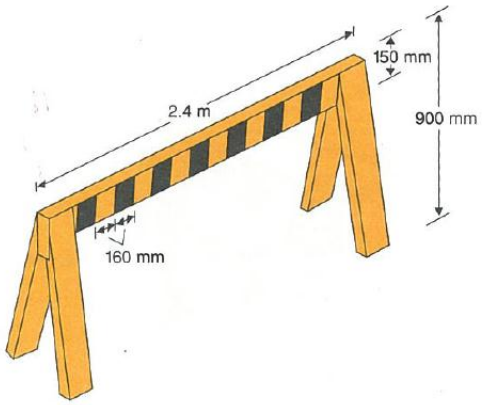
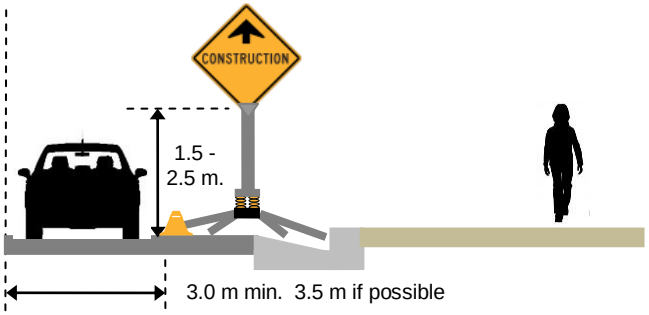


Figure 9-1: Light Barricade
(TC-64A from MUTCDC)

9.11 Sign Installation (*Supplement to Section 4.1*)

The sign installation guidelines in Section 4.1 are applicable to urban roads. However, the presence of additional roadside constraints often makes it difficult (if not impossible) to adhere to these guidelines. As previously noted in Section 9.6, the minimum recommended sign spacing of 50 m may be reduced to 30 m *provided the first warning sign is located at least 100 m from the Activity Area*. The following diagrams provide additional guidance for the lateral placement of signs on a variety of urban road cross sections.

ROADWAY EDGE

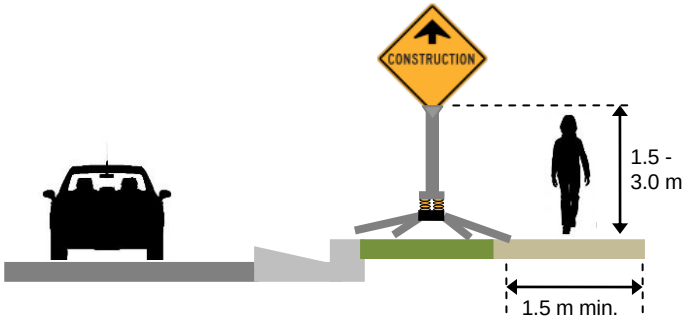


A lane width of at least 3.0 m shall be maintained. An additional 0.5 m should be provided as clearance to the sign where space permits.

Signs shall not be placed on the roadway edge where bike lanes are present unless a delineated bicycle diversion or detour is provided.

Signs shall not be placed on the roadway edge where on-street parking is permitted unless parking has been temporarily prohibited by the municipality.

BOULEVARD



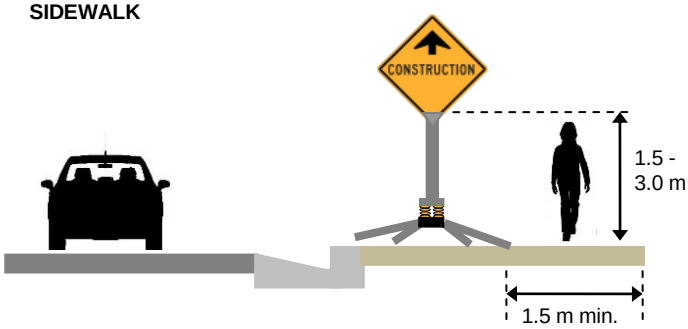
75 cm x 75 cm signs shall be used to minimize any obstruction to pedestrians and cyclists.

Signs may partially encroach onto the sidewalk provided that an unobstructed path of at least 1.5 m is maintained. Otherwise, an alternate pedestrian path shall be specified (e.g. detour or diversion).

Signs on portable stands shall be mounted at a height of between 1.5 and 3.0 m to minimize obstruction to pedestrians and ensure sign visibility.

Signs on fixed posts shall be mounted at a height of 2.0 m.

SIDEWALK



75 cm x 75 cm signs shall be used to minimize any obstruction to pedestrians and cyclists.

Signs may be placed on the sidewalk provided at least 1.5 m of unobstructed path is available. Otherwise, an alternate pedestrian path shall be specified (e.g. detour or diversion).

Signs on portable stands shall be mounted at a height of between 1.5 and 3.0 m to minimize obstruction to pedestrians and ensure sign visibility.

Signs may be mounted on existing supports used for other purposes (e.g. utility poles) to minimize sidewalk obstruction.

Signs on fixed posts shall be mounted at a height of 2.0 m.

Signs may be placed behind the sidewalk provided they are within 4.0 m of the curb.

9.12 Work Area Personnel (*Supplement to Section 5*)

Personal Protective Equipment

All Work Area personnel shall comply at a minimum with the provisions of the *Occupational Health and Safety Act, Regulation 91-191 (OHSA)*. Currently, the regulations do not specify a standard for personal protective equipment. However, Work Safe New Brunswick has recommended that the Canadian Standards Association Standard CSA-Z96-09 for High-Visibility Safety Apparel be adopted for New Brunswick. The standard provides more detail on acceptable safety apparel for workers than the OHSA regulations and is recommended by the Canadian Centre for Occupational Health and Safety. Municipalities can specify the CSA standard for work area personnel in their jurisdiction if worker visibility is a concern.

Traffic Control Persons

For work areas in close proximity to intersections, where drivers have an expectation to stop, the minimum distance between the Traffic Control Person Ahead sign and the Traffic Control Person can be reduced to 50 m (see typical intersection layouts in Section 9.14).

9.13 Selecting the Appropriate Traffic Control Layout *(Replaces Section 6)*

Section 9.14 contains typical traffic control layouts for common urban work activities. The following four factors must be considered when selecting the most appropriate layout:

- Work Location
- Work Duration
- Road Class
- Vehicle Speeds

Three of the four factors are the same as the ones described in Section 6 for rural roads. Road Class is used for urban roads instead of Traffic Volumes. Each of these factors is described in the following sections.

Work Location

The location of an Activity Area within the right-of-way is a major factor when selecting the appropriate traffic control layout. The more an Activity Area encroaches onto the road and interferes with the flow of traffic, the greater the level of traffic control required. On urban roads, work location is defined by the following two categories:

Roadway Edge….	Work that is carried out on the shoulder area of the road or in a travelled lane without reducing the remaining useable lane width below 3.0 m *or* the remaining usable roadway width below 6.0 m (for 2 lanes).
Full Lane…	Work that is carried out on the travelled way and reduces the remaining useable width of one or more lanes to less than 3.0 m.

Work Duration

Work duration is the length of time that a Work Area occupies a single location or several adjacent locations that are sufficiently close to be effectively considered as one. There are four categories of work duration:

Moving Operations…	Work that is either done *continuously*, usually at slow speeds, or *intermittently*, with brief stops related to the work. Examples of Moving Operations include: line painting, mowing, sweeping, and pavement testing.
Very Short Duration…	Work that occupies a fixed location for up to 30 minutes, including the time required to setup and remove Traffic Control Devices.
Short Duration…	Work that occupies a fixed location for longer than 30 minutes, yet less than 1 day.
Long Duration…	Work that occupies a fixed location for longer than 1 day.

As work duration increases, so too does the exposure for workers. As a result, the magnitude of traffic control is typically greater for longer duration Work Areas.

Road Class

Urban roads have been divided into two categories – major and local. Major roads are typically arterial and collector highways that have higher traffic volumes and levels of traffic control compared to local roads. The primary function of major roads is mobility, rather than land access. Local roads have lower volumes and are used primarily for land access. **It is the responsibility of municipalities to identify the major and local roads within their jurisdiction.** Local roads often require a less complex traffic control layout than major roads because traffic volumes are lower and worker exposure to traffic is reduced.

Vehicle Speeds

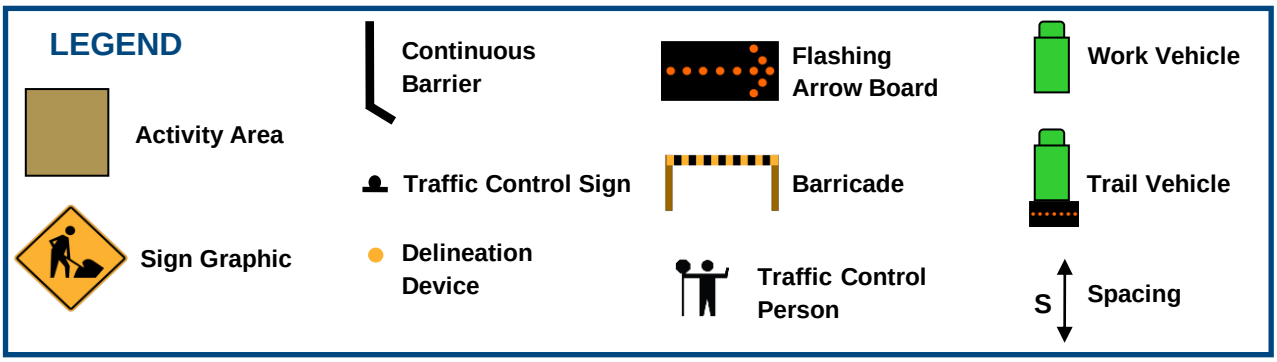
As previously noted in Section 6.4, the spacing and size of traffic control devices varies with vehicle speed**. The typical layouts in Section 9.14 apply to urban roads with speed limits of 50 and 60 km/h. The previous sections of WATCM should be used for higher speed roads.**

9.14 Typical Layouts for Urban Roads *(Supplement to Sections 7 & 8)*

TWO AND FOUR LANE ROAD SECTION LAYOUTS				
Road Cross Section	**Work Location**	**Duration**	**Road Class**	**Figure No.**
Two Lanes (no turning lanes)	Roadway Edge	Moving	Major & Local	**9-3**
		Very Short	Major & Local	**9-4**
		Short / Long	Major & Local	**9-5**
	Single Lane	Moving	Major & Local	**9-3**
		Very Short	Major & Local	**9-4**
		Short	Major & Local	**9-7**
		Long	Major & Local	**9-8**
	Center Line	Very Short, Short	Major & Local	**9-9**
Two Lanes with Two-Way-Left-Turn Lane	Two-Way-Left-Turn-Lane	Very Short / Short / Long	Major	**9-10**
	Adjacent to Two-Way-Left-Turn-Lane	Very Short / Short / Long	Major	**9-11**
Four Lanes, Undivided (no turning lanes)	Roadway Edge	Moving	Major	**9-3**
		Very Short	Major	**9-12**
		Short / Long	Major	**9-5**
	Single Lane (left or right)	Moving	Major	**9-3**
	Single Lane (left or right)	Very Short	Major	**9-12**
	Single Lane (left or right)	Short / Long	Major	**9-13**
	Two Lanes	Short / Long	Major	**9-14**
	Centre Line	Very Short	Major	**9-15**
Four Lanes, Undivided, with Two-Way-Left-Turn Lane	Two Lanes	Short / Long	Major	**9-16**
	Two-Way-Left-Turn-Lane	Short / Long	Major	**9-17**
	Left Lane	Short / Long	Major	**9-18**

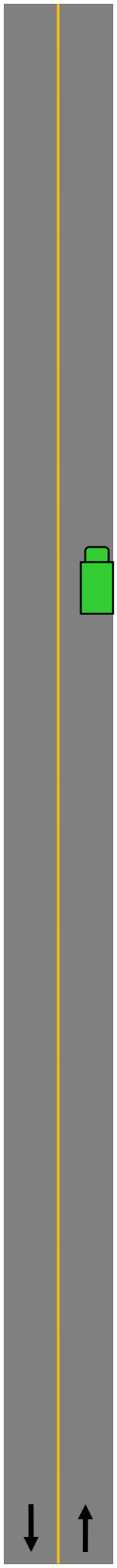
INTERSECTION LAYOUTS				
Approach Cross Section	**Work Location**	**Duration**	**Road Class**	**Figure No.**
One Through Lane (no turning lanes)	Near Side – Signalized and Stop Controlled Intersections	Very Short, Short	Major & Local	**9-19**
	Far Side – Signalized and Stop Controlled Intersections	Very Short, Short	Major & Local	**9-20**
One Through Lane with Left Turn Lane	Near Side, Right Lane	Very Short / Short / Long	Major & Local	**9-21**
One Through Lane with Left and/or Right Turn Lane	Near Side, Left or Right Turn Lane	Very Short / Short / Long	Major & Local	**9-22**
Two Through Lanes (no turning lanes)	Near Side - Left or Right Lane	Very Short / Short / Long	Major	**9-23**
	Near Side - Two Lanes	Very Short / Short / Long	Major	**9-24**
	Far Side - Left or Right Lane	Very Short / Short / Long	Major	**9-25**
	Far Side -Two Lanes	Very Short / Short / Long	Major	**9-26**
Two Through Lanes with Left and/or Right Turn Lane	Near Side - Through Lane Adjacent to Turn Lane	Very Short / Short / Long	Major	**9-27**
	Near Side - Through Lane and Turn Lane	Very Short / Short / Long	Major	**9-28**
	Far Side - Single Lane	Very Short / Short / Long	Major	**9-29**

OTHER LAYOUTS				
Approach Cross Section	**Work Location**	**Duration**	**Road Class**	**Figure No.**
Urban Network – All Cross Sections	Entire Block (i.e. detour)	Short / Long	Major & Local	**9-30**
Bicycle Lanes	Bicycle Lane and Full Adjacent Vehicle Lane	Very Short / Short / Long	Major & Local	**9-31**
Bicycle Lanes	Bicycle Lane and Partial Adjacent Vehicle Lane	Very Short / Short / Long	Major & Local	**9-32**



NOTES:

1. Layout only applies to work areas where work vehicle does not stop and workers remain in the vehicles.
2. On four lane roads, the work vehicle shall be equipped with a **Flashing Arrow Board** displaying the caution, arrow left, or arrow right mode as appropriate.



Work Vehicle equipped with 360 amber light visible from all directions.

Figure 9-3

Cross-section:	**Two Lanes / Four Lanes (no turning lanes)**
Work Location:	**Roadway Edge, Single Lane**
Duration:	**Moving**
Road Class:	**Major & Local**

NOTES:

1. **Traffic Control Person** and **Traffic Control Person Ahead** signs only required where 6 m minimum road width cannot be provided.
2. Work vehicle shall display 360 degree amber beacon that is visible from the rear at all times.
3. Layout can be used for patching operations.

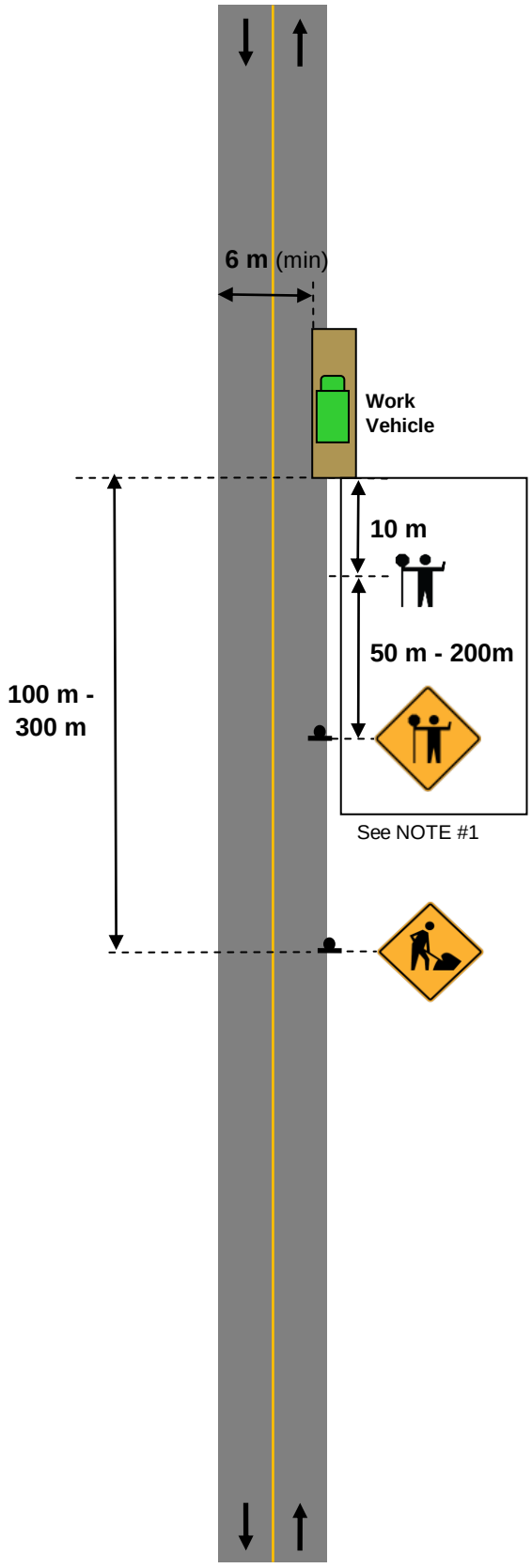


Figure 9-4

Cross-section:	**Two Lanes (no turning lanes)**
Work Location:	**Roadway Edge, Single Lane**
Duration:	**Very Short**
Road Class:	**Major & Local**

NOTES:

1. **Sign opposite approach in same manner using the Lane Narrows Left sign** (if on major road).
2. Layout also applies to activity areas at the edge of four lane roads.
3. Centreline delineators are only required where centreline already exists.
4. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.
5. **Road Narrows** sign only required for long duration work on major roads.

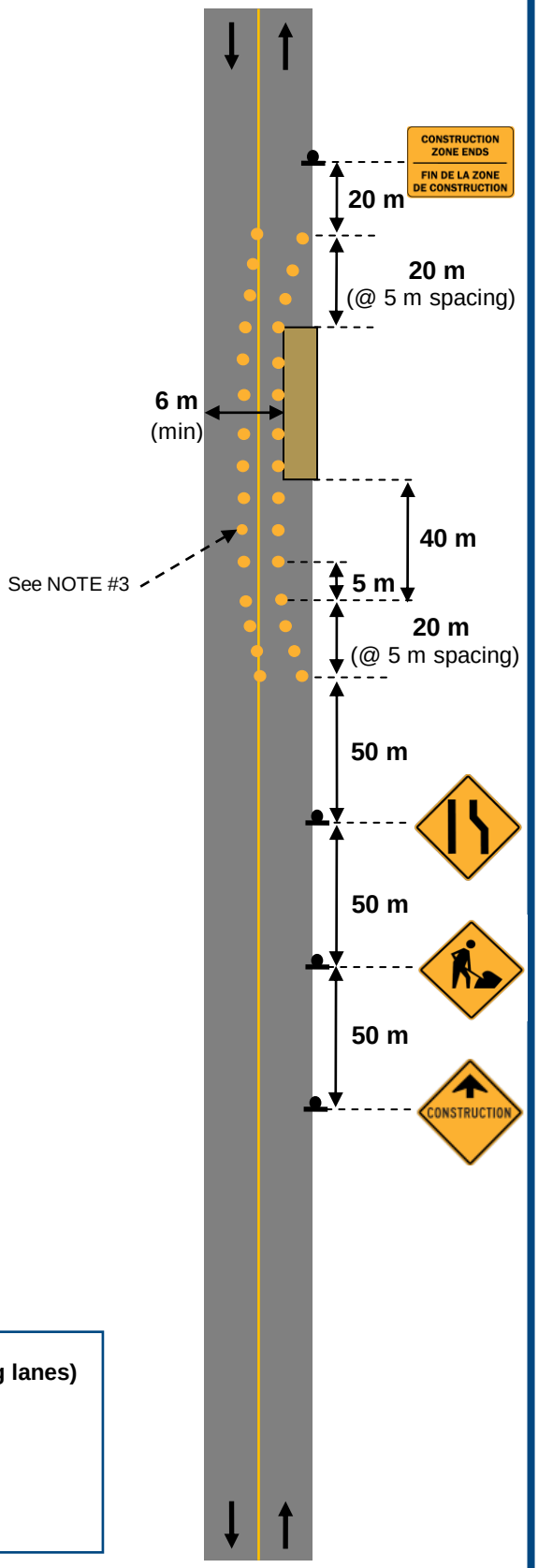


Figure 9-5

Cross-section:	**Two Lanes / Four Lanes (no turning lanes)**
Work Location:	**Roadway Edge**
Duration:	**Short / Long**
Road Class:	**Major & Local**

NOTES:

1. **Sign opposite approach in same manner without the Yield Ahead and Yield signs.**
2. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.
3. **Traffic Control Persons** or **signals** shall be used if sight distance is not sufficient to see oncoming traffic (see Figures 9-7 and 9-8).

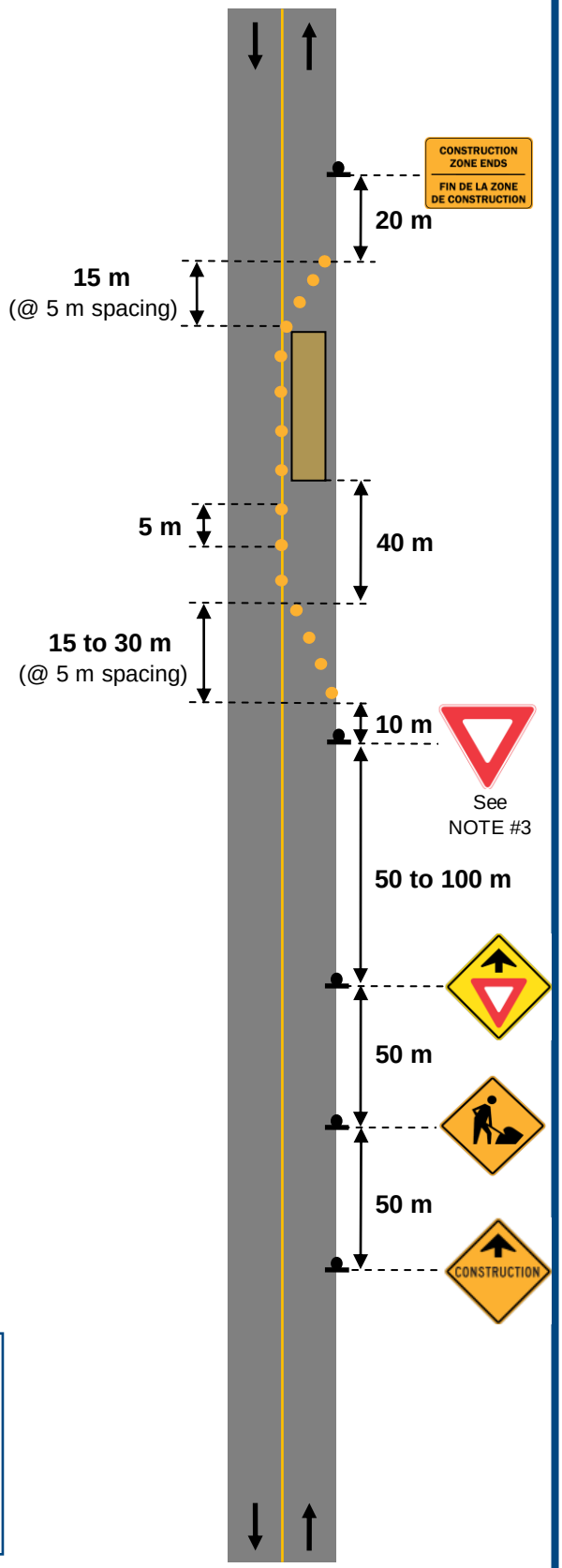


Figure 9-6

Cross-section:	**Two Lanes (no turning lanes)**
Work Location:	**Single Lane**
Duration:	**Short / Long**
Road Class:	**Local**

NOTES:

1. **Sign opposite approach in same manner.**
2. **Traffic Control Person** and **TCP Ahead** sign on local roads can be replaced by **Yield** and **Yield Ahead** signs as shown in Figure 9-6 if sufficient sight distance is available.

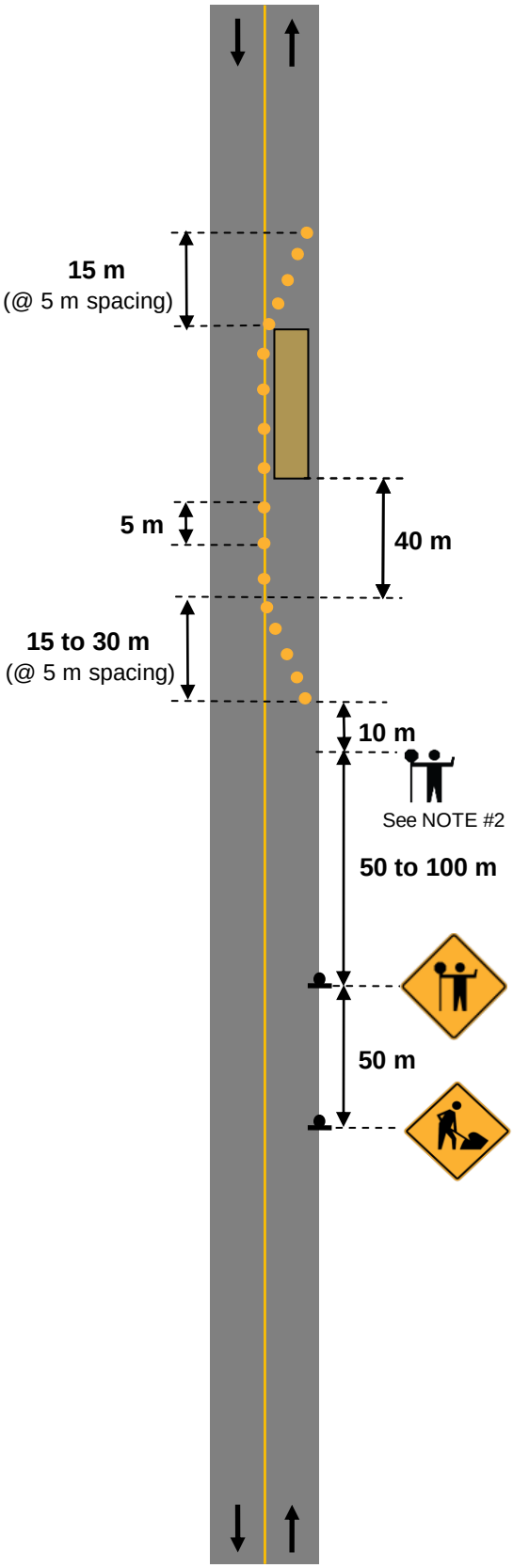


Figure 9-7

Cross-section:	**Two Lanes (no turning lanes)**
Work Location:	**Single Lane**
Duration:	**Short**
Road Class:	**Major & Local**

NOTES:

1. **Sign opposite approach in same manner.**
2. **Signals** and **Signals Ahead** signs on local roads can be replaced by **Yield** and **Yield Ahead** signs as shown in Figure 9-6 if sufficient sight distance is available.

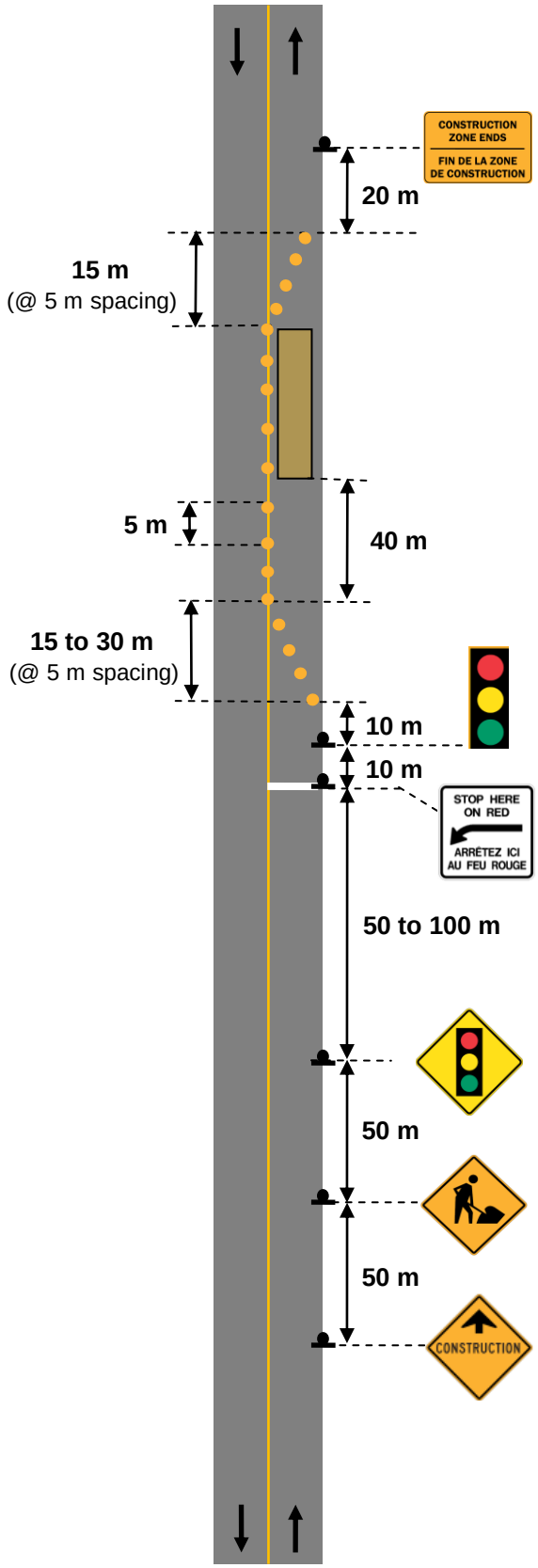


Figure 9-8

Cross-section:	**Two Lanes (no turning lanes)**
Work Location:	**Single Lane**
Duration:	**Long**
Road Class:	**Major and Local**

NOTES:

1. **Flashing Arrow Board** and taper may be replaced by a **Trail Vehicle.**
2. **Flashing Arrow Board** may be replaced by a **Light Barricade**.

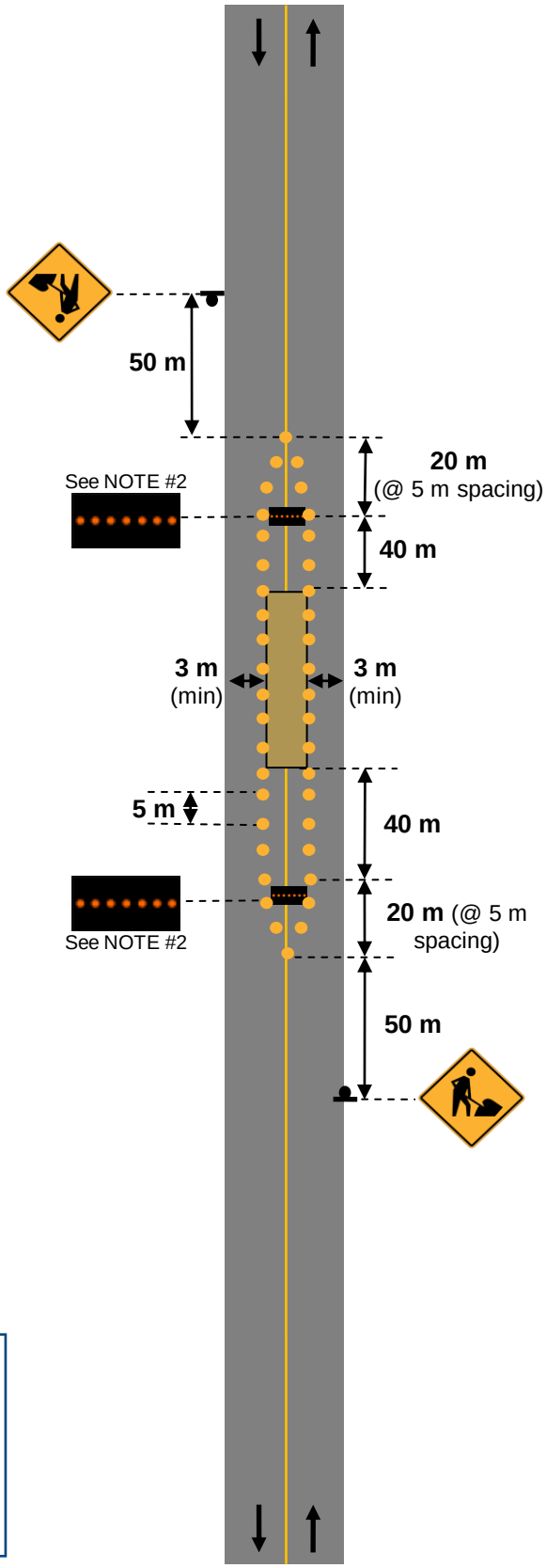


Figure 9-9

Cross-section:	**Two Lanes (no turning lanes)**
Work Location:	**Roadway Centre Line**
Duration:	**Very Short & Short**
Road Class:	**Major & Local**

NOTES:

1. **Sign opposite approach in the same manner.**
2. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

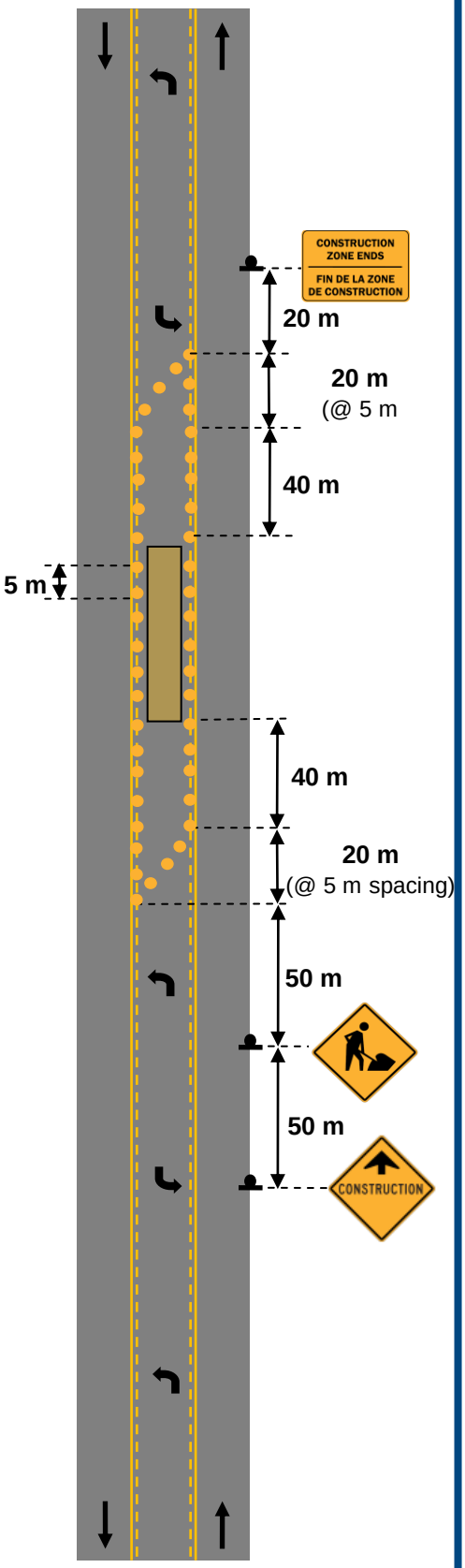


Figure 9-10

Cross-section:	**Two Lanes with TWLTL**
Work Location:	**Two-Way-Left-Turn-Lane**
Duration:	**Very Short / Short / Long**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

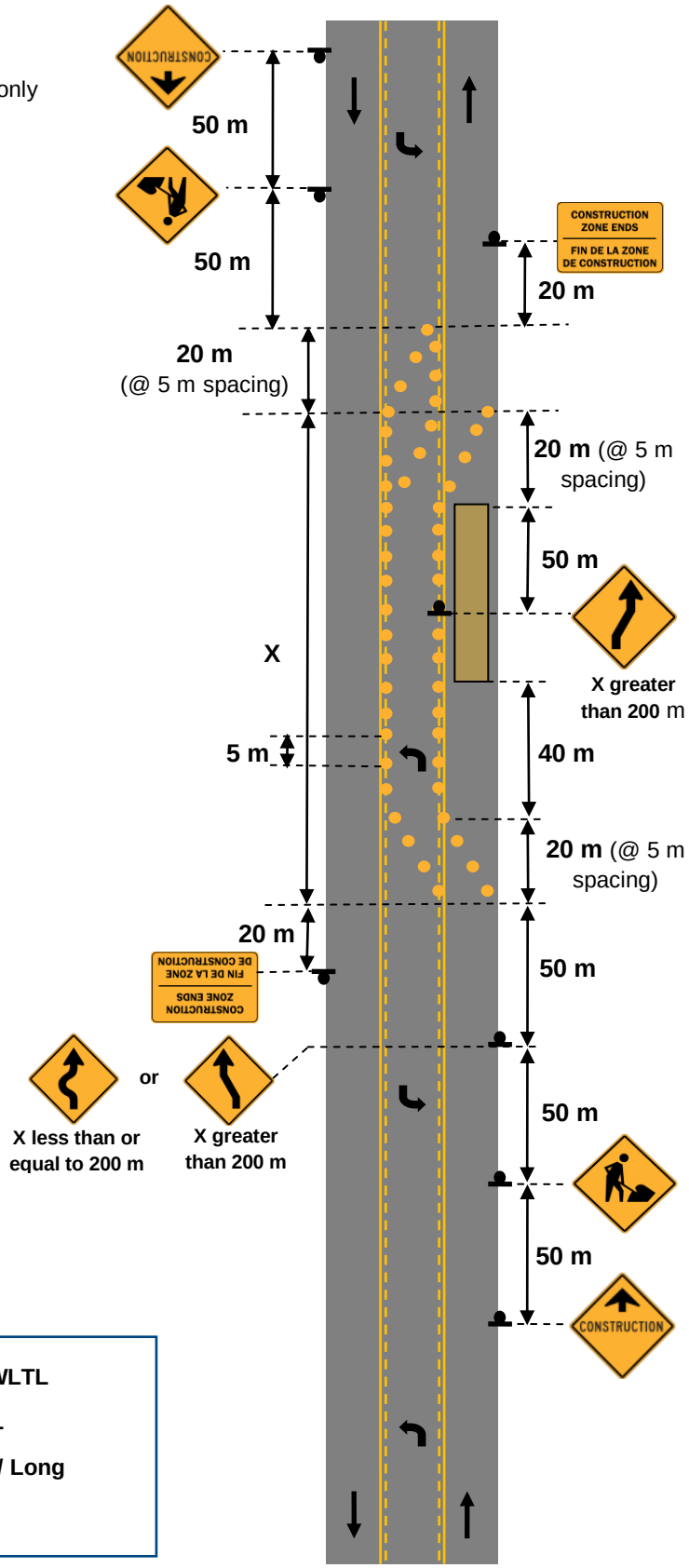


Figure 9-11

Cross-section:	**Two Lanes with TWLTL**
Work Location:	**Adjacent to TWLTL**
Duration:	**Very Short / Short / Long**
Road Class:	**Major**

NOTES:

1. Use either **Trail Vehicle OR Road Work** sign at spacing shown.
2. If 3 m lane width cannot be maintained, **Trail Vehicle** shall display right or left directional arrow as appropriate.
3. Layout can be used for patching operations.
4. Figure 9-13 may be used as an alternative setup for very short duration work.

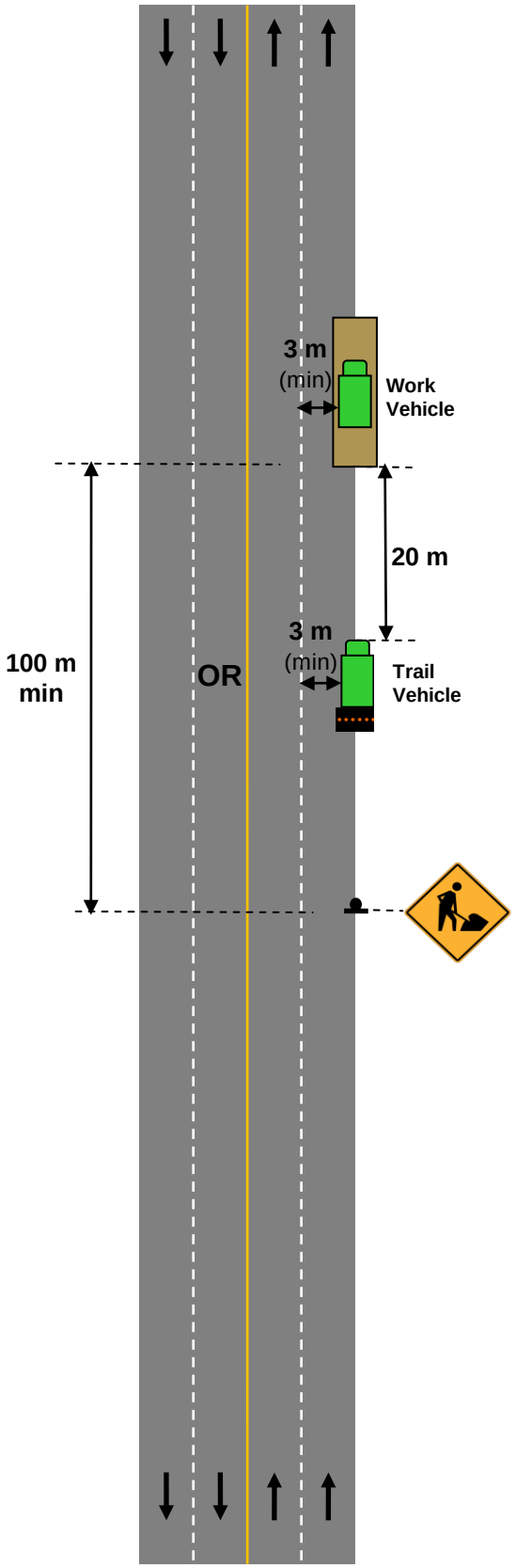


Figure 9-12

Cross-section:	**Four Lanes (no turning lanes)**
Work Location:	**Roadway Edge, Single Lane (left or right)**
Duration:	**Very Short**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

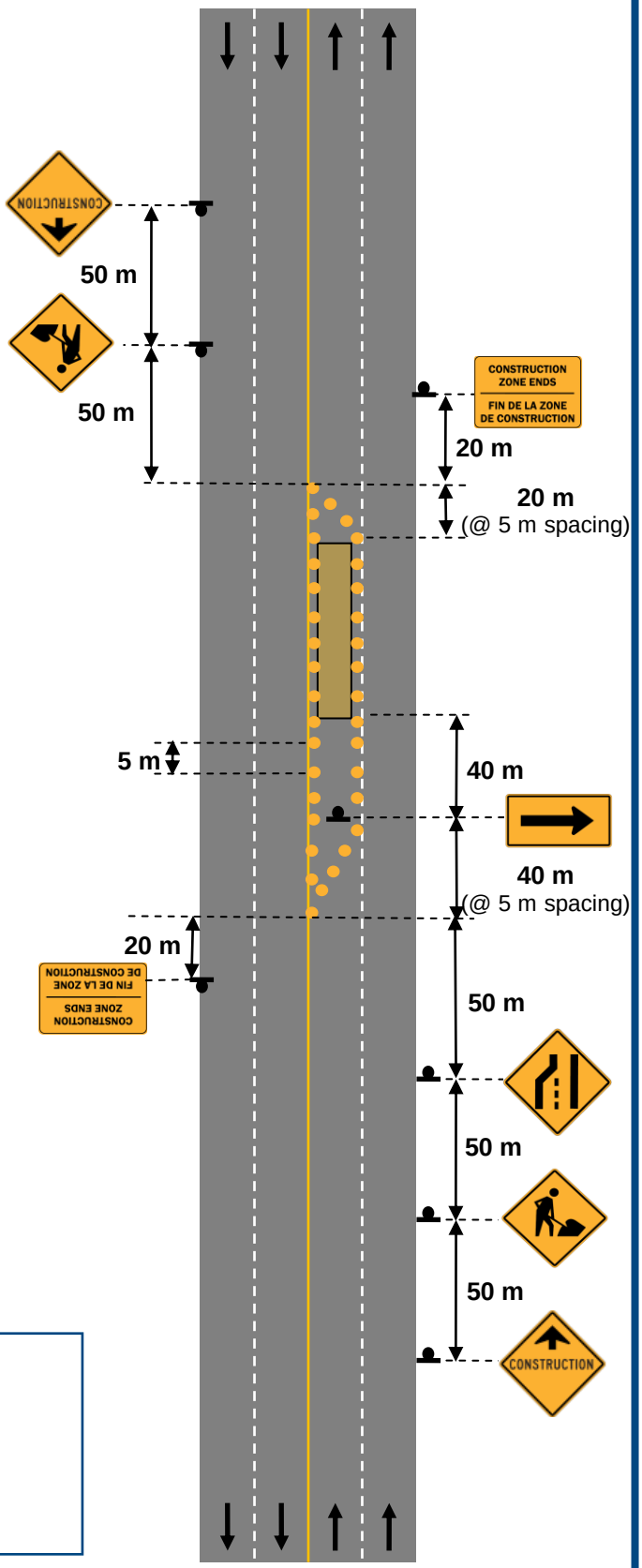


Figure 9-13

Cross-section:	**Four Lane Undivided**
Work Location:	**Single Lane (left or right)**
Duration:	**Short & Long**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

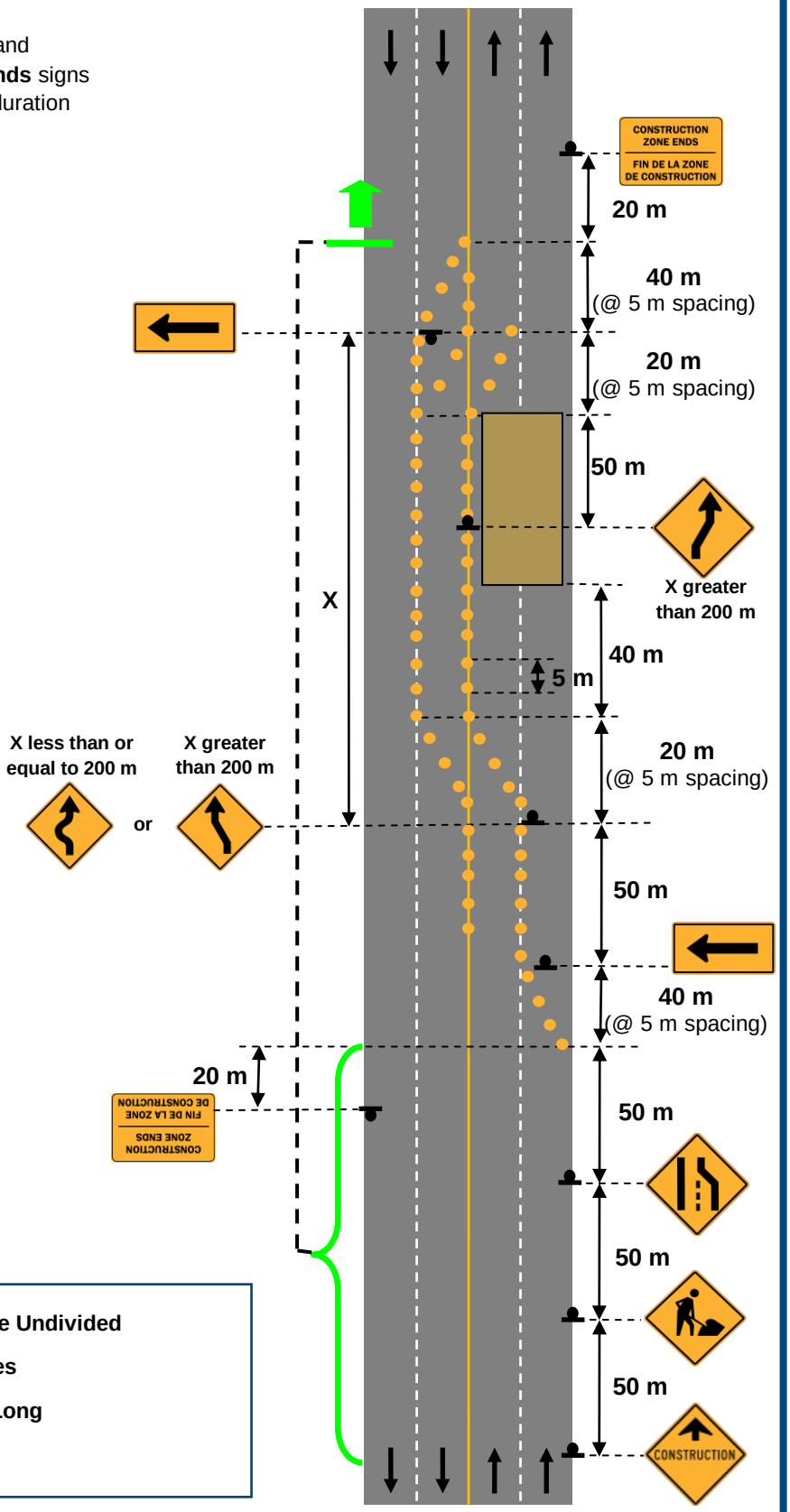


Figure 9-14

Cross-section:	**Four Lane Undivided**
Work Location:	**Two Lanes**
Duration:	**Short & Long**
Road Class:	**Major**

NOTES:

1. Figure 9-9 shall be used if the activity area is in the centre of the road.
2. **Flashing Arrow Board** may be replaced by a **Light Barricade.**
3. **Flashing Arrow Board** and taper may be replaced by a **Trail Vehicle.**

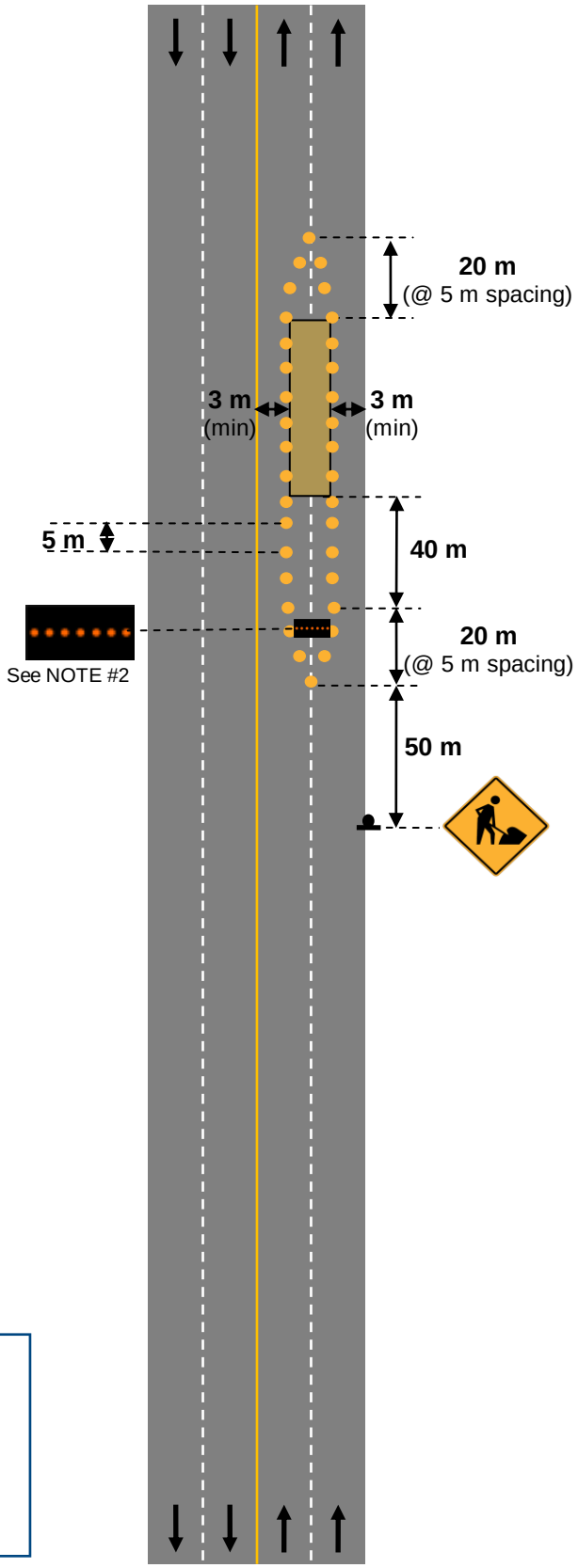


Figure 9-15

Cross-section:	**Four Lane Undivided**
Work Location:	**Centre Line**
Duration:	**Very Short**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

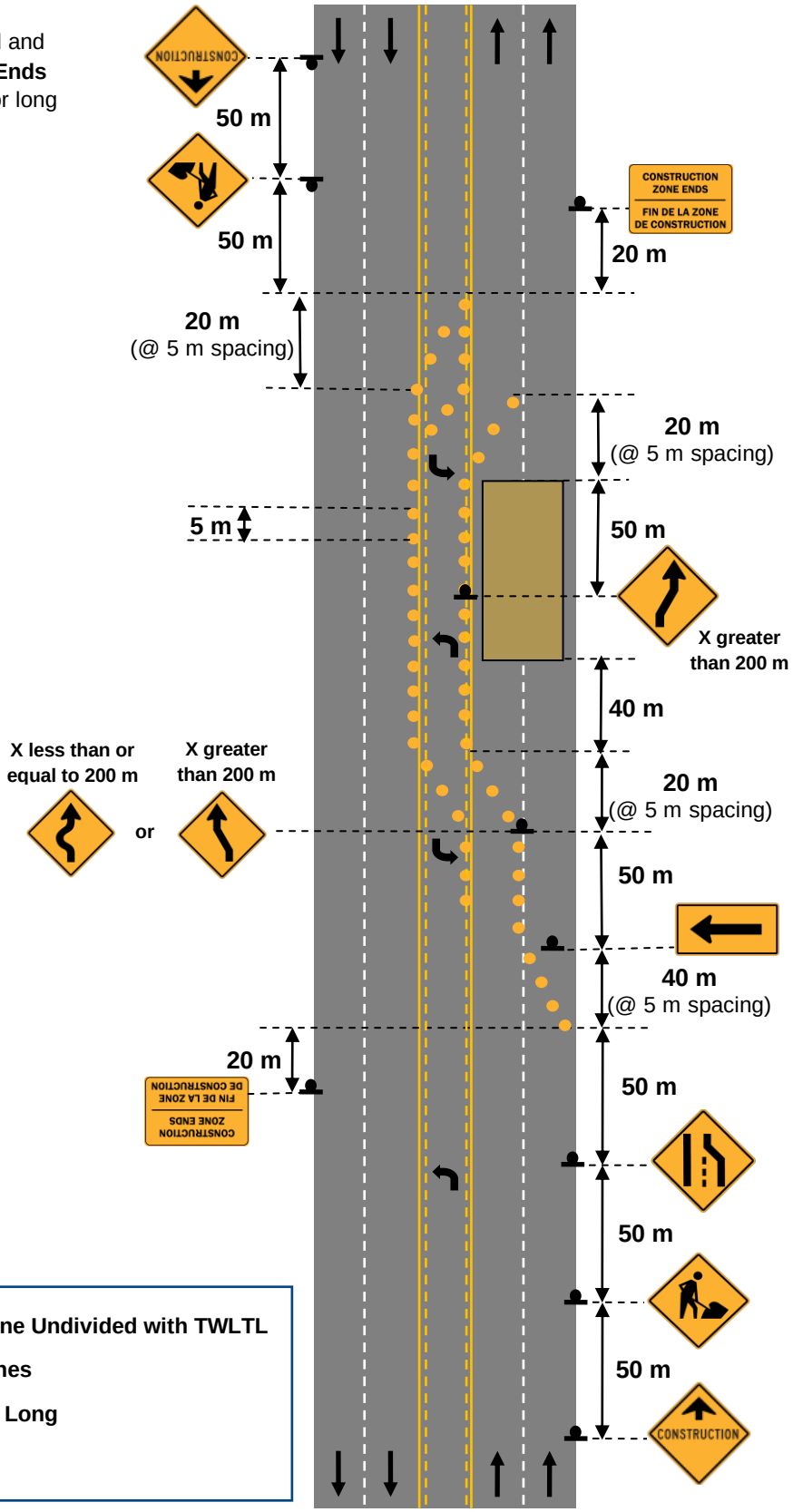


Figure 9-16

Cross-section:	**Four Lane Undivided with TWLTL**
Work Location:	**Two Lanes**
Duration:	**Short & Long**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

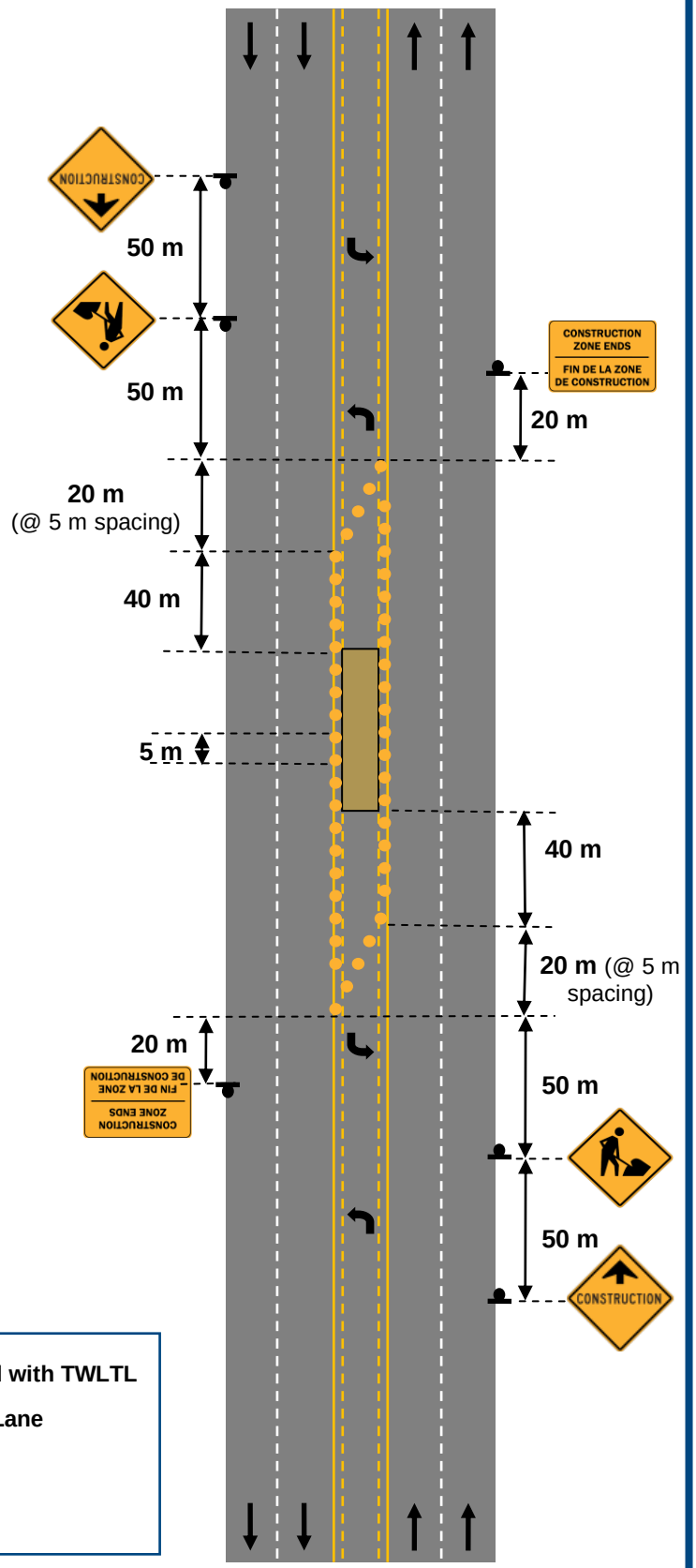


Figure 9-17

Cross-section:	**Four Lane Undivided with TWLTL**
Work Location:	**Two-Way-Left-Turn-Lane**
Duration:	**Short & Long**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

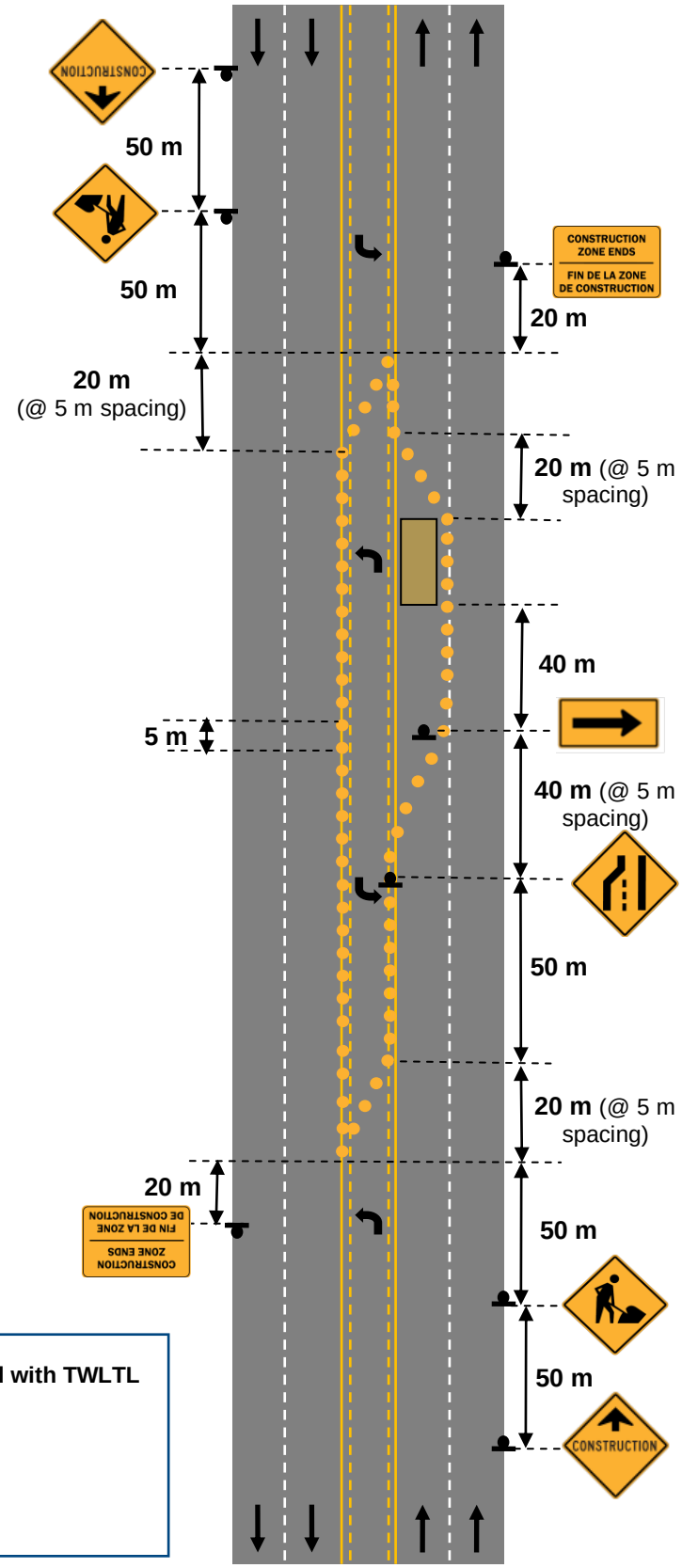


Figure 9-18

Cross-section:	**Four Lane Undivided with TWLTL**
Work Location:	**Left Lane**
Duration:	**Short & Long**
Road Class:	**Major**

NOTES:

1. Layout also applies to intersections with stop control on the other road, four-way stop controlled intersections, and signalized intersections.
2. TCPs can only allow traffic to stop and go. They shall not direct vehicles to turn or proceed in a manner that conflicts with traffic control devices such as stop signs or signals.
3. At signalized intersections, clearance intervals should be adjusted to ensure vehicles approaching from the leg with the work area can clear the intersection before the signal turns red.

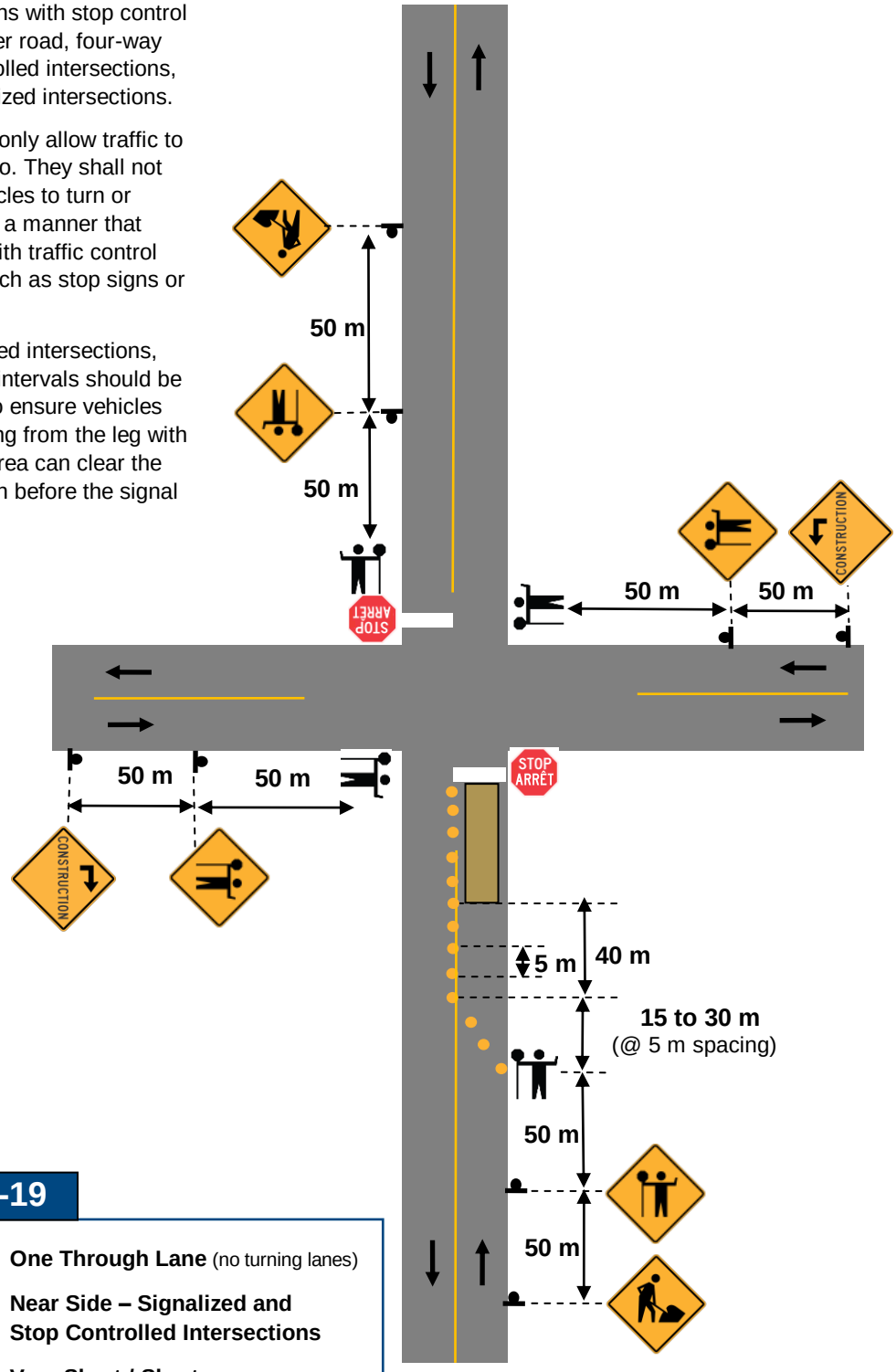


Figure 9-19

Cross-section:	**One Through Lane** (no turning lanes)
Work Location:	**Near Side – Signalized and Stop Controlled Intersections**
Duration:	**Very Short / Short**
Road Class:	**Major & Local**

NOTES:

1. Layout also applies to intersections with stop control on the other road, four-way stop controlled intersections, and signalized intersections.
2. TCPs can only allow traffic to stop and go. They shall not direct vehicles to turn or proceed in a manner that conflicts with traffic control devices such as stop signs or signals.
3. At signalized intersections, clearance intervals should be adjusted to ensure vehicles approaching from the leg with the work area can clear the intersection before the signal turns red.

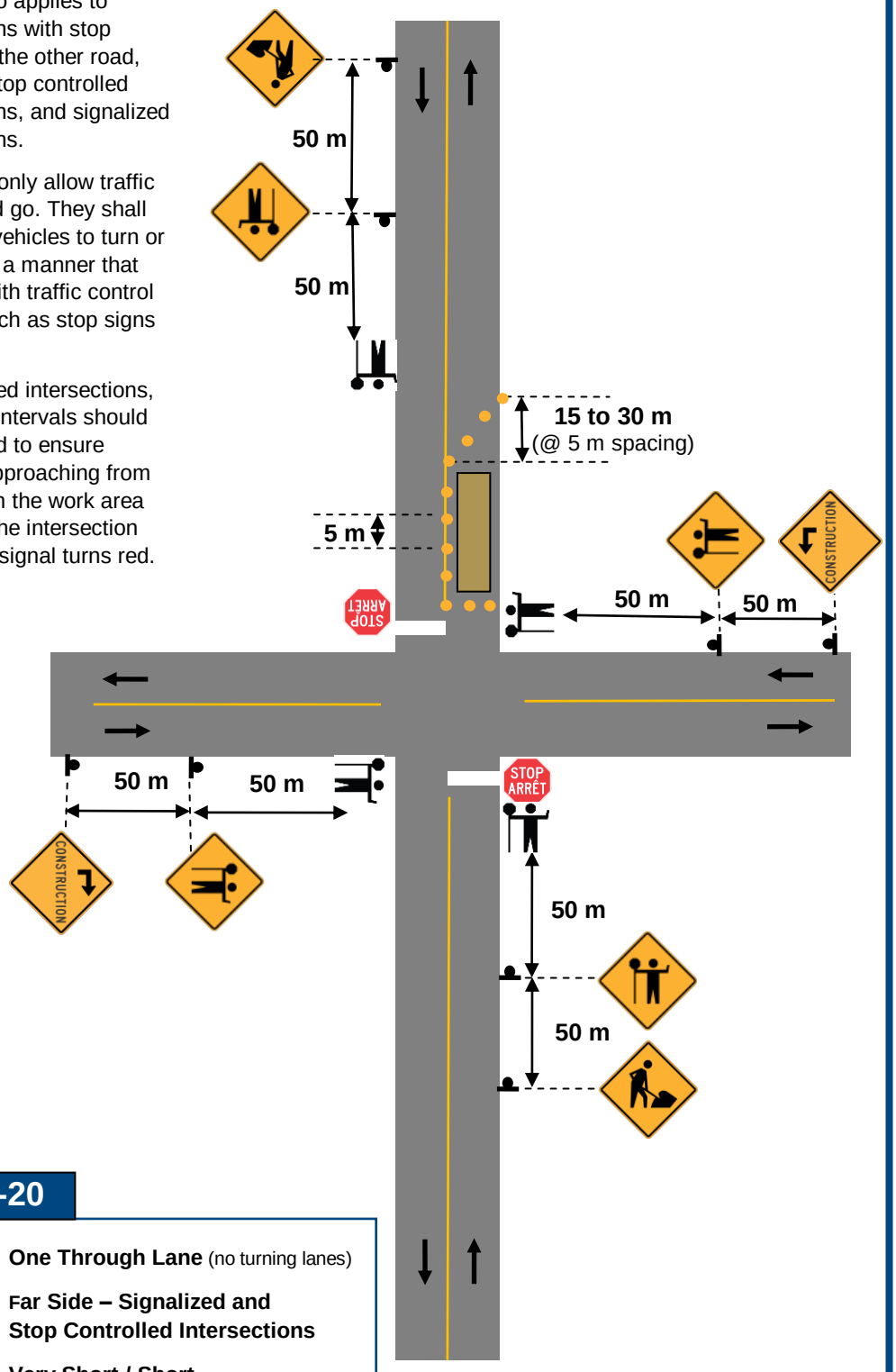


Figure 9-20

Cross-section:	**One Through Lane** (no turning lanes)
Work Location:	**Far Side – Signalized and Stop Controlled Intersections**
Duration:	**Very Short / Short**
Road Class:	**Major & Local**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

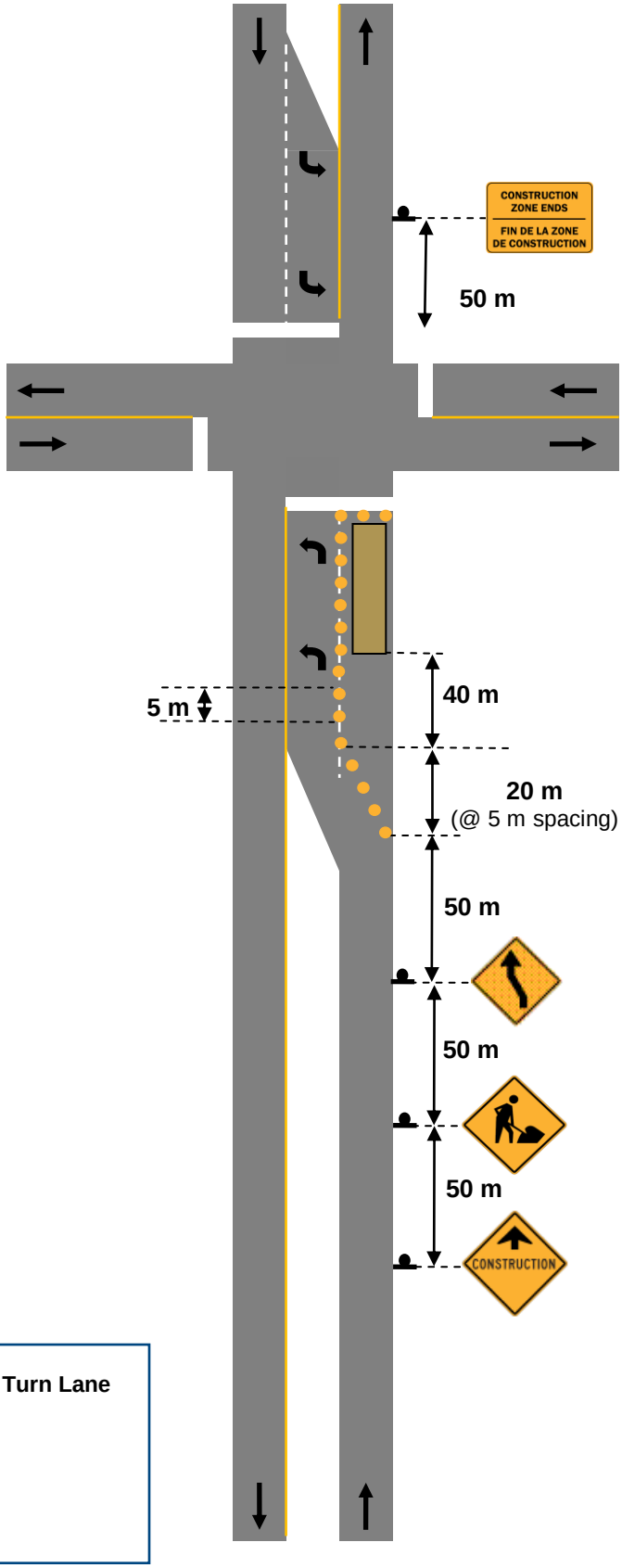


Figure 9-21

Cross-section:	**1 Through Lane + Left Turn Lane**
Work Location:	**Near Side, Right Lane**
Duration:	**All**
Road Class:	**Major & Local**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.
2. Layout can also be used for work areas in the right turn lane. Signs on other approaches are not required for work areas in the right lane.

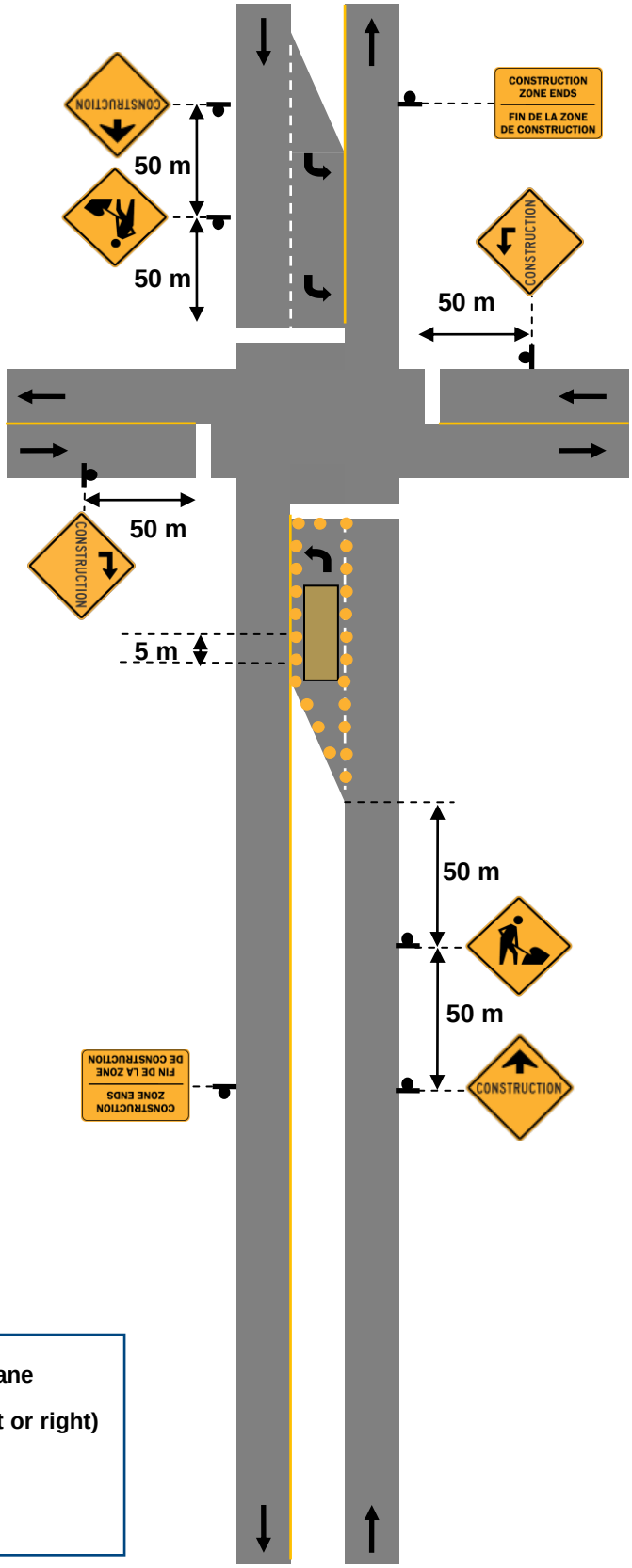


Figure 9-22

Cross-section:	**1 Through Lane + Turn Lane**
Work Location:	**Near Side, Turn Lane (left or right)**
Duration:	**All**
Road Class:	**Major & Local**

NOTES:

1. **Construction Ahead** (on through street) and **Construction Zone Ends** signs only required for long duration work.
2. Layout can also be used for work areas in the right lane. Signs on other approaches are not required for work areas in the right lane.

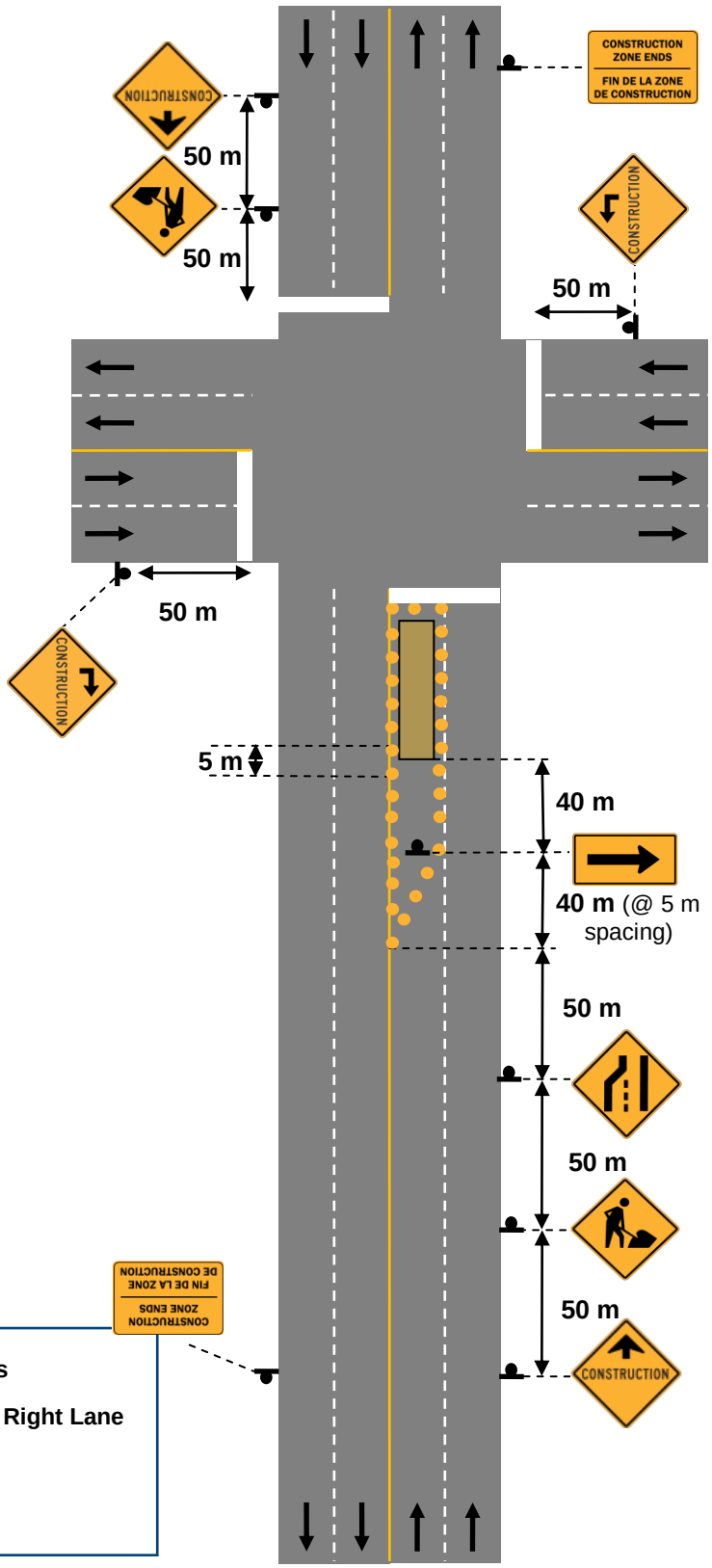


Figure 9-23

Cross-section:	**Two Through Lanes**
Work Location:	**Near Side - Left or Right Lane**
Duration:	**All**
Road Class:	**Major**

NOTES:

1. **Sign opposite approach in similar manner** (see Figure 9-13 for additional guidance).
2. **Construction Ahead** (on through street) and **Construction Zone Ends** signs only required for long duration work.
3. Prohibit parking on through street approaches to the work area.

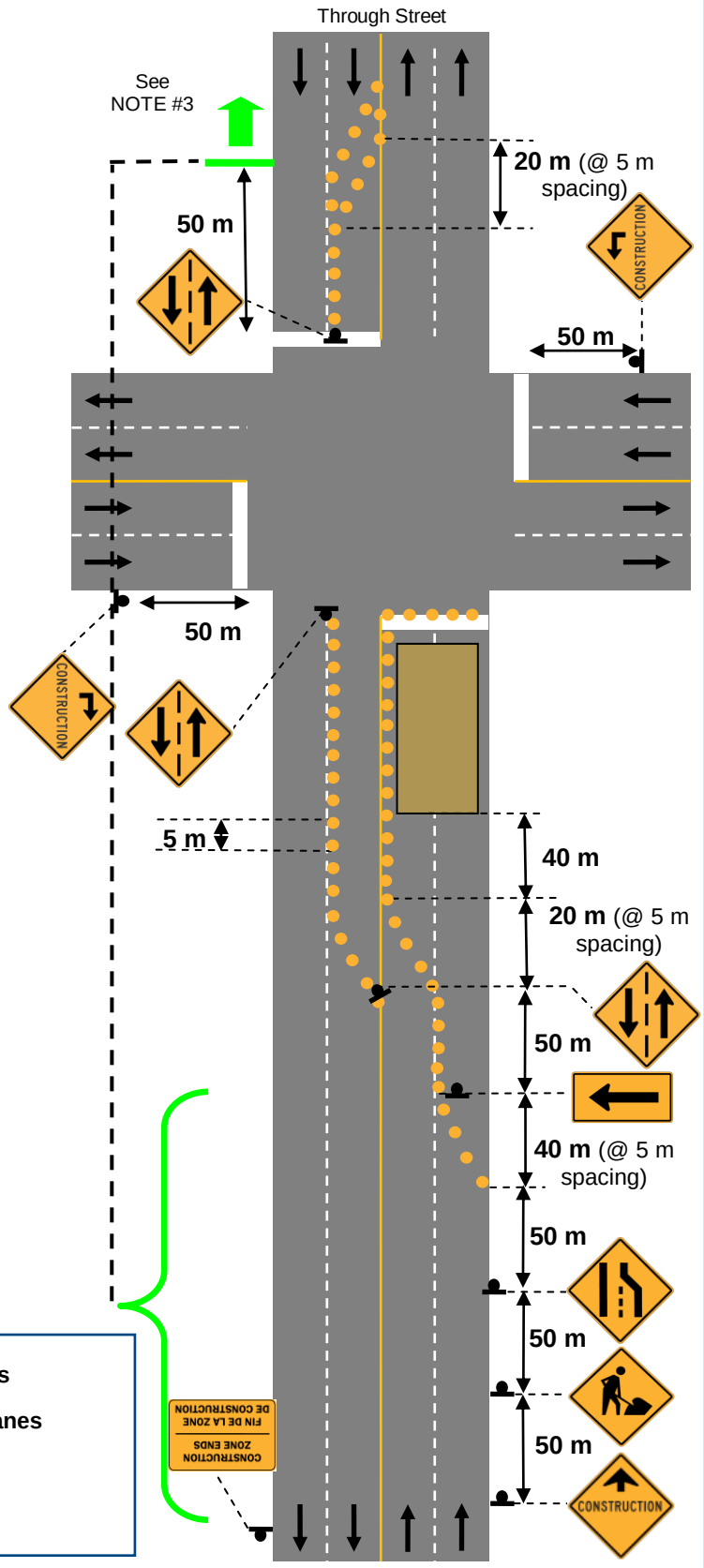


Figure 9-24

Cross-section:	**Two Through Lanes**
Work Location:	**Near Side – Two Lanes**
Duration:	**All**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** (on through street) and **Construction Zone Ends** signs only required for long duration work.
2. Replace **Light Barricade** with **Heavy Barricade** for long duration work on major roads.

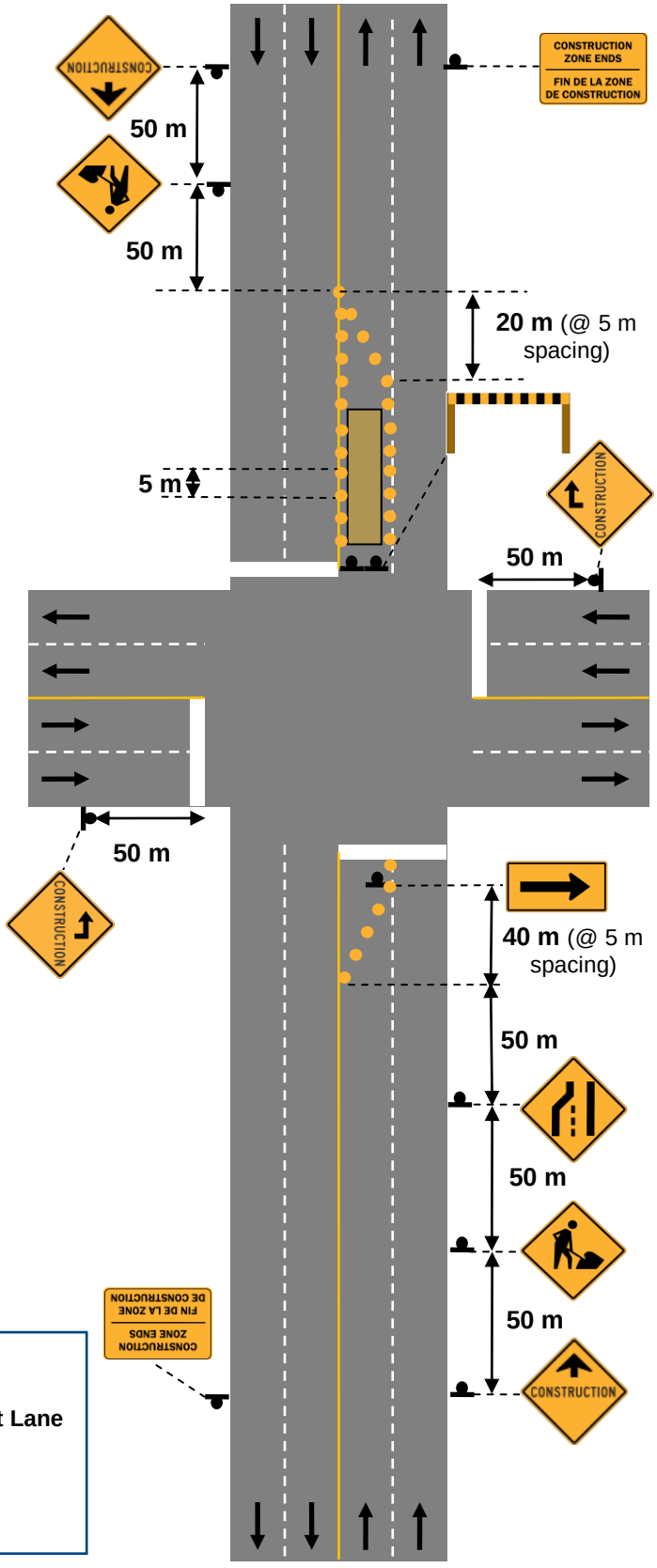


Figure 9-25

Cross-section:	**Two Through Lanes**
Work Location:	**Far Side – Left or Right Lane**
Duration:	**All**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** (on through street) and **Construction Zone Ends** signs only required for long duration work.
2. Prohibit parking on all approaches to the work area.
3. Replace **Light Barricade** with **Heavy Barricade** for long duration work on major roads.
4. Sign opposite approach in similar manner (see Figure 9-13 for additional guidance).

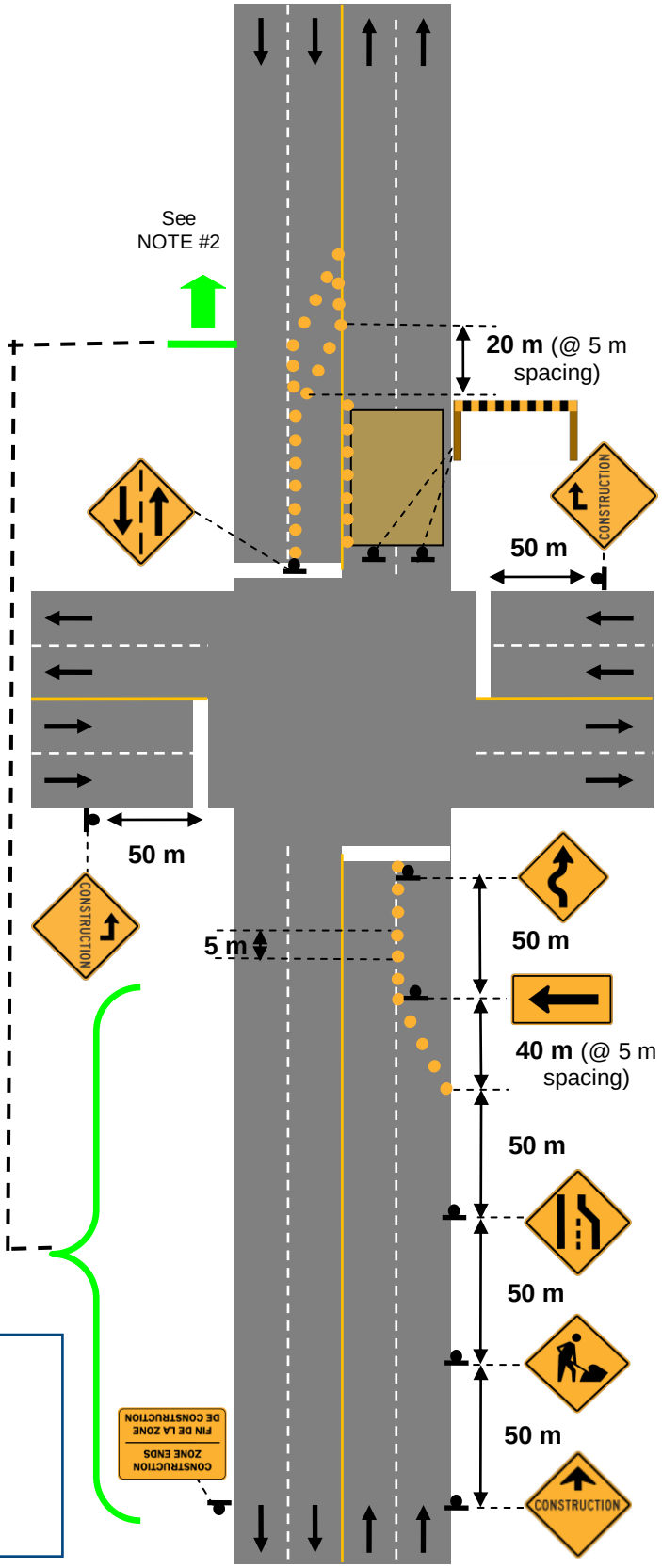


Figure 9-26

Cross-section:	**Two Through Lanes**
Work Location:	**Far Side – Two Lanes**
Duration:	**All**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** and **Construction Zone Ends** signs only required for long duration work.

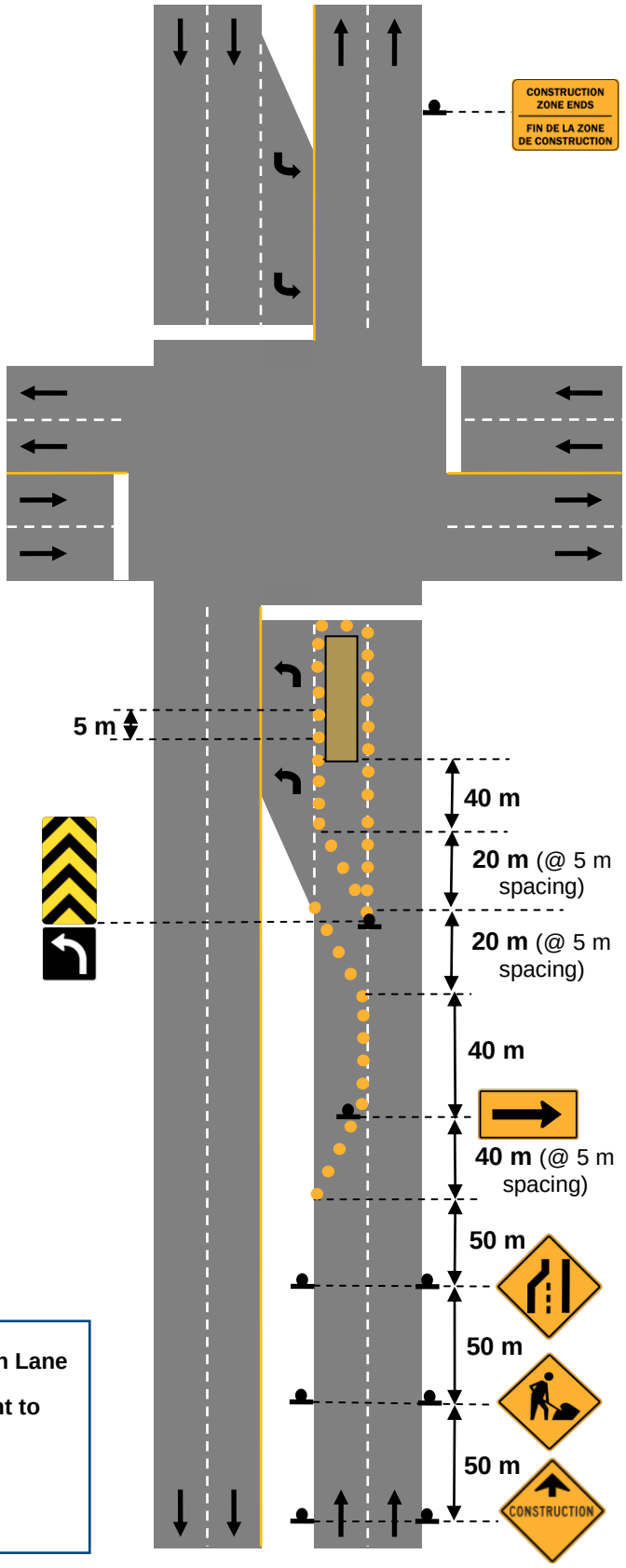


Figure 9-27

Cross-section:	**2 Through Lanes + 1 Turn Lane**
Work Location:	**Near Side – Lane adjacent to turn lane**
Duration:	**All**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** (on through street) and **Construction Zone Ends** signs only required for long duration work.

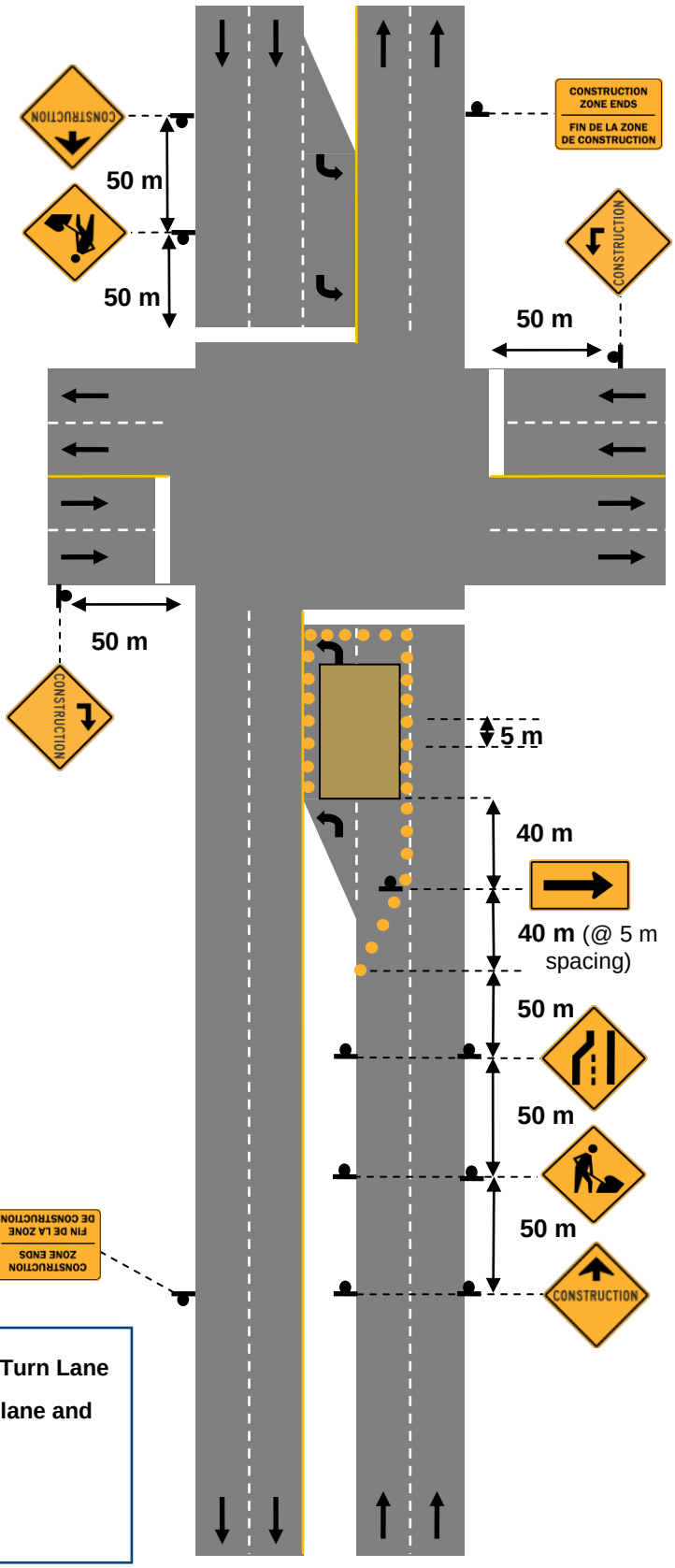


Figure 9-28

Cross-section:	**2 Through Lanes + 1 Turn Lane**
Work Location:	**Near Side – Through lane and turn lane**
Duration:	**All**
Road Class:	**Major**

NOTES:

1. **Construction Ahead** (on through street) and **Construction Zone Ends** signs only required for long duration work.
2. Replace **Light Barricade** with **Heavy Barricade** for long duration work on major roads.

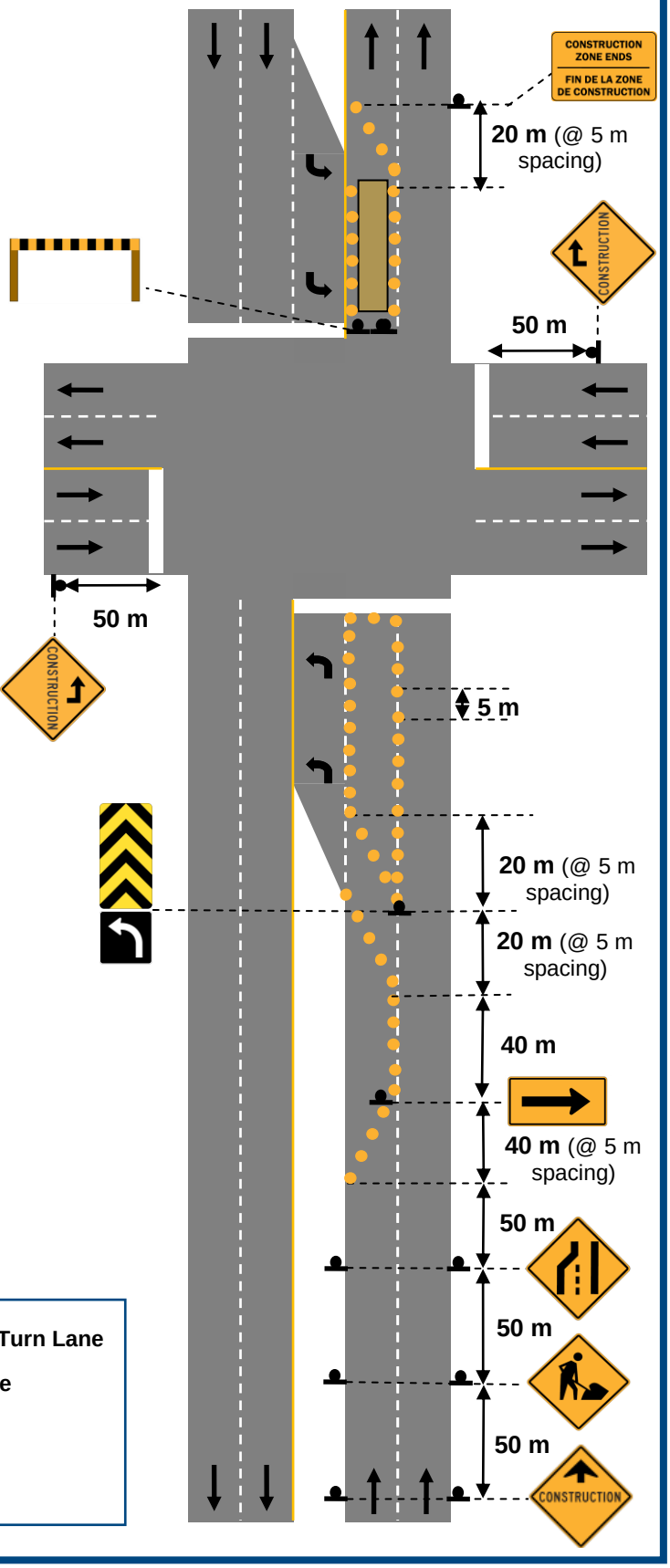


Figure 9-29

Cross-section:	**2 Through Lanes + 1 Turn Lane**
Work Location:	**Far Side – Single Lane**
Duration:	**All**
Road Class:	**Major**

NOTES:

1. Add appropriate street name signs to detour tabs for major road closures.
2. Detour signage may not be required for local road closures at the discretion of the Municipality.
3. Signs shall be spaced 50 m apart if possible.
4. Replace **Light Barricade** with **Heavy Barricade** for long duration work on major roads.

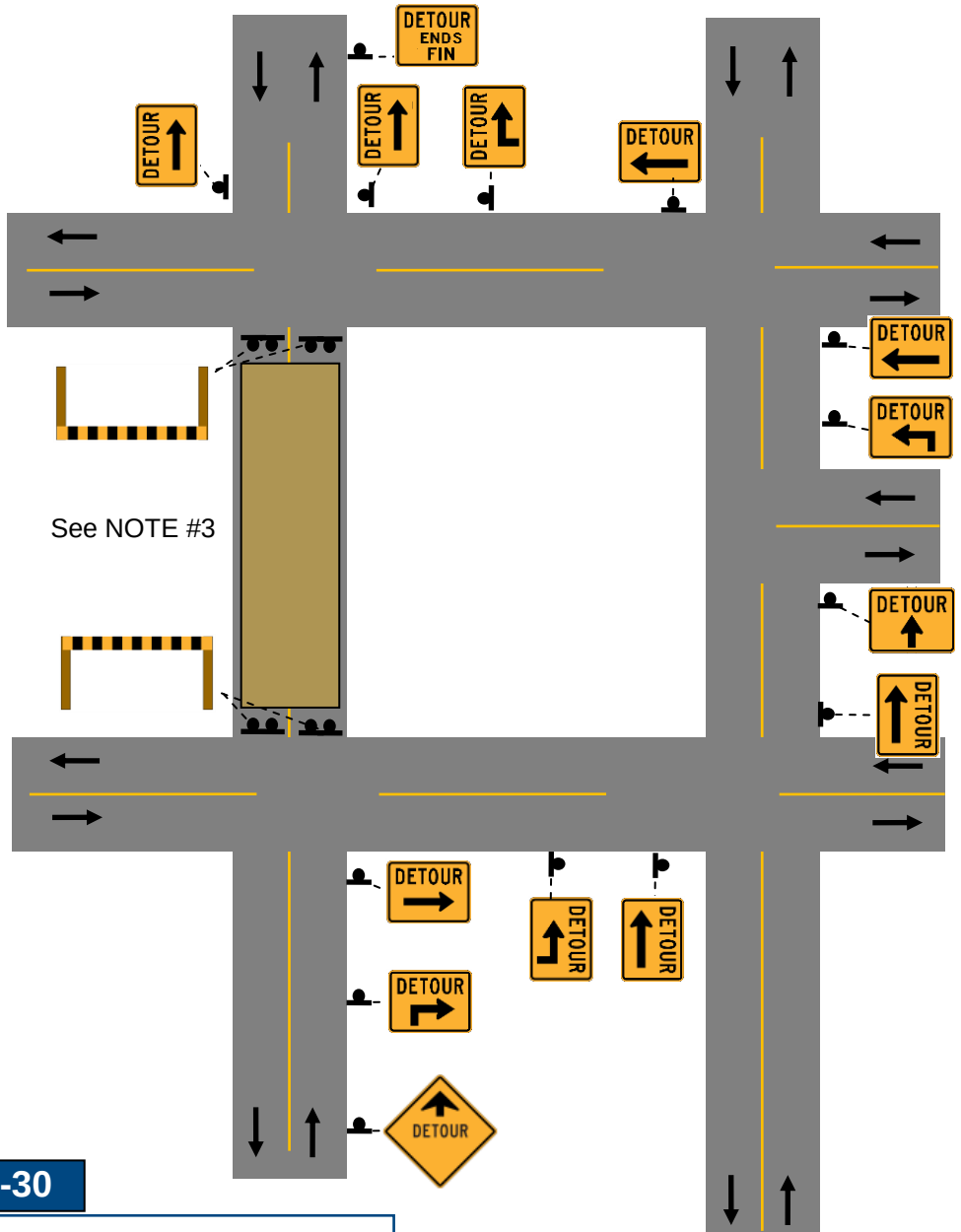


Figure 9-30

Cross-section:	**All Cross Sections**
Work Location:	**Entire Block**
Duration:	**Short / Long**
Road Class:	**Major and Local**

NOTES:

1. All advanced warning signs shall be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.
2. Warning sign layout for cyclists also applies to yield and signal traffic control (see Figures 9-6 and 9-8).

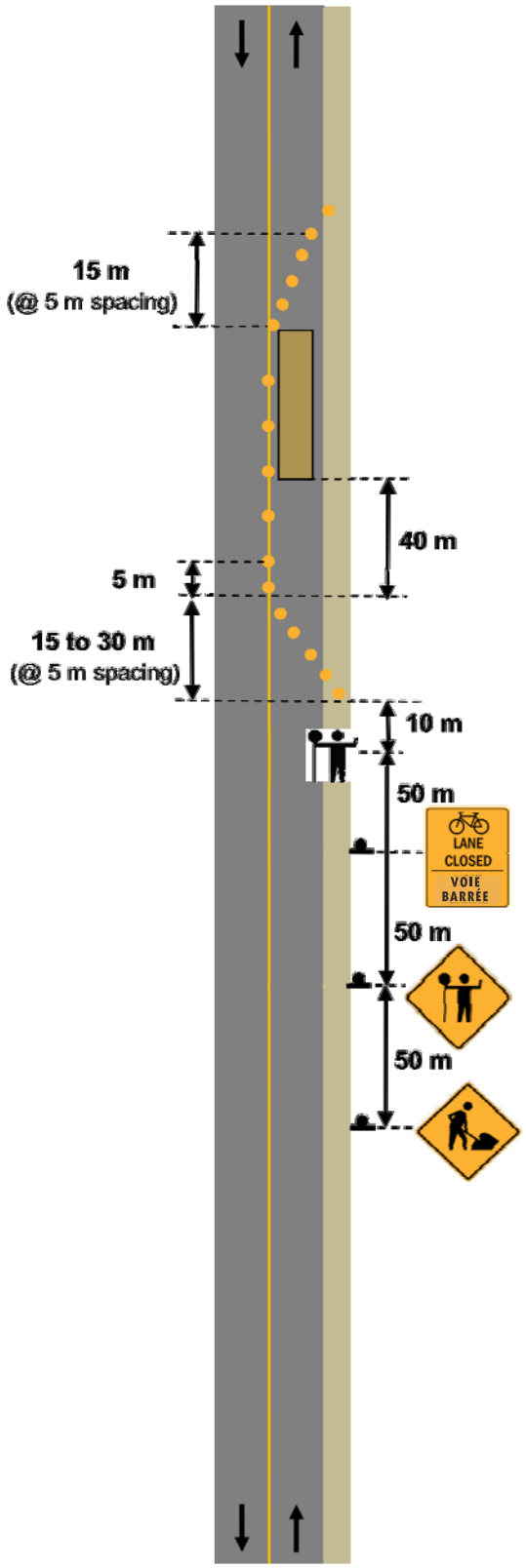


Figure 9-31

Cross-section:	**Bicycle Lane**
Work Location:	**Single Lane and Bicycle Lane**
Duration:	**Very Short / Short / Long**
Road Class:	**Major and Local**

NOTES:

1. All advanced warning signs shall be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.
2. Warning sign layout for cyclists also applies to yield and signal traffic control (see Figures 9-6 and 9-8).

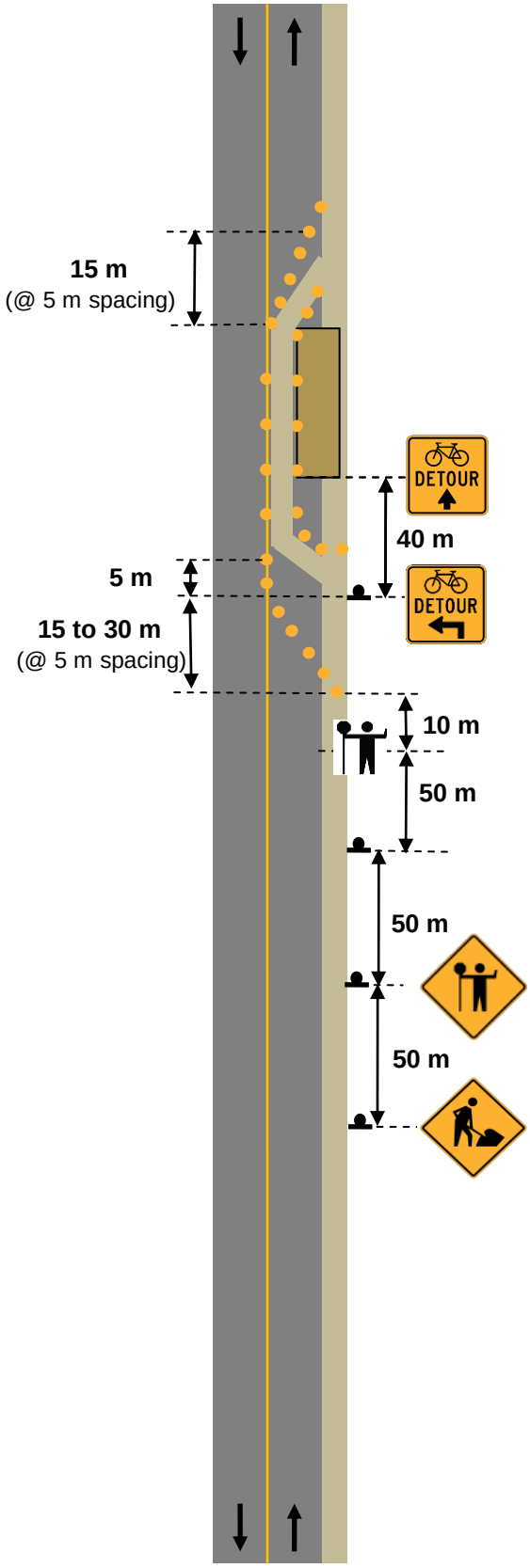


Figure 9-32

Cross-section:	**Bicycle Lane**
Work Location:	**Partial Lane and Bicycle Lane**
Duration:	**Very Short / Short / Long**
Road Class:	**Major and Local**

NOTES:

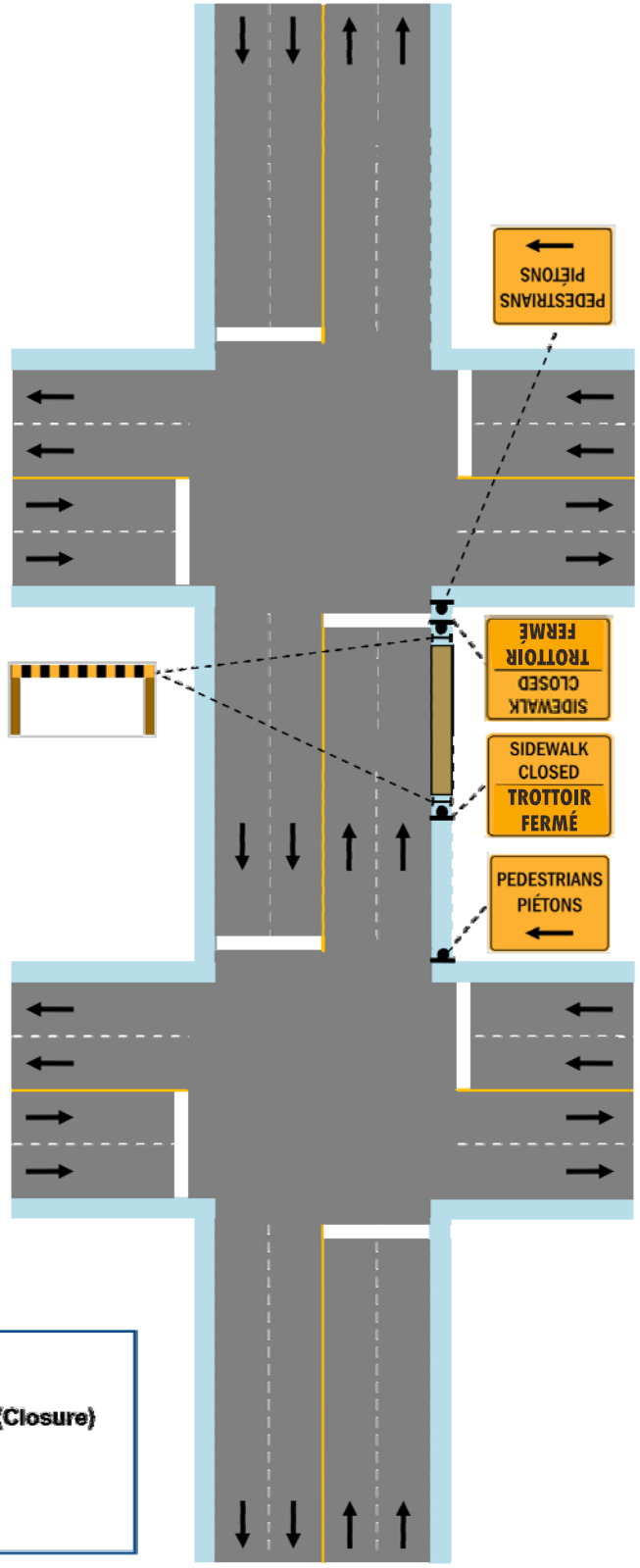


Figure 9-33

Cross-section:	**Sidewalk**
Work Location:	**Full Sidewalk Width (Closure)**
Duration:	**Short / Long**
Road Class:	**Major and Local**

Schedule A

AGREEMENT BETWEEN TOWN OF SHEDIAC AND CONTRACTOR

THIS AGREEMENT made on this _____ day of _____, 20____.

BETWEEN: The Town of Shediac, a municipal corporation, duly incorporated under and by virtue of a Special Act of the Legislative Assembly of the Province of New Brunswick,

hereinafter called the **"Town"**

AND: _____, a company incorporated under the laws of the Province of _____ having its Head Office in the _____ of _____, in the Province of _____.

hereinafter called the **"Contractor"**

The Town and the Contractor agree as follows:

ARTICLE A-1: THE WORK

The Contractor shall:

1.1 perform the Work required by the Contract Documents for _____

_____

(insert above the title of Work)

located at _____,

(insert above the place of the Work)

which have been signed by the parties, and for which _____,

_____,

(insert above the name of the Consultant)

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

1.2 do and fulfill everything indicated by the Agreement, and

1.3 commence the Work by the _____, day of _____, in the year _____and subject to adjustment in the completion date as provided for in the Contract Documents, attain Completion of the Work, by the _____ day of _____ in the year _____ . Failure to comply shall result in the application of liquidated damages, as per General condition 25. Completion Date shall determine application of bonus or penalty, as per General Condition 26.

ARTICLE A-2: AGREEMENT AND AMENDMENTS

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

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

ARTICLE A-3: CONTRACT DOCUMENTS

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

Schedule A) Agreement between Town of Shediac and Contractor;

Schedule B) Town of Shediac Standard Municipal Specifications (including Contract Definitions and General Conditions)

Schedule C) Supplementary Conditions

Schedule D) Supplementary Technical Specifications

Schedule E) N/A

Schedule F) Tender Form

Schedule G) Certificate of Insurance

Schedule H) Performance Bond

Schedule I) Labour and Material Payment Bond

ARTICLE A-4: CONTRACT PRICE

4.1 The quantities shown in the Schedule of Contract Unit Prices are estimated. The Contract Price shall be the final sum of the products of the actual quantities that are incorporated in, or made necessary by the Work, as confirmed by count and measurements, and the appropriate Contract. Unit Prices, together with any adjustments that are made in accordance with the provisions of the Contract Documents.

4.2 The Estimated Contract Price shall be the sum of the products of the estimated quantities and the appropriate Contract Unit Prices in the Schedule.

4.3 Schedule of Contract Prices

Item No.	Description	Unit	Estimated Quantity	Contract Unit Price	Estimated Total Price

ARTICLE A-5: PAYMENT

5.1 The Town shall pay the Contractor for the performance of the Contract, the amounts being determined by actual measured quantities of the individual work items contained in the Schedule of Contract Unit Prices in Article A-4.3 of this Agreement, and measured in accordance with the methods of measurement given in the specifications.

ARTICLE A-6: RIGHTS AND REMEDIES

6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

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

ARTICLE A-7: RECEIPT OF AND ADDRESSES FOR NOTICES

7.1 Notices in writing between the parties or between them and the Consultant shall be considered to have been received by the addressee on the date of delivery if delivered to the individual, or to a member of the firm, or to an officer of the corporation for whom they are intended by hand or by registered post; or if sent by regular post, to have been delivered within 5 working days of the date of mailing when addressed as follows:

The Town at 290 Main Street, unit 300
Street and number and postal box number if applicable

Shediac, NB, Canada, E4P 2E3
Post office or district, province, postal code

The Contractor at _____
Street and number and postal box number if applicable

_____
Post office or district, province, postal code

The Consultant at _____
Street and number and postal box number if applicable

_____
Post office or district, province, postal code

ARTICLE A-8: SUCCESSION

8.1 The Contract Documents are to be read into and form part of this Agreement and the whole shall constitute the Contract between the parties, and subject to the law and the provisions of the Contract Documents shall ensure to the benefit of and be binding upon the parties hereto, their respective heirs, legal representatives, successors and assigns.

IN WITNESS WHEREOF the parties hereto have executed this Agreement and by the hands of their duly authorized representatives.

SIGNED SEALED AND DELIVERED:

TOWN OF SHEDIAC:

_____
Mayor

_____
Town Administrator/Clerk

CONTRACTOR:

_____
(Signature - name and title of person signing)

_____
(Signature - name and title of person signing)

APPENDIX "K"

COUNTY OF WESTMORLAND
PROVINCE OF NEW BRUNSWICK

AFFIDAVIT FOR TOWN OF SHEDIAC SIGNATURES

TO WIT:

I, _____, OF THE TOWN OF SHEDIAC, IN THE COUNTY OF WESTMORLAND AND PROVINCE OF NEW BRUNSWICK MAKE OATH AND SAY:

1. THAT I AM THE TOWN CLERK OF THE TOWN OF SHEDIAC AND _____ IS THE MAYOR OF THE SAID TOWN.

2. THAT AS TOWN CLERK OF THE TOWN OF SHEDIAC, I HAVE THE CUSTODY OF THE COMMON SEAL OF THE TOWN OF SHEDIAC AND AM DULY AUTHORIZED TO AFFIX THE SEAL TO ANY CONTRACT MADE BY THE TOWN OF SHEDIAC.

3. THAT THE SEAL AFFIXED TO THE AFOREGOING CONTRACT IS THE COMMON AND CORPORATE SEAL OF THE TOWN OF SHEDIAC AND SUCH SEAL WAS BY ME AFFIXED THERETO BY ORDER OF THE COUNCIL OF THE TOWN OF SHEDIAC AND FOR THE PURPOSES THEREIN SET FORTH.

4. THAT THE SIGNATURE "ROGER CAISSIE" TO THE SAID CONTRACT SUBSCRIBED AS MAYOR, IS IN THE TRUE AND PROPER HANDWRITING OF HIM, THE SAID _____ AND WAS SIGNED BY HIM IN MY PRESENCE; AND THE SIGNATURE "GILLES BELLEAU" TO THE AFOREGOING CONTRACT SUBSCRIBED AS TOWN CLERK IS IN MY TRUE AND PROPER HANDWRITING.

SWORN TO AT THE TOWN OF SHEDIAC)
IN THE COUNTY OF WESTMORLAND AND)
PROVINCE OF NEW BRUNSWICK, THIS)
_____DAY OF_____)
A.D., , _____ BEFORE ME :)
)
)
)
)
)
)

_____ _____

A COMMISSIONER OF OATHS GILLES BELLEAU
BEING A SOLICITOR

APPENDIX "K"

AFFIDAVIT FOR CONTRACTOR SIGNATURES

COUNTY OF WESTMORLAND
PROVINCE OF NEW BRUNSWICK

AFFIDAVIT FOR CONTRACTOR SIGNATURES

TO WIT:

I, _____, OF THE ___(municipality)_____, IN THE COUNTY OF _____ _____AND PROVINCE OF NEW BRUNSWICK MAKE OATH AND SAY:

1. THAT I AM THE _____(title)_____OF ___(company name)_____. A COMPANY DULY AND REGURLARLY INCORPORATED WITH HEAD OFFICE AND CHIEF PLACE OF BUSINESS IN _____(municipality)_____, COUNTY OF _____AND PROVINCE OF NEW BRUNSWICK, AND HAVE THE CUSTODY OF THE CORPORATE SEAL OF THE SAID COMPANY.

2. THAT THE SIGNATURE AFFIXED TO THE AFOREGOING CONTRACT WAS AFFIXED BY ME BY ORDER OF THE BOARD OF DIRECTORS OF THE SAID COMPANY IN ACCORDANCE WITH A RESOLUTION OF THE BOARD.

3. THAT THE SIGNATURE "_____" TO THE SAID CONTRACT AS THAT OF _____(title)_____ , IS MY HANDWRITING AND THE SAID INDENTURE WAS SUBSCRIBED BY ME AND FOR THE ACTS AND DEEDS OF THE SAID COMPANY AND FOR THE USES AND PURPOSES THEREIN CONTAINED.

SWORN TO AT THE __(municipality)_____)
IN THE COUNTY OF WESTMORLAND AND)
PROVINCE OF NEW BRUNSWICK, THIS)
_____DAY OF_____)
A.D., , _____ BEFORE ME :)
)
)
)
)
)
)

_____ _____
A COMMISSIONER OF OATHS (name)
BEING A SOLICITOR

APPENDIX "L"

MINIMUM TESTING FREQUENCY

Item No.	Description	Test Method	Testing Frequency	Remarks
1.	Trench Work (water and sewer)	ASTM D 2922	Rolling pattern for both stone and common backfill to establish a benchmark to continue until a noticeable change in material. Once procedure is established, Inspector must insure that the recommended method is followed on all trenches.	Nuclear Gauge Testing, Inspector to make field notes on method and results.
2.	Subgrade Testing (Fill Sections)	ASTM D 2922	One field test section per material type to develop a definite compaction procedure (equipment, lift thickness, moisture application and number of passes), which will produce the required density. Visual deflection test of all subgrade surfaces with a fully loaded tandem truck. Minimum one test per 20m of street, for each 300mm lifts.	Nuclear Gauge Testing
3.	Subgrade Testing (Cut Sections)		Visual Deflection Test of all subgrade surfaces with a fully loaded tandem truck.	Inspector must record and confirm the results.
4.	Granular Base and Subbase	ASTM D 2922	Minimum one test per 40m of street, for each lift of stone added.	Nuclear gauge testing
5.	Concrete Curb and Sidewalks	CSA A23.1-00	Minimum one set of tests and cylinders per 50cu.m (±300m).	Air, slump and compressive strength
6.	Asphalt Concrete		Rolling pattern for each different type of asphalt to establish a benchmark to continue. Once procedure is established, Inspector must insure that the recommended method is followed.	Nuclear gauge testing
7.	Asphalt Concrete Sampling	ASTM D 979	Minimum of three Asphalt Concrete Mix samples per street per LOT/day hot-mix type (as per Section 8.6.2.1). Note: As per Section 8.6.2.1, each sample shall be split in two equal portions; one tested, the other set aside in the event that an appeal is requested by the Contractor.	Testing to be carried out following Asphalt Institute Manual Series Sp2,Superpave mix design method
8.	Asphalt Concrete Coring	ASTM D 3549 ASTM D 5361	Minimum of three cores per LOT per hot-mix type. Two additional cores per job to be done at joints adjacent to two of the other core locations. Small areas, tapers, aprons and areas of handwork shall not be cored.	
9.	Asphalt Binder	ASTM D 140	Minimum of one litre per contract per Asphalt Binder Type.	Sample shall be taken from the Contractor's storage tank in accordance with ASTM D 140.

* Frequency or number of tests may be increased at any time by the Engineer when deemed necessary.
* All test results shall be immediately faxed or e-mailed to the Town of Shediac concurrently with notification to the Consultant/Engineer and/or Owner/Developer.

APPENDIX "M"

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CLOSED CIRCUIT VIDEO INSPECTION

QUALIFICATIONS OF INSPECTORS:

Inspectors must have obtained formal certification through the National Association of Sewer Service Companies (NASSCO) and be familiar with the Pipeline Assessment Certification Program (PACP) sewer condition classification.

TRAFFIC CONTROL:

Supply and maintain signs, barricades, flashers and signallers as required.

EQUIPMENT:

The Supplier must provide equipment meeting the following requirements:

- Appropriate equipment as required to perform the flushing of sewer lines to remove debris or other foreign material that prevents the camera from passing through sewers.
- 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 thesewer line for inspection and photographic purposes.
- Minimum camera resolution must be 640 x 480 and show the entire periphery of the pipe.
- CCTV video is to be recorded in MPEG 4 (H.264/MPEG-4 AVC) format and be in colour.
- Supplier must be able to video pipe sizes ranging from 100 mm diameter up to 1800 mmdiameter 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 servicelateral 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 circumferentialcracks (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 video displaying standing water.

INSPECTION:

- Perform inspection of pipe by passing CCTV camera through sewer along the axis of thepipe in the direction of flow according to line conditions at the time of inspection.
- All faults 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 representationof that fault.

APPENDIX "N"

RECORDS AND REPORTS:

- Video inspection of pipe shall be from manhole to manhole.
- Reports to include location of each fault and service laterals with their respective distancemeasured from centreline reference manhole and clock position referenced to axis of pipe.Reports shall also include pictures of significant defects (severely deteriorated pipes, severely protruding laterals, etc.)
- At the start of each sewer main inspection, the following information shall be recorded inMP4 format.
    - Date format : day(24) month(August) year(2021),time and weather conditions
    - Pipe type (combined ,sanitary or storm)
    - Purpose of survey
    - Pipe size
    - Pipe material
    - Pipe ID
    - Street name
    - From manhole ID
    - To manhole ID
    - MH to MH distance
    - Distance videoed
    - Pipe slope
    - Direction of travel (upstream or downstream)
    - Survey number
    - Any other pertinent information
- The pipe ID shall be displayed on the screen at all times during the inspection for quickreference.
- On screen display to clearly identify exact location of camera in meters.
- On screen to display a clear visual of pipe being videoed if camera lens are obstructed withany type of reduced clarity the section affected shall be re videoed at the expense of the contractor and at no extra cost to the Town.
- The inspection reports shall be in PDF format and shall be submitted to the Town of Shediac.

ACCURACY:

- Maximum permissible error in the location of faults and service laterals with their respective distance measured from centreline of reference manhole to be within 1 (one) meter tolerance.

MP4 VIDEO FORMAT:

- Supply a complete individual file record of all CCTV video inspections.
- Streets and corresponding pipe ID`s inspected.
- The contractor shall provide a video file along with the corresponding PDF report of each section videoed separately. One MP4 file and one PDF report file for each section inspected