TABLE OF CONTENTS

	TITLE	SECTION	REVISION DATE	PAGE NUM.
1.	Definitions	00 71 00	JAN. 2025	2
2.	General Conditions of the Civil Works Contract	00 72 45	JAN. 2025	5
3.	Measurement and Payment	01 22 00	JAN. 2025	33
4.	Specification for Hot Mix Asphalt Concrete	S-1	JAN. 2024	118
5.	Specification for Performance Graded Asphalt Binder	S-2	JAN. 2020	148
6.	Asphaltic Concrete and Portland Cement Concrete Planing / Profiling	S-3	JAN. 2024	146
7.	Pavement Markings	S-4	JAN. 2020	160
8.	Micro-Surfacing	S-5	JAN. 2021	166
9.	Concrete	S-11 Part A	JAN. 2025	177
10.	Curbs, Walks, and Gutter	S-11 Part B	JAN. 2025	199
11.	Precast Concrete	S-11 Part C	JAN. 2025	207
12.	Interlocking Concrete Pavers	S-12	JAN. 2025	214
13.	Traffic Control Manual Supplement	Appendix ‘A’	JAN. 2025	223
14.	Lighting Equipment	26 50 00	JUN. 2019	240
15.	Granite Curbstone	32 16 13.43	AUG. 2024	248
16.	Pre-cast Segmental Retaining Wall System	32 32 23	JAN. 2021	254
17.	Soil Cell Systems	32 94 50	OCT. 2024	260
18.	Traffic Signal Systems	34 41 13	JAN. 2022	271
19.	Standard Details	39 00 00	MAR. 2023	295
20.	Contractor Safety Management Policy		MAR. 2021	385

TABLE OF CONTENTS

	TITLE	SECTION	REVISION DATE	PAGE NUM.
1.	Definitions	00 71 00	JAN. 2025	2
2.	General Conditions of the Civil Works Contract	00 72 45	JAN. 2025	5
3.	Measurement and Payment	01 22 00	JAN. 2025	33
4.	Specification for Hot Mix Asphalt Concrete	S-1	JAN. 2025	118
5.	Specification for Performance Graded Asphalt Binder	S-2	JAN. 2025	157
6.	Asphaltic Concrete and Portland Cement Concrete Planing / Profiling	S-3	JAN. 2025	169
7.	Pavement Markings	S-4	JAN. 2020	173
8.	Micro-Surfacing	S-5	JAN. 2025	179
9.	Concrete	S-11 Part A	JAN. 2025	195
10.	Curbs, Walks, and Gutter	S-11 Part B	JAN. 2025	217
11.	Precast Concrete	S-11 Part C	JAN. 2025	225
12.	Interlocking Concrete Pavers	S-12	JAN. 2025	232
13.	Traffic Control Manual Supplement	Appendix ‘A’	JAN. 2025	241
14.	Lighting Equipment	26 50 00	JUN. 2019	258
15.	Granite Curbstone	32 16 13.43	AUG. 2024	266
16.	Pre-cast Segmental Retaining Wall System	32 32 23	JAN. 2021	272
17.	Soil Cell Systems	32 94 50	OCT. 2024	278
18.	Traffic Signal Systems	34 41 13	JAN. 2022	289
19.	Standard Details	39 00 00	MAR. 2023	313
20.	Contractor Safety Management Policy		MAR. 2021	403

The following Definitions shall apply to all Contract Documents:

1. **Changes in the Work**

Changes in the Work means the deletion, extension, increase, decrease or alteration of lines, grades, dimensions, methods, drawings or materials of the Work or part thereof, within the scope of the Work contemplated by the Contract Documents.

2. **Completion Time**

The Completion Time is the time stipulated in the Contract Documents for Substantial Performance of the Work.

3. **Contract**

The Contract means the undertaking by the parties to perform their respective duties, responsibilities and obligations as prescribed in the Contract Documents and represents the entire agreement between the parties. The Contract may be amended only as provided in the General Conditions of the Civil Works Contract.

4. **Contract Documents**

Contract Documents means the executed Form of Agreement between the Owner and Contractor, the General Conditions of the Civil Works Contract, the Supplementary General Conditions, the Definitions, the Standard Specifications for Municipal Services, Part II, the Supplementary Specifications, the Drawings, the Instructions to Bidders, the Bid Form and such other documents as are listed in the Table of Contents including amendments or addenda thereto incorporated before the execution of the Form of Agreement and subsequent amendments or addenda thereto made pursuant to the provisions of the Contract and agreed upon between the parties.

5. **Contractor**

The Contractor means the person, firm or corporation identified as such in the Form of Agreement and is referred to throughout the Contract Documents as if singular in number. The term Contractor means the Contractor or authorized representative as designated to the Owner in writing.

6. **Drawings**

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

7. **Engineer**

The Engineer means the Executive Director of Public Works for the Halifax Regional Municipality or their authorized representative.

8. **Engineer's Representative**

Engineer's Representative means a person, firm or corporation appointed from time to time by the Engineer under GC3-ENGINEER.

9. **Extra Work**

Extra Work means any work or service, the performance of which is beyond the scope of the Work contemplated by the Contract Documents.

10. **Other Contractor**

Other Contractor means a person, firm or corporation employed by or having a separate contract directly or indirectly with the Owner for work other than that required by the Contract Documents.

11. **Owner**

The Owner means the Halifax Regional Municipality. The term Owner means the Owner or authorized agent or representative as designated to the Contractor in writing but does not include the Engineer.

12. **Place of the Work**

The Place of the Work means the designated site or location of the Project of which the Work may be the whole or a part.

13. **Products**

Products mean material, machinery, equipment, and fixtures forming the Work but does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work and normally referred to as construction machinery and equipment.

14. **Project**

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

15. **Subcontractor**

A Subcontractor means a person, firm or corporation having a direct contract with the Contractor to perform a part or parts of the Work, or to supply products worked to a special design according to the Contract Documents but does not include one who merely supplies products not so worked. The term Subcontractor is referred to throughout the Contract Documents as if singular in number.

16. **Substantial Performance of the Work**

Substantial Performance of the Work is as defined in the lien legislation applicable in the Province of Nova Scotia. If such legislation is not in force or does not contain such definition, Substantial Performance of the work shall have been reached when the Work is ready for use or is being used for the purpose intended and is so certified by the Engineer.

17. **Total Performance of the Work**

Total Performance of the Work means the entire Work, except those items arising from the provisions of Section 00 72 45, subsection 25 - WARRANTY, has been performed to the requirements of the Contract Documents and is so certified by the Engineer.

18. **Work**

Work means the total construction and related services required by the Contract Documents and to be performed by the Contractor.

19. **Working Day**

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

****** End 00 71 00 ******

INDEX TO CLAUSES

GC 1 Documents
GC 2 Additional Instructions
GC 3 Engineer
GC 4 Delays
GC 5 Suspension of Work
GC 6 Owners Right to Terminate Contract and Perform Work
GC 7 Contractors Right to Stop Work or Terminate the Contract
GC 8 Disputes
GC 9 Assignment
GC 10 Other Contractors
GC 11 Subcontractors
GC 12 Changes in the Work and Extra Work
GC 13 Valuation and Certification of Changes in the Work and Extra Work
GC 14 Applications for Payment
GC 15 Certificates and Payments
GC 16 Taxes and Duties
GC 17 Laws, Notices, Permits and Fees
GC 18 Patent Rights and Royalties
GC 19 Workers Compensation Insurance
GC 20 Indemnification
GC 21 Insurance
GC 22 Protection of Work and Property
GC 23 Damages and Mutual Responsibility
GC 24 Security
GC 25 Warranty
GC 26 Contractor's Responsibility and Control of Work
GC 27 Superintendence
GC 28 Labour and Products
GC 29 Subsurface Conditions
GC 30 Use of the Work
GC 31 Inspection of the Work
GC 32 Rejected Work
GC 33 Products Supplied by Owner
GC 34 Liquidated Damages
GC 35 Hours and Days of Work
GC 36 Land
GC 37 Order to Start Work
GC 38 Setting Out the Work
GC 39 Local Office and Telephone Numbers
GC 40 Time for Completion
GC 41 Vendor Performance Evaluation

GC 1 DOCUMENTS

1.1 The Form of Agreement shall be signed in duplicate by the Owner and the Contractor.

1.2 The intent of the Contract Documents is to describe the labour, products, and services necessary for the performance of the Work. It is not intended, however, that the Contractor shall supply products or perform Work not consistent with, covered by, or properly inferable from the Contract Documents.

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

1.4 References to the singular shall be considered to include the plural, and references to the masculine shall be considered to include the feminine, or body corporate, as the context requires.

1.5 The language in the Contract Documents shall be interpreted as to its fair meaning and not strictly for or against any party. Any rule of construction to the effect that ambiguities are to be resolved against the drafting party (i.e. – “contra proferentem”) shall not apply in interpreting the Contract Documents, as the Contract Documents shall be construed as having been co-authored by the parties.

1.6 If there is a conflict within the Contract Documents:

(a) The order of priority of documents, from highest to lowest, shall be
- The Form of Agreement between the Owner and the Contractor,
- The Definitions,
- The Supplementary General Conditions,
- The General Conditions of the Civil Works Contract,
- The Supplementary Specifications,
- The Drawings,
- The Bid Form,
- Summary Sheet,
- Instructions to Bidders,
- The Standard Specifications for Municipal Services, Part II.

(b) Drawings of larger scale shall govern over those of smaller scale of the same date.

(c) Dimensions shown on Drawings shall govern over dimensions scaled from Drawings.

(d) Later dated documents shall govern over earlier documents of the same type.

1.7 The Contractor will be provided without charge electronic copies of the Contract Documents as are necessary for the performance of the Work.

1.8 The Contractor shall keep one copy of the current Contract Documents and shop drawings at the Place of the Work, in good order and available to the Engineer and the Engineer’s representatives. This requirement shall not be considered to include the executed set of Contract Documents.

1.9 Drawings, specifications, models, and copies thereof furnished by the Engineer are and shall remain the property of the Engineer with the exception of the signed contract sets belonging to each party to this Contract. Such documents and models are to be used only with respect to the Work and are not to be used on other work. Such documents and models are not to be copied or revised in any manner without the written authorization of the Engineer.

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

GC 2 ADDITIONAL INSTRUCTIONS

2.1 During the progress of the Work the Engineer will furnish to the Contractor such additional instructions to supplement the Contract Documents as may be necessary for the performance of the Work. Such instructions shall be consistent with the intent of the Contract Documents.

2.2 Additional instructions may be in the form of specifications, drawings, samples, models, or other written instructions.

2.3 Additional instructions will be issued by the Engineer with reasonable promptness and in accordance with a schedule agreed upon for such instructions.

GC 3 ENGINEER

3.1 The Engineer will provide administration of this Contract as described in the Contract Documents.

3.2 The Engineer will be the Owner's representative during construction and until completion of any correction of defects under the provisions of GC 25 - WARRANTY, Subsection 25.2 or until all required Work is performed completely, whichever is later. The Owner's instructions to the Contractor shall be forwarded through the Engineer. The Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

3.3 The Engineer will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences (unless otherwise directed by the Engineer), or procedures. The Engineer will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or their agents, employees, or other persons performing any of the Work.

3.4 The Engineer will visit the Place of the Work at intervals appropriate to the progress of construction to become familiar with the progress and quality of the Work and to record the data necessary to establish the pay quantities under the Schedule of Quantities and Unit Prices.

3.5 Based on the Engineer's observations and evaluation of the Contractor's applications for payment, the Engineer will determine the amounts owing to the Contractor under the Contract and will issue certificates for payment in such amounts, as provided in the AGREEMENT and GC 15 - CERTIFICATES AND PAYMENTS.

3.6 The Engineer will be, in the first instance, the interpreter of the requirements of the Contract Documents and the judge of the performance there under by both parties to the Contract.

Interpretations and decisions of the Engineer shall be consistent with the intent of the Contract Documents.

3.7 Claims, disputes, and other matters in question relating to the performance of the Work or the interpretation of the Contract Documents shall be referred initially to the Engineer in writing for decision which will be given in writing within a reasonable time.

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

3.9 The Engineer will review and take appropriate action upon the Contractor's submittals, such as shop drawings, product data, and samples, in accordance with the requirements of the Contract Documents.

3.10 The Engineer will prepare change orders in accordance with the requirements of GC 12 - CHANGES IN THE WORK AND EXTRA WORK.

3.11 The Engineer will conduct inspections to determine the date of Substantial Performance of the Work and the date when all required Work is performed completely in accordance with the requirements of GC 15 - CERTIFICATES AND PAYMENT and will receive equipment, system or material warranties, and related documents required by the Contract and provided by the Contractor.

3.12 The Engineer may provide at the site one or more representatives. The Engineer's Representative shall be responsible to the Engineer and shall carry out such duties and exercise such authority as may be delegated by the Engineer under 3.13.

3.13 The Engineer may from time-to-time delegate to the Engineer's Representative any of the duties and authorities vested in the Engineer and may at any time revoke such delegation. Any such delegation or revocation shall be in writing and shall not take effect until a copy thereof has been delivered to the Owner and the Contractor.

3.14 Any communication given by the Engineer's Representative to the Contractor in accordance with such delegation shall have the same effect as though it had been given by the Engineer, provided that:

(a) any failure of the Engineer's Representative to disapprove any Work, materials or plant shall not prejudice the authority of the Engineer to disapprove such Work, materials, or plant and to give instructions for the rectification thereof;

(b) if the Contractor questions any communication of the Engineer's Representative, the Contractor may refer the matter to the Engineer who shall confirm, reverse, or vary the contents of such communication.

3.15 In the event of the termination of the employment of the Engineer, the Owner shall immediately appoint an Engineer whose status under the Contract shall be that of the former Engineer.

3.16 Nothing contained in the Contract Documents shall create any contractual relationship between the Engineer and the Contractor, Subcontractors, suppliers, or their agents, employees, or other persons performing any of the Work.

GC 4 DELAYS

4.1 If the Contractor is delayed in the performance of the Work by an act or omission of the Owner, Engineer, Other Contractor, or anyone employed or engaged by them directly or indirectly, contrary to the provisions of the Contract Documents, then the Completion Time shall be extended for such reasonable time as the Engineer may decide in consultation with the Contractor. The Contractor shall be reimbursed by the Owner for reasonable costs incurred by the Contractor as a result of such delay, but excluding any consequential, indirect or special damages, loss of profit, loss of opportunity or loss of productivity resulting from such delay.

4.2 If the Contractor is delayed in the performance of the Work by a Stop Work Order issued by a court or other public authority, and providing that such order was not issued as the result of an act or fault of the Contractor or anyone employed or engaged directly or indirectly by the Contractor, then the Completion Time shall be extended for such reasonable time as the Engineer may decide in consultation with the Contractor. The Contractor shall be reimbursed by the Owner for reasonable costs incurred by the Contractor as a result of such delay, but excluding any consequential, indirect or special damages, loss of profit, loss of opportunity or loss of productivity resulting from such delay.

4.3 If the Contractor is delayed in the performance of the Work by labour disputes, strikes, lock-outs (including lock-outs decreed or recommended for its members by a recognized contractors' association, of which the Contractor is a member or to which the Contractor is otherwise bound), fire, unusual delay by common carriers or unavoidable casualties or, without limit to any of the foregoing, by a cause beyond the Contractor's control, then the Completion Time shall be extended for such reasonable time as the Engineer may decide in consultation with the Contractor, but in no case shall the extension of time be less than the time lost as the result of the event causing the delay, unless such shorter extension be agreed to by the Contractor. The Contractor shall not be entitled to payment for costs incurred as the result of such delays.

4.4 No extension shall be made for delay unless written notice of claim is given by the Contractor to the Engineer no later than seven (7) days after the commencement of delay, providing however, that in the case of a continuing cause of delay only one notice of claim shall be necessary.

4.5 If no additional instruction is made under GC 2 - ADDITIONAL INSTRUCTIONS, no claim by the Contractor for delay shall be allowed because of failure of the Engineer to furnish instructions until ten (10) days after a demand for such instructions has been made and not then unless such claim is reasonable.

4.6 The Engineer will not, except by written notice to the Contractor, stop or delay the Work pending instructions or proposed changes in the Work.

4.7 Notwithstanding any of the above paragraphs or any other provision in the Contract Documents, the Contractor shall not be reimbursed by the Owner for any costs incurred as a result of any delay unless the delay exceeds three (3) working days.

GC 5 SUSPENSION OF WORK

5.1 The Engineer may, by a written order, at any time suspend any part of the Work, or direct any portion to be commenced or completed in priority to any other part or portion.

5.2 Under no circumstances will the Contractor be entitled to any consequential, indirect, or special damages, loss of profit, loss of opportunity or loss of productivity resulting from a suspension order, and the Contractor shall not be reimbursed by the Owner for any costs of any kind incurred as a result of any suspension order unless the period of suspension exceeds three (3) working days.

5.3 When, for any reason, it is necessary to discontinue the Work, or any part thereof, the Contractor must, on notice from the Engineer, forthwith place the Work in proper and satisfactory condition for the accommodation of the public and for its effectual protection against damage from rain, snow, frost, ice, or other causes and must so maintain it.

GC 6 OWNER'S RIGHT TO TERMINATE CONTRACT AND PERFORM WORK

6.1 If the Contractor should be adjudged bankrupt, or makes a general assignment for the benefit of creditors because of insolvency or if a receiver is appointed because of insolvency, the Owner may, without prejudice to any other right or remedy, by giving the Contractor or receiver or trustee in bankruptcy written notice, terminate the Contract.

6.2 If the Contractor should neglect to perform the Work properly or otherwise fails to comply with the requirements of the Contract to a substantial degree and if the Engineer has given a written statement to the Owner and Contractor that sufficient cause exists, the Owner may notify the Contractor in writing that the Contractor is in default of contractual obligations and issue instructions to correct the default in the five (5) working days immediately following the receipt of such notice.

6.3 If the correction of the default cannot be completed in the five (5) working days specified, the Contractor shall be in compliance with the Owner's instructions if the Contractor:

(a) commences the correction of the default within the specified time, and

(b) provides the Owner with an acceptable schedule for such correction, and

(c) completes the correction in accordance with such schedule.

6.4 If the Contractor fails to correct the default in the time specified or subsequently agreed upon the Owner, without prejudice to any other right or remedy, may:

(a) correct such default and deduct the cost thereof from any payment then or thereafter due the Contractor provided the Engineer has certified such cost to the Owner and the Contractor, or

(b) terminate the Contractor's right to continue with the Work in whole or in part or terminate the Contract.

6.5 If the Owner terminates the Contractor's right to continue with the Work under the conditions set out above, the Owner shall:

(a) be entitled to take possession of the premises and products, and utilize the construction machinery and equipment subject to the rights of third parties, and finish the Work expediently,

(b) withhold further payments to the Contractor until the Work is finished, and

(c) when all required Work is performed completely, charge the Contractor the amount by which the full cost of finishing the Work as certified by the Engineer, including compensation to the Engineer for additional services, exceeds the unpaid balance of the Contract Price.

6.6 If surety bonds have been provided by the Contractor, the provisions of this General Condition shall be exercised in accordance with the conditions of such surety bonds.

6.7 The Contractor's obligation under the Contract as to quality, correction and warranty of the Work performed up to the time of termination shall continue in force after such termination.

6.8 In addition to its right to terminate the Contract set out herein, the Owner may terminate this Contract at any time for any other reason and without cause upon giving the Contractor Notice in Writing to that effect. In such event, the Contractor shall be entitled to be paid for all Work performed including reasonable profit, for loss sustained upon Products and Construction Equipment, and such other damages as the Contractor may have sustained as a result of the termination of the Contract, but in no event shall the Contractor be entitled to be compensated for any loss of profit on unperformed portions of the Work, or indirect, special, or consequential damages incurred.

GC7 CONTRACTOR'S RIGHT TO STOP THE WORK OR TERMINATE THE CONTRACT

7.1 If the Owner should be adjudged bankrupt or makes a general assignment for the benefit of creditors because of insolvency or if a receiver is appointed because of insolvency, the Contractor may, without prejudice to any other right or remedy available, by giving the owner or receiver or trustee in bankruptcy written notice, terminate the Contract.

7.2 If the Work should be stopped or otherwise delayed for a period of thirty (30) days or more under an order of a court or other public authority and providing that such order was not issued as the result of an act or fault of the Contractor or of anyone directly or indirectly employed or engaged by the Contractor, the Contractor may, without prejudice to any other right or remedy available, by giving the Owner written notice, terminate the Contract.

7.3 The Contractor may notify the Owner in writing, with a copy to the Engineer, that the Owner is in default of contractual obligations if:

(a) the Engineer fails to issue a certificate in accordance with the provisions of GC 15-CERTIFICATES AND PAYMENT, or

(b) the Owner fails to pay the Contractor when due the amounts certified by the Engineer or awarded by arbitration or court, or

(c) the owner materially violates the requirements of the Contract to a substantial degree.

The Contractor's written notice to the Owner shall advise that if the default is not corrected in the five (5) working days immediately following the receipt of the written notice the Contractor may, without prejudice to any other right or remedy, stop the Work or terminate the Contract.

7.4 If the Contractor terminates the Contract under the conditions set out above, the Contractor shall be entitled to be paid for all Work performed in accordance with the Schedule of Quantities and Unit Prices to be mutually agreed to by both parties or where agreement cannot be reached, then the matter shall be settled in accordance with the provisions of GC 8 - DISPUTES.

GC 8 DISPUTES

8.1 Differences between the parties to the Contract as to the interpretation, application or administration of this Contract, or any failure to agree where agreement between the parties is called for, herein collectively called disputes, which are not resolved in the first instance by decision of the Engineer pursuant to the provisions of GC 3 - ENGINEER, subsections 3.6 and 3.7, shall be settled in accordance with the requirements of this General Condition.

8.2 The claimant shall give written notice of such dispute to the other party no later than twenty

(20) days after the receipt of the Engineer's decision given under GC 3 - ENGINEER, paragraph 3.7. Such notice shall set forth the particulars of the matters in dispute, the probable extent and value of the damage and the relevant provisions of the Contract Documents. The other party shall reply to such notice within twenty-one (21) days after receiving it, setting out in such reply the grounds and other relevant provisions of the Contract Documents.

8.3 If the matter in dispute is not resolved promptly the Engineer will give such instructions as are necessary for the proper performance of the Work and to prevent delays pending settlement of the dispute. The parties shall act immediately according to such instructions, it being understood that by so doing neither party will jeopardize any claim he may have. If it is subsequently determined that such instructions were in error or at variance with the Contract Documents, the Owner shall pay the Contractor extra costs incurred by the Contractor in carrying out such instructions.

8.4 It is agreed that no act by either party shall be construed as a renunciation or waiver of any rights for recourse, provided the notices were given in accordance with subsection 8.2 and instructions were carried out as provided in subsection 8.3.

8.5 If the parties agree to submit disputes to arbitration, then the dispute shall be submitted to arbitration in accordance with the provisions of the Nova Scotia Commercial Arbitration Act.

8.6 If no provision or agreement is made for arbitration then either party may submit the dispute to a court of competent jurisdiction in the Province of Nova Scotia, as the circumstances may require.

8.7 In recognition of the obligation by the Contractor to perform the disputed Work as provided in paragraph 8.3, it is agreed that settlement of dispute proceedings may be commenced immediately following the dispute in accordance with the foregoing settlement of dispute procedures.

GC 9 ASSIGNMENT

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

9.2 The Contract shall be binding upon and shall inure to the benefit of the parties and their heirs, executors, administrators, successors and permitted assigns.

GC 10 OTHER CONTRACTORS

10.1 The Owner reserves the right to enter separate contracts in connection with the Project of which the Work is a part, or do certain Work by its own forces.

10.2 When separate contracts are awarded for different parts of the Project, or Work is performed by the Owner's own forces, the Owner shall:

(a) provide for the co-ordination of the Work of its own forces and of each separate contract with the Work of this Contract, and

(b) ensure that insurance coverage is provided to the same requirements as are called for in GC 21 - INSURANCE. Such insurance shall be coordinated with the insurance coverage of the Contractor as it affects the Work of this Contract.

10.3 The Contractor shall co-ordinate the Work of this Contract with the Work of Other Contractors and the Owner's forces and connect as specified or shown in the Contract Documents. If there is a change in the scope of the Work required for the planning and performance of this co-ordination and connection, the changes shall be authorized in accordance with GC 12 - CHANGES IN THE WORK AND EXTRA WORK, and the value of the changes shall be determined in accordance with GC 13 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK AND EXTRA WORK.

10.4 The Contractor shall report to the Engineer any apparent deficiencies in the Work of Other Contractors or Owner's forces which would affect the Work of this Contract immediately as they come to the Contractor's attention and shall confirm such report in writing. Failure by the Contractor to report as required shall invalidate any claims against the Owner by reason of the deficiencies of Work of Owner's forces or Other Contractors.

10.5 The Owner shall take all reasonable precautions to avoid disputes on the Project arising from the Work of Other Contractors or own forces.

GC 11 SUBCONTRACTORS

11.1 The Contractor agrees to preserve and protect the rights of the parties under the Contract with respect to Work to be performed under subcontract and to:

(a) enter into contracts or written agreements with Subcontractors to require them to perform their Work in accordance with and subject to the terms and conditions of the Contract Documents, and

(b) be as fully responsible to the Owner for acts and omissions of Subcontractors and of persons directly or indirectly employed by them as for acts and omissions of persons directly employed by the Contractor.

The Contractor therefore agrees to incorporate the terms and conditions of the Contract Documents into all sub-contract agreements entered into with Subcontractors.

11.2 The Contractor agrees to employ those Subcontractors proposed in writing at the time of the bid submission and accepted by the Owner.

11.3 The Owner may, for reasonable cause, object to the use of a proposed Subcontractor and require the Contractor to employ another person or firm as Subcontractor.

11.4 In the event that the Owner requires a change from a proposed Subcontractor, the Contract Price shall be adjusted by the difference in cost and mark-up occasioned by such required change.

11.5 The Contractor shall not be required to employ as a Subcontractor a person or firm to whom the Contractor may reasonably object.

11.6 The Engineer may, upon reasonable request, provide to a Subcontractor information as to the percentage or quantity of the Subcontractor's Work which has been certified for payment.

11.7 Nothing contained in the Contract Documents shall create a contractual relationship between a Subcontractor and the Owner.

GC 12 CHANGES IN THE WORK AND EXTRA WORK

12.1 **Changes in The Work**:

Except as provided in GC 13 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK AND EXTRA WORK paragraph 13.4:

(a) the Owner, through the Engineer, without invalidating the Contract, may by written order, make Changes in the Work with the Contract Price and Completion Time being adjusted accordingly and

(b) no Changes in the Work shall proceed without a written order signed by the Owner and no claim for a change in the Contract Price or change in the Completion Time shall be valid unless so ordered, and at the same time valued or agreed to be valued as provided in GC 13 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK AND EXTRA WORK.

12.2 **Extra Work:**

(a) The Owner may offer the Contractor Extra Work. If the terms and conditions for the performance of the Extra Work are agreed upon, the Owner, through the Engineer, shall

issue a written change order amending the Contract Price and Completion Time as appropriate, or a written order to proceed until a price and change in time are agreed upon by the parties and a change order can be issued.

GC 13 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK AND EXTRA WORK

13.1 If the type of work involved in a Change in the Work is included in the items contained in the Schedule of Quantities and Unit Prices, it shall be performed on the same payment basis as the original Work except as described in paragraphs 13.7 and 13.8, and the Completion Time shall be extended for such time as the Engineer may decide in consultation with the Contractor.

13.2 If the type of work involved in a Change in the Work is not included in the items contained in the Schedule of Quantities and Unit Prices, or is such as to alter the nature or intent of the Work included in this Schedule the value of such change shall be determined in one or more of the following methods.

(a) by estimate and acceptance in a lump sum;

(b) by unit prices agreed upon;

(c) by cost and a fixed or percentage fee;

(d) by variation of the Contract Unit Prices.

13.3 When a Change in the Work covered by paragraph 13.2 is proposed or required the Contractor shall present to the Engineer for approval the claim for a change in the Contract Price and change in Completion Time with appropriate documentation in a form acceptable to the Engineer. When the Engineer is satisfied as to the correctness of such claim and, when approved by the Owner, a change order shall be issued to the Contractor amending the Contract Price and Completion Time as appropriate. The value of Work performed in the change shall be included for payment with the regular certificates of payment.

13.4 In the case of Changes in the Work to be paid for under methods (b) of paragraph 13.2, the form of presentation of methods of measurement shall be agreed to by the Engineer and Contractor before proceeding with the change. The Contractor shall keep accurate records, as agreed upon, of quantities and present an account of the quantities for the Change in the Work.

13.5 In the case of changes in the Work to be paid for under method (c) of paragraph 13.2, the prices for any extra or additional Work shall be based on the sum of the following six items:

(a) direct basic wages paid to labour excluding machine operators, administrative and supervisory staff, required to perform the Work in accordance with direction and when devoting exclusive attention to this Work;

(b) twenty-five (25) percent of item 13.5 (a) to cover cost of small tools, payroll burden and employee benefit costs;

(c) The cost of material delivered to the Place of the Work;

(d) fifteen (15) percent of the sum of items 13.5 (a), (b), and (c), which shall cover overhead expense, profit, head office and site office overhead, including salaries of time-keeping, clerical, accounting, warehousing and other administrative personnel and all costs associated therewith;

(e) rental of construction equipment (including operators). The equipment rental rates shall be in accordance with equipment rental rates indicated in the latest edition of Road Builders Equipment Rates. In the absence of Road Builders Equipment Rates, Department of Transportation and Infrastructure Renewal rates shall apply.

(f) Standby time shall be the time when equipment is required on site but not operated to execute the required works. Approved standby time shall be paid for at 65% of the hourly rates.

(g) ten (10) percent mark-up on subcontractor work.

13.6 If the method of valuation, measurement, change in Contract Price and/or change in Completion Time cannot be promptly agreed upon, and the change is required to be proceeded with then the Engineer in the first instance will determine the method of valuation, measurement, change in Contract Price and/or Completion Time subject to final determination in the manner set out in GC 8 - DISPUTES. In this case the Engineer will, with the consent of the Owner, issue a written authorization for the change, setting out the method of valuation and if by lump sum valuation of the change in Contract Price and/or Completion Time.

13.7 In the case of a dispute in the valuation of a change authorized in the Work and pending final determination of such value, the Engineer will make an evaluation and certify the value of Work performed and include the amount with the regular certificates for payment. The Contractor shall keep accurate records of quantities and cost of such Work.

13.8 Should the actual quantity of an item in the Schedule of Quantities and Unit Prices, vary by more than 25% of the estimated quantity, either the Owner or the Contractor may request a revision to the Unit Price contained in the Schedule of Quantities and Unit Prices. Such a request for a revision in a Unit Price shall be given as soon as reasonably possible after the party concerned becomes aware of the circumstances.

13.9 If a revision to a Unit Price is negotiated pursuant to paragraph 13.8, then:

(a) the revised unit price in the case of a decrease of more than 25% of the estimated quantity will apply to the actual Work performed for that item, and

(b) the revised unit price in the case of an increase of more than 25% of the estimated quantity will apply to the excess quantity of Work for that item only.

13.10 If either party request renegotiations of a Unit Price pursuant to paragraph 13.8, both parties shall act promptly in order to arrive at an equitable revision of the Unit Price prior to proceeding with the Work so affected. If agreement of such renegotiation cannot be reached, the Contractor shall proceed with the Work and the matter shall be subject to final determination in the manner set out in GC 8 - DISPUTES. Pending such settlement, payment for the Work performed shall be made on the regular certificates for payment on the basis of the Unit Prices set out in the Schedule of Quantities and Unit Prices.

13.11 In all matters referred to above both the Engineer and the Contractor shall act promptly.

GC 14 APPLICATIONS FOR PAYMENT

14.1 Applications for payment on account may be made monthly as the Work progresses.

14.2 Applications for payment shall be dated the last day of the agreed monthly payment period and the amount claimed shall be for the value of Work performed at that date and subject to a ten percent (10%) holdback.

14.3 Applications for release of holdback monies following Substantial Performance of the Work and the application for final payment shall be made at the time and in the manner set forth in GC 15 - CERTIFICATES AND PAYMENTS.

GC 15 CERTIFICATES AND PAYMENTS

15.1 The Engineer will, no later than seven (7) days after the receipt of an application for payment from the Contractor submitted in accordance with GC 14 - APPLICATION FOR PAYMENT, issue a progress payment certificate in the amount applied for or in such other amount deemed to be properly due. If the Engineer amends the application, the Engineer will promptly notify the Contractor in writing giving reasons for the amendment. Notwithstanding that the Contractor has not made application for payment, the Engineer may measure and value the Work performed during a payment period, prepare, and issue a progress payment certificate.

15.2 The Owner shall make payment to the Contractor on account no later than twenty (20) days after the issuance of a certificate for payment by the Engineer.

15.3 The Engineer will, no later than ten (10) days after the receipt of an application from the Contractor for a Certificate of Substantial Performance of the Work, make an inspection and assessment of the Work to verify the validity of the application. The Engineer, in consultation with the Contractor, will make a measurement of the Work completed to the date of the application and no later than seven (7) days after inspection, notify the Contractor of approval or the reasons for disapproval of the application. When the Engineer finds that Substantial Performance of the Work has been reached the Engineer will issue such a certificate. The date of Substantial Performance of the Work shall be as stated in this certificate. Immediately following the issuance of the Certificate of Substantial Performance of the Work, the Engineer, in consultation with the Contractor, will establish a reasonable date for the Work to be performed completely.

15.4 Immediately following the issuance of the certificate of Substantial Performance of the Work, the Engineer will issue a progress payment certificate for Work performed up to the date of Substantial Performance and a certificate for payment of holdback monies. Payment of one hundred percent (100%) of the accumulated holdback monies as authorized by this certificate shall become due and payable five (5) days after the following conditions have been satisfied:

(a) sixty (60) days have elapsed from the date of Substantial Performance of the Work, and

(b) the Contractor has submitted to the Engineer, in one complete package, the following:

(i) statutory declaration that all accounts for labour, subcontracts, products, construction machinery and equipment have been paid and the Owner is released from any and all further claims relating to the Contract, along with any statement of accounts from any supplier or Subcontractor that the Owner may request;

(ii) a clearance certificate from the Workers' Compensation Board;

(iii security for the warranty period in accordance with GC 24 - SECURITY;

(iv) written release from each property owner whose lands were used by the Contractor in the execution of this Contract stating that such property has been restored; and

(v) written verification that all claims by third parties have been acknowledged and either resolved or under investigation by the Contractor's insurer.

(c) the Contractor has agreed to, signed, and returned the Substantial Performance measurement certificate.

If however, the Contractor has failed to sign the measurement certificate within sixty (60) days of Substantial Performance of the Work and provided required documents as listed above, then the Owner shall release one hundred percent (100%) of the holdback within fourteen (14) days following the date on which the Contractor meets all these requirements.

15.5 No later than ten (10) days after the receipt of an application from the Contractor for final payment, the Engineer, in consultation with the Contractor, will complete the final measurement and inspection of the Work and, no later than seven (7) days after measurement and inspection, notify the Contractor of approval or the reasons for disapproval of the application.

15.6 When the Engineer finds the Work acceptable under the Contract Documents and the required Work is performed completely, the Engineer will promptly issue a final measure progress payment certificate. The certificate shall state that to the best of the Engineer's knowledge, information, and belief, and on the basis of the Engineer's observations and reviews, the Work has been completed in general accordance with the terms and conditions of the Contract Documents.

The certificate shall state the balance due the Contractor and noted in said final measure certificate is due and payable.

15.7 No later than thirty (30) days after the date of Total Performance of the Work as certified by the Engineer, the Owner will release to the Contractor the balance of monies owing, subject to a ten percent (10%) holdback, provided that the following conditions have been satisfied:

(a) the Contractor has submitted to the Engineer a statutory declaration stating that there are no Builders' Liens filed relating to the Work performed between Substantial Performance and the date when the required Work is performed completely;

(b) the Contractor has submitted to the Engineer a clearance certificate from the Workers' Compensation Board;

(c) the Contractor has agreed to, signed, and returned to the Engineer a copy of the final measure;

(d) the Contractor has submitted to the Engineer any other information or documentation reasonably requested by the Owner.

If, however, the Contractor has failed to sign the measurement certificate within sixty (60) days of when the required Work is performed completely and to provide required documents as listed above, then the Owner shall release final payment fourteen (14) days following the date on which the Contractor meets all these requirements.

15.8 No payment made by the Owner under this Contract or partial or entire use or occupancy of the Work by the Owner shall constitute an acceptance of Work or products which are not in accordance with the requirements of the Contract Documents.

15.9 All certificates issued by the Engineer shall be to the best of the Engineer's knowledge, information and belief.

GC 16 TAXES AND DUTIES

16.1 The Contractor shall pay all government sales taxes, customs, duties, and excise taxes with respect to the Contract.

16.2 Where a recovery of taxes is applicable to the Contract, the amount recovered shall be the property of the Owner.

16.3 The Harmonized Sales Tax is not to be included in unit and lump sum prices.

16.4 The Contractor shall indicate on each application for payment as a separate amount the Harmonized Sales Tax applicable to the claim. The amount paid to the Contractor will be based on the amount of the application for payment certified by the Engineer.

16.5 Any increase or decrease in costs to the Contractor due to changes in such taxes and duties after the date of the tender shall increase or decrease the Contract Price accordingly.

GC 17 LAWS, NOTICES, PERMITS AND FEES

17.1 The laws of the Province of Nova Scotia shall govern the Work.

17.2 The Contractor shall obtain the permits, licenses and certificates and pay the fees required for the performance of the Work which are in force at the date of tender closing, but this shall not include the obtaining of permanent easements or rights of servitude. A street excavation permit is required for all projects, although there will be no charge for the HRM permit. For projects on Nova Scotia Department of Transportation and Infrastructure Renewal (NSDTIR) roads, the Contractor shall pay all fees and deposits required for NSDTIR permits.

17.3 The Contractor shall give the required notices and comply with the laws, bylaws, ordinances, rules, regulations, standards, codes, applicable HRM policies, and orders of HRM and other authorities having jurisdiction, which are or become in force during the performance of the Work, and which relate to the Work, to public health, to environment, to fisheries, and to construction safety.

17.4 The Contractor shall not be responsible for verifying that the Contract Documents are in compliance with the applicable laws, ordinances, rules, regulations, and codes relating to the Work. If the Contract Documents are at a variance therewith, or changes which require modification to the Contract Documents are made to the laws, ordinances, rules, regulations, or codes by the authorities having jurisdiction subsequent to the date of the tender closing, the Contractor shall notify the Engineer in writing requesting direction immediately such variance or change becomes known. The Engineer will make the changes required to the Contract Documents in accordance with GC 12 - CHANGES IN THE WORK AND EXTRA WORK, and the value of the changes shall be determined in accordance with GC 13 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK AND EXTRA WORK.

17.5 If the Contractor fails to notify the Engineer in writing and obtain direction as required in paragraph 17.4 and performs Work knowing it to be contrary to any laws, ordinances, rules, regulations, codes and orders of the authorities having jurisdiction, the Contractor shall be responsible for and shall correct the violations thereof and shall bear the costs, expenses and damages attributable to failure to comply with the provisions of such laws, ordinances, rules, regulations, codes and orders

GC 18 PATENT RIGHTS AND ROYALTIES

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

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

GC 19 WORKERS' COMPENSATION INSURANCE

19.1 Prior to commencing the Work, the Contractor shall provide a current clearance letter from the Workers' Compensation Board and **must** maintain this coverage during the whole term of the contract. HRM will only enter contracts with firms that provide WCB coverage.

19.2 WCB Clearance Letters provide clarity as to who is covered and who is not covered for individual firms (e.g. Directors not taking a T4 from the company are excluded from coverage, owners of sole proprietorships and partnerships are excluded from coverage, family members living in the household of a director or partner are excluded from coverage). It will be the responsibility of the Contractor to ensure coverage is in place for its employees and employees of any of its sub-contractors. Individuals not covered by WCB are not permitted on Halifax Regional Municipal property.

GC 20 INDEMNIFICATION

20.1 The Contractor shall indemnify and hold harmless the Owner, its agents, representatives and employees from and against all claims, demands, losses, costs, damages, actions, suits or proceedings arising out of or resulting from the performance of the Work (hereinafter called “Claims”), provided that any such claim is caused in whole or in part by the negligent act or omission of the Contractor, any Subcontractor, supplier, licensee, anyone directly or indirectly employed by any one of them or anyone for whose acts any of them is liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

GC 21 INSURANCE

21.1 Without restricting the generality of Indemnification (20.1) the Contractor will provide and maintain insurance in accordance with the following minimum criteria:

(a) General Conditions All Insurance

(i) The policies will be in the name of the Contractor (Named Insured). The Halifax Regional Municipality (HRM) will be added as an additional insured under this Contract.

(ii) The policies will be primary to any other coverage with the same terms and conditions held by the named, additional, and unnamed insureds.

(iii) All insurance shall be maintained continuously while this Contract is in force.

(iv) If the Contractor fails to furnish the Owner with a certificate of insurance for each policy required to be obtained hereunder or if after furnishing such certificate of insurance the policy lapses, is cancelled, or is materially altered, then in every such case the Owner, without the obligation to do so, may obtain and maintain such insurance in the name of such Contractor. The cost thereof shall be payable by the Contractor to the Owner on demand, and the Owner may at its election deduct the cost thereof from any monies which are due or may become due to the Contractor. All certificates of insurance to be furnished under this Contract shall be provided

to the Owner before commencement of work, in a form and with an insurer(s) satisfactory to the Owner. Any review of such insurance by the Owner shall not be an acknowledgment that the terms of this agreement have been fulfilled.

(v) The Contractor shall be responsible for any deductible amounts.

(vi) Each policy required to be placed by the Contractor shall state that it cannot be cancelled, lapsed, or materially altered without at least thirty (30) days written notice to the Owner.

(b) Commercial General Liability Insurance

This insurance will be subject to limits of not less than Five Million Dollars ($5,000,000) inclusive per occurrence for bodily injury, death and damages to property including loss of use thereof, and including but not limited to coverage for:

(i) where a guarantee period is required by the Owner under this Contract, the Contractor shall ensure that Completed Operations coverage, as applicable, shall be in force for the duration of the guarantee period or twelve (12) months, whichever is greater;

(ii) premises and operations liability, including all activities arising out of work performed;

(iii) owner's and contractor's contingent liability with respect to the operations of persons, firms or corporations having a contract for the execution of a part or parts of the Work included in the Contract;

(iv) products and completed operations liability;

(v) blanket contractual liability;

(vi) cross liability;

(vii) elevator and hoist liability;

(viii) contingent employer's liability;

(ix) personal injury liability;

(x) liability with respect to non-owned licensed vehicles;

(xi) the Contractor shall maintain coverage as noted in this paragraph to cover exposures or risks with respect to liability to owned and non-owned water craft;

(xii) if any part of the Work includes blasting, shoring, excavating, underground work, underpinning, demolition, pile driving or caisson work (none of which will be covered by the owner's insurance) it shall be the obligation of the Contractor to ensure that it, or the Subcontractor doing such part of the Work has liability coverage for risks arising out of such part of the Work.

(xiii) The Contractor shall obtain and maintain aircraft and watercraft liability insurance with respect to owned or non-owned aircraft and watercraft if used directly or indirectly in the performance of the Work, including use of additional premises, which shall be subject to limits of not less than $5,000,000 inclusive per occurrence for bodily injury, death, and damage to property including loss of use thereof. Such insurance shall be in a form acceptable to the Owner. The policies shall be endorsed to provide the Owner with not less than 15 days' notice in writing in advance of cancellation, change, or amendment restricting coverage.

(c) Automobile Liability Insurance

The Contractor shall provide automobile liability insurance in respect to owned licensed vehicles subject to limits of not less than Five Million Dollars ($5,000,000) inclusive.

(d) Contractors Environmental/Pollution Insurance

This insurance will be subject to limits of not less than Two Million Dollars ($2,000,000) inclusive per occurrence, including but not limited to coverage for:

(i) 3rd party bodily injury/property damage (including natural resource damages);

(ii) remediation expenses including restoration costs to restore property damaged in the course of remediation;

(iii) emergency response costs;

(iv) legal defence expenses;

(v) non-owned disposal sites;

(vi) transportation;

(vii) fines and penalties arising from environmental contamination;

(viii) asbestos abatement/removal/disposal; and

(ix) mould and Legionella.

21.2 The Contractor shall provide proof of all required insurance to the Owner within five (5) working days of written notice of contract award unless the Owner provides permission otherwise.

GC 22 PROTECTION OF WORK AND PROPERTY

22.1 The Contractor shall protect the Work and the Owner's property and property adjacent to the place of the Work from damage, and shall be responsible for damage which may arise as the result of operations under the Contract.

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

GC 23 DAMAGES AND MUTUAL RESPONSIBILITY

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

23.2 Claims under this General Condition shall be made in writing to the party liable within reasonable time after the first observance of such damage and may be adjusted by agreement or in the manner set out in GC 8 - DISPUTES.

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

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

23.5 Notwithstanding any other provision contained in these General Conditions or contained elsewhere in the Contract Documents, under no circumstances shall the Owner be liable for any incidental, indirect, special, or consequential damages of any kind, including those arising from or measured by lost revenues or profits, even if the Owner has been advised of such damages.

GC 24 SECURITY

24.1 The Contractor shall, prior to the commencement of the Work or within the specified time, provide to the Owner any Contract security specified in Section 00 73 63 CONTRACT SECURITY REQUIREMENTS.

GC 25 WARRANTY

25.1 The Contractor shall correct promptly, at its own expense, defects or deficiencies in the Work which appear prior to and during the period of two years from the date of Substantial Performance of the Work, as set out in the Certificate of Substantial Performance of the Work, or such longer period as may be specified for certain products or Work.

25.2 During the period provided in GC 3- ENGINEER paragraph 3.2, the Engineer shall promptly give the Contractor written notice of observed defects and deficiencies. For traffic signal systems, the Engineer shall include a priority rating as per the requirements of 25.2(a)(i).

The Contractor shall be required to perform to the satisfaction of the Engineer all necessary warranty repairs to such traffic signal system components (traffic control signals and other signals, electrical and electronic equipment, and traffic signs) which become defective or damaged due to Work completed by the Contractor.

For traffic signal systems, the Contractor shall be required to provide such warranty emergency service 24 hours per day, each day of the year. Warranty emergency service shall begin immediately upon notification of a defect in any device. The Contractor shall be held responsible for any damages to equipment or to the public which may result from or be attributed to any defect in, failure or damage to, any such traffic control device covered by this Contract.

Electricians with a minimum International Municipal Signal Association (IMSA) Traffic Signals Level 1 Certification shall be on call for emergency call out. The service crew must consist of two people, the second of which shall be an apprentice or helper.

(a) Scheduling and Coordination of Traffic Signal System Defects and Deficiencies

(i) Schedule, coordinate, and perform the work to the following priorities:

Priority	Response Time	Temporary Repairs Completed	Permanent Repairs Completed
High*	Within 1 hour	Within 1 hour of site arrival	Within 24 hours
Normal**	End of next working day	Within 1 hour of site arrival	Within 48 hours
Low	To be scheduled with the Traffic and Right of Way by the end of next working day	N/A	As scheduled

* (generally consists of twisted heads, red signal failures and malfunctioning signal equipment)

** (generally consists of RA5 failures, signal failures other than red)

(ii) The Owner is the sole judge and will establish the priority level for all warranty work.

(iii) The Contractor shall notify the Engineer when it arrives at the Place of Work for any warranty work.

(iv) Failure to meet the priority response time shall result in the Owner having the work completed by another contractor or by the Owner's own forces. All costs for the repairs will be the responsibility of the Contractor.

(v) Contractor is to provide a single telephone number and fax number, typically a pager/cell phone, where the on-call person can be reached 24 hours per day.

25.3 The Contractor agrees to correct or pay for damage resulting from corrections made under the requirements of paragraph 25.2.

GC 26 CONTRACTOR'S RESPONSIBILITY AND CONTROL OF WORK

26.1 The Contractor shall have complete control of the Work and shall effectively direct and supervise the Work so as to ensure conformance with the Contract Documents. The Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures and for coordinating the various parts of the Work under the Contract.

26.2 The Contractor shall be responsible for construction safety at the Place of the Work and for compliance with the rules, regulations and practices as set out in the Occupational Health and Safety Act of the Province of Nova Scotia. Before being permitted access to the site to commence construction, the Contractor shall provide the Owner with a written

site safety plan. The site safety plan provided shall be a written course of action that, through a pre-job evaluation, identifies and sets out specific actions to be taken to eliminate or control, hazards associated with the Work to be performed and to also deal with concerns or hazards that may develop during the course of the Project. This plan shall include but not be limited to identification of safety hazards anticipated during the Project, solutions to those hazards, safety procedures, identification of designated safety officers and provisions for safe access to the Place of the Work for the Owner's staff and consultants. Receipt and review of the safety plan shall be mandatory prior to commencement of Work.

26.3 The Contractor shall:

(a) comply with all health and safety and environmental legislation in the performance of this Contract and to practice the principles of proactive Due Diligence.

(b) maintain a safe and healthy work environment during the performance of this Contract.

26.4 The Contractor shall:

(a) comply with all health and safety and environmental legislation and any HRM policy or procedure applied to or applicable to this Contract is a condition of the Contract.

(b) permit the Owner to audit or inspect the Contractor's health and safety and environmental records during the term of the Contract and upon its conclusion and to co-operate fully with any such audit or inspection.

26.5 The Contractor shall agree:

(a) that the Owner may address Contractor safety deficiencies in the following progressive steps:

(i) The problem will be identified to the Contractor, (site supervisor).

(ii) The Contractor's head office will be contacted about the problem, orally and followed up in writing.

(iii) The Contract may, at the discretion of the Owner, be suspended or terminated and/or payment withheld by the Owner.

(iv) If required to do so by legislation, the Owner will immediately report the problem to the appropriate regulatory authority.

(b) that depending upon the nature and/or seriousness of the deficiency the Owner reserves the right to bypass any or all of the steps described in subsection GC 26.5(a)

26.6 The Contractor shall acknowledge receipt of a copy of HRM Contractor Safety Management Policy as found on the Owner's web site at www.halifax.ca/procurement and that the Contractor understands and shall undertake to adhere to the terms of this Policy and to co-operate with the Owner in its efforts to ensure compliance thereunder.

26.7 The Contractor shall have the sole responsibility for the design, erection, operation, maintenance and removal of temporary structural and other temporary facilities and the design and execution of construction methods required in their use. The Contractor shall engage and pay for registered professional engineering personnel, skilled in the

appropriate disciplines to perform these functions where required by law or by the Contract Documents and in all cases where such temporary facilities and their method of construction are of such a nature that professional engineering skill is required to produce safe and satisfactory results.

26.8 Notwithstanding the provisions of paragraphs 26.1 and 26.3, or provisions to the contrary elsewhere in the Contract Documents, where such Contract Documents include designs for temporary structural and other temporary facilities or specify a method of construction in whole or in part, such facilities and methods shall be considered to be part of the design of the Work and the Contractor shall not be held responsible for that part of the design or the specified method of construction. The Contractor shall, however, be responsible for the execution of such design or specified method of construction in the same manner that the Contractor is responsible for the execution of the Work.

26.9 The Contractor shall review the Contract Documents and shall promptly report to the Engineer any error, inconsistency or omission of the Contract Documents. Such review shall be to the best knowledge, information and belief and in making such review the Contractor does not assume any responsibility to the Owner or the Engineer for the accuracy of the review. The Contractor shall not be liable for damage or costs resulting from such errors, inconsistencies or omissions in the Contract Documents which were not discovered. If the Contractor does discover any error, inconsistency or omission in the Contract Documents, Work affected shall not proceed until corrected or missing information is received from the Engineer.

26.10 The Contractor shall prepare and update as required (at least monthly) a construction schedule indicating the timing of the major activities of the Work. The schedule shall be designed to ensure conformance with the required Completion Time. The schedule shall be submitted to the Engineer within five (5) working days of the date of Contract award. The Contractor shall monitor the progress of the Work relative to the schedule and advise the Engineer of any revisions required as the result of delays as provided in GC 4 - DELAYS, indicating the results expected from the resultant change in schedule.

GC 27 SUPERINTENDENCE

27.1 The Contractor shall employ a competent supervisor and necessary assistants who shall be in attendance at the Place of the Work while Work is being performed.

27.2 The supervisor shall be satisfactory to the Engineer and shall not be changed except for good reason and only then after consultation with the Engineer.

27.3 The supervisor shall represent the Contractor at the Place of the Work and be fully empowered to act for and on behalf of and to bind the Contractor in all matters at the site that pertain to the Contract. Instructions given to the supervisor by the Engineer shall be held to have been given to the Contractor.

27.4 The supervisor shall, if required by the Engineer, be solely employed upon work directly connected with the Contract.

GC 28 LABOUR AND PRODUCTS

28.1 Unless otherwise stipulated elsewhere in the Contract Documents, the Contractor shall provide and pay for labour, products, tools, construction equipment and machinery, water, heat, lights, power, transportation and other facilities and services necessary for the performance of the Work in accordance with the Contract.

28.2 Products provided shall be new unless otherwise specified in the Contract Documents. Products which are not specified shall be of a quality best suited to the purpose required and their use subject to the approval of the Engineer.

28.3 The Contractor shall maintain good order and discipline among employees engaged on the Work and shall not employ on the Work anyone not skilled in the assigned task.

GC 29 SUBSURFACE CONDITIONS

29.1 The Contractor shall promptly notify the Engineer in writing if subsurface conditions at the Place of the Work differ significantly from those indicated in the Contract Documents, or a reasonable assumption of probable conditions based thereon.

29.2 After prompt investigation, should the Engineer determine that conditions do differ significantly, the Engineer will issue appropriate instructions for changes in the Work in accordance with GC 12 - CHANGES IN THE WORK AND EXTRA WORK, and the value of the changes shall be determined in accordance with GC 13 - VALUATION AND CERTIFICATION OF CHANGES IN THE WORK AND EXTRA WORK.

29.3 The location of existing utilities is approximate only and the best known to the Engineer at the time of Tender call. It shall be the responsibility of the Contractor to check the exact location of all utilities from various owners before starting of the Work. The Contractor is deemed to have included all the costs which may be necessary to protect utilities as required by various owners. No additional cost shall be considered by the Owner which the Contractor may have to bear to protect existing utilities. Notwithstanding the provisions of 29.1 and 29.2 the Owner will not consider payment of extra cost which the Contractor may incur to protect existing utilities.

GC 30 USE OF THE WORK

30.1 The Contractor shall confine apparatus, storage of products, and operations of employees to limits indicated by laws, ordinances, permits or the Contract Documents and shall not unreasonably encumber the premises with products.

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

GC 31 INSPECTION OF THE WORK

31.1 The Owner and the Engineer or their authorized agents or representatives shall at all times have access to the Work. If parts of the Work are in preparation at locations other than the Place of the Work, the Owner and the Engineer or their authorized agents or representatives shall be given access to such Work whenever it is in progress.

31.2 If Work is designated for special tests, inspections or approvals in the Contract Documents, or by the Engineer's instructions, or the laws or ordinances of the Place of the Work, the Contractor shall give the Engineer timely notice requesting inspection. Inspection by the Engineer shall be made promptly. The Contractor shall arrange for inspections by other authorities and shall give the Engineer timely notice of the date and time. Minimum twelve (12) hours' notice, in writing, shall be provided to the Owner's designated materials, testing and inspection contractor. The Owner shall also be copied on any such notices.

31.3 If the Contractor covers or permit to be covered any Work that has been designated for special tests, inspections or approvals before such special tests, inspections or approvals are made, given or completed, the Contractor shall, if so directed, uncover such Work, have the inspections or tests satisfactorily completed and make good such Work at own expense.

31.4 The Engineer may order any part or parts of the Work to be specially examined should the Engineer believe that such Work is not in accordance with the requirements of the Contract Documents. If, upon examination, such Work be found not in accordance with the requirements of the Contract documents, the Contractor shall correct such Work and pay the cost of examination and correction. If such Work be found in accordance with the requirements of the Contract documents, the Owner shall pay the cost of examination and replacement.

31.5 The Contractor shall furnish promptly the Engineer two (2) copies of certificates and inspection reports relating to the Work.

GC 32 REJECTED WORK

32.1 Defective work, whether the result of poor workmanship, use of defective products, or damage through carelessness or other act or omission of the Contractor and whether incorporated in the Work or not, which has been rejected by the Engineer as failing to conform to the Contract Documents shall be removed promptly from the Place of the Work by the Contractor and replaced or re-executed promptly in accordance with the Contract Documents at the Contractor's expense.

32.2 Other Contractors' Work destroyed or damaged by such removals or replacements shall be made good promptly at the Contractor's expense.

32.3 If in the opinion of the Engineer it is not expedient to correct defective work or work not performed in accordance with the Contract Documents, the Owner may deduct from the monies otherwise due to the Contractor the difference in value between the work as performed and that called for by the Contract Documents, the amount of which will be determined in the first instance by the Engineer.

GC 33 PRODUCTS SUPPLIED BY OWNER

33.1 If the Contract provides that products are to be supplied by the Owner, the point of delivery shall be as designated by the Engineer.

33.2 The Contractor shall take full responsibility for the care and protection of all products supplied by the Owner from the time of arrival at the designated delivery point until the Work is fully performed.

33.3 As soon as the Contractor has been notified that products supplied by the Owner have arrived at the designated delivery point, the Contractor shall inspect, accept, unload and store the products.

33.4 The Contractor shall note on the freight or delivery slip any defects or shortages noted at the time of delivery and the Owner shall be notified of shortage or defect promptly.

33.5 The Contractor shall, at Substantial Performance of the Work, collect all unused products which were supplied by the Owner and deliver to a place designated by the Engineer. If such products are not collected and returned in good order, their cost shall be deducted from payments otherwise due to the Contractor.

GC 34 LIQUIDATED DAMAGES

34.1 Time shall be construed as being of the essence of the Contract.

34.2 The date of expiring of the time allowed in accordance with the Contract for Completion Time shall be termed the “Date for Substantial Performance of the Work”.

34.3 Should the Contractor fail to complete the Work by the Date of Substantial Performance of the Work, the period of time from the Date for Substantial Performance of the Work to the date when the required Work is performed substantially, as determined by the Engineer, shall be termed the “Period of Delay”.

34.4 The Contractor recognizes and agrees that the Owner will suffer financial loss if there is a Period of Delay. The Contractor also recognizes the difficulties involved in proving and quantifying the actual loss suffered by the Owner as a result of unexcused delays. Accordingly, instead of requiring any such proof, the Contractor agrees that as liquidated damages for delay (but not as penalty) the Contractor shall pay to the Owner $1,500.00 per day for each and every working day from the agreed upon Date for Substantial Performance of the Work until Substantial Performance of the Work is actually achieved.

It is further expressly acknowledged and agreed by the Contractor that:

(a) this amount is a reasonable estimate of the actual damage that will be incurred by the Owner due to any failure to complete the Work by the Date for Substantial Performance of the Work; and

(b) the Owner may deduct the amount due under this paragraph from any amounts that may be due or payable to the Contractor, whether under this Contract or any other agreement.

GC 35 HOURS AND DAYS OF WORK

35.1 Normal working days shall be all days other than Saturdays, Sundays, and Holidays observed at the Place of the Work. Working hours shall be governed by applicable noise bylaws and regulations. Normal working hours shall consist of ten (10) hours between 7:00 a.m. and 6:00 p.m., including a one half-hour lunch break.

35.2 If the Contractor wishes to work outside normal working hours and days of work, permission shall be obtained from the Engineer.

35.3 The Engineer may require the Contractor to perform Work outside the normal hours and days of work at no additional cost to the Contract.

35.4 Notwithstanding the above, the Contractor is advised that no work under this Contract shall be performed on Remembrance Day, November 11.

35.5 Notwithstanding the above, the Contractor is advised that work under this Contract shall be limited on the first day of school on those streets abutting school properties and on election days on those streets abutting polling stations.

GC 36 LAND

36.1 The Owner shall provide the lands upon which the Work is to be constructed, rights-of-way for access, easements, and such other lands which are designated for the use of the Contractor.

36.2 If the Contractor deems it advisable to acquire the right or rights to use, enjoy or occupy additional land or lands in order to facilitate the execution of the Works, the Contractor shall obtain such right or rights at own expense and without liability to the Owner.

GC 37 ORDER TO START WORK

37.1 No Work shall be started, nor materials or equipment moved to the Place of the Work, until after receipt by the Contractor of the Order to Start Work. The Work shall commence within the time indicated on the Order to Start Work unless otherwise agreed in writing. Failure of the Contractor to start the Work within the time indicated shall give the Owner the right to cancel the Contract.

GC 38 SETTING OUT THE WORK

38.1 Unless otherwise specified, the Contractor is responsible to develop and make all detail surveys required for the laying out of the various work components with the assistance of available information as supplied by the Owner.

38.2 The Contractor shall carefully preserve benchmark reference points and stakes and in case of willful or careless destruction, the Contractor shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

GC 39 LOCAL OFFICE AND TELEPHONE NUMBERS

39.1 For designated projects the Contractor shall be required to maintain a site office which shall be staffed during normal working hours.

39.2 The Contractor shall provide the Engineer with the names and telephone numbers of two (2) representatives in the Halifax Metro Area of which at least one (1) will be available after hours, including weekends and holidays. This person shall be responsible to take remedial action identified by the Owner.

GC 40 TIME FOR COMPLETION

40.1 The required Work shall be performed completely within the time stated in the Bid Form.

40.2 If the Contractor requests any extensions of time for completion of the Works to do extra Work, strikes, lockouts, fires, insurrection, Acts of God, or delay in delivery of equipment, or by any act of the Owner, or from such other cause for which the Contractor cannot reasonably be held responsible, the Contractor shall give notice in writing to the Engineer within seven (7) days after any such delay has first arisen, stating the reason and requesting a stated extension of time, and in such event the Engineer shall determine what extension of time, if any, shall be allowed the Contractor.

GC 41 VENDOR PERFORMANCE EVALUATION

41. The Contractor will be evaluated in its performance during the Contract. During construction, if performance concerns arise, a meeting or meetings may take place to discuss and resolve issues.

A Vendor Performance Evaluation form will be completed by the Engineer at the completion of the Contract. A copy of the complete form will be provided to the Contractor by the Owner.

Should the Contractor be at variance with the evaluation of its performance, the Contractor, within fourteen (14) days of receipt of the Vendor Performance Evaluation form, shall give notice in writing to the Director of Procurement and set out the terms of the variance.

If, in the opinion of the Owner, performance ratings indicate a meeting between the Contractor and the Owner are warranted, the Owner will invite the Contractor to meet and discuss the performance concerns. These discussions shall focus on specific issues and the outcomes will be summarized in a confirming letter. The Contractor may be invited to respond by letter, as to the measures it proposes to make, to correct or mitigate the concerns. Information in the evaluation may be used in future tender evaluations as an award recommendation.

****** END OF SECTION 00 72 45 ******

Halifax Regional Municipality Standard Details referenced below are as found in the Municipal Design Guidelines at: https://www.halifax.ca/transportation/streets-sidewalks/municipal-design-guidelines-red-book and/or in Section 39 00 00 found at: https://www.halifax.ca/business/doing-business-halifax/procurement/terms-conditions

INDEX TO CLAUSES

GENERAL

EARTHWORK

1. Clearing
2. Grubbing
3. Mass Excavation and Embankment - Common
4. Mass Excavation and Embankment - Rock
5. Mass Excavation - Unsuitable Material
6. Replacement of Unsuitable Material with Type 2 Gravel or Surge Rock
7. Borrow
8. Breaking Mass Rock Without Removal

9.1 Scarify Existing Road Surface

9.2 Fine Grading of Road Surface

WATER SYSTEM

10. Pipe
11. Fire Hydrant
12. Valve Chamber
13. Direct Buried Valve
14. Water Service
15. Connection to Existing Main
16. Water Main Protection
17. Temporary Water Service
18. Reserved
19. Reserved

SANITARY SEWER

20. Gravity Pipe
21. Pressure Pipe
22. Manholes
23. Services
24. Connections to Existing Main
25. Closed Circuit Television Inspection
26. Removal of Existing Structures
27. Reserved
28. Reserved
29. Reserved

STORM SEWER

30. Pipe
31. Manholes
32. Catchbasins
33. Catchbasin Leads
34. Services
35. Connections to Existing Main
36. Culverts
37. Closed Circuit Television Inspection
38. Removal of Existing Structure
39.1 Culvert Headwall
39.2 Culvert Apron
39.3 Inlet/Outlet Grate/Structure
39.4 Headwall Railing
39.5 Ditch Cleaning
39.6 Ditching

STREET CONSTRUCTION

40. Gravels
41. Placement Materials
42. Asphaltic Concrete
43. Curb
44. Sidewalk
44.5 Asphalt Walkway
45. Retaining Wall
46. Traffic Sign Base
47.1 Adjust Existing Structures to Grade
47.2 Replace Frames and Grates or Covers (Including Final Grade Adjustment)
47.3 Adjust Existing Adjustable Frames and Covers
47.4 Adjust Existing Adjustable Frames and Covers (Micro surfacing)
48. Type 2 Gravel or Surge Rock Below Subgrade
49. Driveway Reinstatement

LANDSCAPING

50. Topsoil and Sod
51. Topsoil and Seed
52. Trees, Shrubs and Groundcover
53. Hydroseed
54. Tree Removal
54.5 Tree Trimming
54.6 Migratory Bird Assessment
55. Chip Trees in Place
56. Bark Mulch
57. Handrails and Fences
58. Tree Stump Removal
59. Soil Cells

ADDITIONAL ITEMS

60. Trench Excavation - Rock
61. Trench Excavation - Unsuitable Material
62. Replacement of Unsuitable Material with Type 2 Gravel or Surge Rock
63. Topsoil Excavation
64. Breaking Trench Rock Without Removal
65.1 Painted Pavement Markings
65.2 Thermoplastic Pavement Markings
66. Preblast Survey
67. Preblast Trenches
68. Trench Plugs
69. Traffic Calming

ENVIRONMENTAL PROTECTION

70. Erosion and Sediment Control Plan
71. Sediment Controls
72. Ground Cover
73. Flow Diversions
74. Reserved
75. Reserved
76. Reserved
77. Reserved
78. Reserved
79. Reserved

ELECTRICAL

80. Direct Buried Conduit
81. Traffic Concrete Bases
82. Overhead Wiring for Detector Loops
83. Detectors
84. RA-5 Crosswalk Lights
85. Traffic Signal Installation
86. Ornamental Street Light
87. Area Lighting
88. Junction Box Removal
89. Reserved

MISCELLANEOUS

90. Project Information Sign
91. Reserved
92. Guiderails
93. HDPE Gas Distribution Pipe
94. Tactile Walking Surface Indicator Plates
95. Pavement Marking Drawing
96. Daylighting Underground Utilities
97. Delineators
98. Surveyed Planing Layout
99. Hydro Excavation Services
100. Traffic Control
102. Streetscaping

STRUCTURES

110. Bridge Bearings
111. Removals
112. Bridge Barriers
113. Drains
114. Waterproofing
115. Bridge Concrete
116. Concrete Repairs
117. Piles
118. Fill Against Structure (FAS)

GENERAL

1. Unit prices are full compensation for the work necessary to complete each item in the Contract and in combination for all work necessary to complete the Work as a whole.

2. For sanitary sewers and storm sewer systems include all of the following as required where individual quantities are not provided in the Bid Form: clearing and grubbing, common excavation, shoring, dewatering, bedding, backfilling, compaction, disposal of surplus common, mechanical joint restraints or thrust blocks as directed, testing, flushing, marker stakes, traffic control, all incidentals and reinstatement as specified.

3. All measurement shall be along a horizontal plane unless otherwise indicated. Scale tickets for gravels and asphaltic concrete shall be provided within 48 hours, when requested by the Engineer, regardless of the unit of measurement.

4. The numbers of the items described below correspond to the numbers of the items in Section 00 41 43, Bid Form – Schedule of Quantities and Unit Prices.

5. For water systems include all of the following as required where individual quantities are not provided in the Bid Form: clearing and grubbing, common excavation of trench material, shoring, dewatering, bedding, pipe protection, polyethylene encasement, backfilling, compaction, joint restraints and thrust blocks, testing, flushing and disinfection, marker stakes, traffic control, all incidentals and reinstatement as specified.

6. For earthwork, street construction and landscaping include all of the following as required where individual quantities are not provided in the Bid Form: clearing and grubbing, removals, borrow, common excavation, backfilling, compaction, disposal of surplus material, pavement markings, tree removal, traffic control, all incidentals and reinstatement as specified.

7. The quantities listed in the Schedule of Quantities and Unit Prices are approximate only and are for the purpose of tendering. Payment to the Contractor will be based on actual quantities of work completed in accordance with the drawings and specifications.

8. The requirement for items indicated as Provisional will not be determined until the time of construction. Provisional items shall mean that the unit prices as tendered shall be included in the Bid Price and that the Owner reserves the right to delete or modify the quantities of these items.

EARTHWORK

1. Clearing

Unit of Measurement: hectare (ha) or square metre (m²) or lump sum (l.s.)

This item includes: cutting and disposal of all trees and brush from areas indicated.

2. Grubbing

Unit of Measurement: hectare (ha) or square metre (m²) or lump sum (l.s.)

This item includes: removal and disposal of all stumps, roots, downed timber, embedded logs, rootmat, humus, and topsoil from areas indicated.

3. Mass Excavation and Embankment – Common

Unit of Measurement: cubic metre (m³) of cut

Method of Measurement: average end area method between cross sections taken after grubbing or topsoil removal and to the finished surface lines and elevations indicated.

This item includes: excavation, placement and compaction to the finished surface lines and elevations indicated, and disposal of surplus or unsuitable material.

4. Mass Excavation and Embankment – Rock

Unit of Measurement: cubic metre (m³) of cut

Method of Measurement: average end area method between cross sections taken after rock is exposed to lines and elevations indicated. Boulders one cubic metre or larger will be classified as rock. Boulders removed from the excavation shall be measured along the three maximum perpendicular axes.

This item includes: excavation, placement and compaction to lines and elevations indicated, and disposal of surplus or unsuitable material.

5. Mass Excavation – Unsuitable Material

Unit of Measurement: cubic metre (m³).

Method of Measurement: average end area method of volume of unsuitable material between cross sections taken before and after excavation.

This item includes: all excavation of unsuitable material and disposal. Written authorization of Engineer required.

6. Replacement of Unsuitable Material with Type 2 Gravel or Surge Rock

Unit of Measurement: cubic metre (m³) or tonne (t).

Method of Measurement: average end area method for volume of unsuitable material or ticket of surge material.

This item includes: placing Type 2 gravel or surge rock in locations where unsuitable material has been excavated as indicated on the plan or as directed by the Engineer. It also includes compaction of the gravel and placement of filter fabric. Written authorization of Engineer required.

7. Borrow

Unit of Measurement: lump sum (l.s.) or cubic metre (m³) or tonne (t).

Method of Measurement: lump sum or average end area method between cross sections taken before placement of borrow to lines and elevations indicated. Imported material must be approved by an HRM representative.

This item includes: supply of new material, placement, and compaction.

8. Breaking Mass Rock Without Removal

Unit of Measurement: cubic metre (m³).

Method of Measurement: average end area method between cross sections taken between surface of rock to lines and elevations indicated, and excluding the volume of mass excavation.

This item includes: breaking of rock to the size indicated, and excavation and backfilling test holes as directed by the Engineer.

9.1 Scarify Existing Road Surface

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: scarifying the existing gravel sub-base to depth indicated to remove any material larger than 50 mm and mix gravels to an even consistency. This item also includes all necessary labour and equipment required for the fine grading and compaction of existing granular material.

9.2 Fine Grading of Road Surface

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: necessary labour and equipment required for the fine grading of Type 1 granular materials, to the lines and elevations as indicated, prior to asphaltic concrete placement.

WATER SYSTEM

10. Pipe

Unit of Measurement: metre (m)

Method of Measurement: along centerline of pipe through fittings, valves and valve chambers.

This item includes: supply and install pipe complete with all fittings and thrust restraints, testing, chlorination and de-chlorination, bedding and pipe protection gravels, polyethylene encasement, common excavation, removal and disposal of existing pipe within or partially within theoretical trench, backfilling, environmental protection and reinstatement up to and including Type 2 gravels as specified.

11. Fire Hydrant

.1 Installation of Fire Hydrant

Unit of Measurement: Each

This item includes: supply and install hydrant complete with lead, polyethylene encasement, anchor tee, valve, valve box, anodes, thrust blocks, bedding and pipe protection gravels, common excavation, backfilling including Type 2 gravel as specified, finish grade adjustments, removal of

existing hydrant when installed within the existing trench and hydrant painting. Existing hydrants shall be returned to Halifax Water in full working order.

.2 Relocation of Fire Hydrant

Unit of Measurement: Each

This item includes: relocation of existing hydrant plus the supply and installation of lead, polyethylene encasement, anchor tee, valve, valve box, anodes, thrust blocks, bedding and pipe protection gravels, common excavation, backfilling including Type 2 gravel as specified and finish grade adjustments of the valve and hydrant.

.3 Relocation of Fire Hydrant (including vertical adjustment)

Unit of Measurement: Each

This item includes: relocation of existing hydrant (including vertical adjustment) plus the supply and installation of lead, polyethylene encasement, anchor tee, valve, valve box, anodes, thrust blocks, bedding and pipe protection gravels, common excavation, backfilling including Type 2 gravel as specified and finish grade adjustments of the valve and hydrant.

.4 Removal of Fire Hydrant

Unit of Measurement: Each

This item includes: common excavation, backfilling including Type 2 gravel as specified and removal of hydrant complete with all reinstatement. Hydrants shall be returned to Halifax Water in full working order.

.5 Reconnection of Fire Hydrant

Unit of Measurement: Each

This item includes: reconnection of a fire hydrant including the supply and installation of lead, polyethylene encasement, anchor tee, valve, valve box, anodes, thrust blocks, bedding and pipe protection gravels, common excavation, backfilling including Type 2 gravel as specified and finish grade adjustments of the valve and hydrant.

.6 Raise Fire Hydrant

Unit of Measurement: Each

This item includes: vertical adjustment plus the supply and installation of lead, polyethylene encasement, anchor tee, valve, valve box, anodes, thrust blocks, bedding and pipe protection gravels, common excavation, backfilling including type 2 gravel as specified and finish grade adjustments of the valve and hydrant.

12. Valve Chamber

Unit of Measurement: Each

This item includes: supply and install chamber and components as per Halifax Water specifications including connection to new/existing water mains complete with all fittings, bedding and gravels, common excavation, backfilling including Type 2 gravel as specified, vents and drains.

13. Direct Buried Valve

Unit of Measurement: Each

This item includes: supply and install direct buried valve complete with valve box, appurtenances, polyethylene encasement, anodes, common excavation, backfilling including Type 2 gravel as specified and finish grade adjustment.

14. Water Service

.1 Reconnect Existing Water Service

Unit of Measurement: Each

This item includes: saddle as required, tapping, corporation stop, service pipe (maximum 3 metres in length), couplings (if required) and anode for services 50 mm and less or tee, gate valve, valve box, anodes, pipe (if required) and couplings for service greater than 50 mm.

.2 Replace Existing Water Service

Unit of Measurement: Each

This item includes: excavation, removal and disposal of existing pipes within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe

complete with saddle as required, tapping, corporation stop, curb stop, tee, gate valve, service box (c/w finish grade adjustment), anode and reinstatement up to and including Type 2 gravels as specified.

15. Connection to Existing Main

Unit of Measurement: lump sum (l.s.)

This item includes: locating existing main and supply and installation of pipe, nipples, valves, reducers, fittings, common excavation, backfilling including Type 2 gravel as specified and reinstatement. This item also includes producing and distributing temporary shutdown notices to affected customers and providing traffic control to Halifax Water Operations to facilitate shutdown.

16. Water Main Protection

.1 Rigid Insulation

Unit of Measurement: square metre (m^2)

Method of Measurement: along center line of pipe

This item includes: supply and install 50 mm HI40 rigid insulation as directed by the Engineer.

.2 Pipe Sleeve (encasement pipe)

Unit of Measurement: Each

This item includes: supply and install DR18 pipe sleeves in minimum 6 metre lengths complete with all necessary appurtenances including, but not limited to, modular mechanical seals (such as Link-Seal or approved equivalent) at each end. Sites requiring pipe sleeve may be directed by the Engineer.

17. Temporary Water Service

Unit of Measurement: lump sum (l.s.)

This item includes: but is not limited to, the supply of all labour, material and equipment required for installing, maintaining and removing a minimum 50 mm diameter temporary main line and 19 mm service laterals complete with valves, pipe, backflow prevention device (sized to match temporary main line diameter), meter (supplied by Halifax Water), and vacuum breakers at the connection

to homes, etc. See Halifax Water Supplemental Specification Section 33 11 00 Water Mains for further information.

This item also includes installation of approved vehicle and pedestrian crossing protective measures along with producing and distributing notice to customers that will be placed on temporary water.

18. Reserved

19. Reserved

SANITARY SEWER

20. Gravity Pipe

Unit of Measurement: metre (m)

Method of Measurement: along centreline of pipe through manholes and/or termination points indicated.

.1 Gravity Pipe

This item includes: excavation, removal and disposal of existing pipe within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe complete with all fittings, service reconnects, environmental protection and reinstatement up to and including Type 2 gravels as specified.

.2 Spot Repair

This item includes: excavation, removal and disposal of existing pipe within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe (PVC DR35 diameter to match existing) complete with approved connection fittings (Unicouplings) and reinstatement up to and including Type 2 gravels as specified.

21. Pressure Pipe

Unit of Measurement: metre (m)

Method of Measurement: along centreline of pipe through fittings.

This item includes: excavation, removal and disposal of existing pipe within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe complete with all fittings, corrosion protection, trace wire, test stations at 300 m intervals,

utility marker tape and reinstatement up to and including Type 2 gravels as specified.

22. Manholes

Unit of Measurement: Each

This item includes: excavation, removal and disposal of existing structure where existing structure is within or partially within excavation limits for new structure, bedding and backfilling, supply and placement of manholes as indicated and in accordance with Halifax Water Standard Details or as otherwise detailed on the drawings. Also includes adjustment to finished grade and reinstatement up to and including Type 2 gravels as specified.

23. Services

Unit of Measurement: Each

Method of Measurement: along centreline of pipe through fittings

This item includes: excavation, removal and disposal of existing pipes within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe complete with all fittings, installation of prefabricated PVC in-line tee on new and existing sewer main, approved fittings at connection points and reinstatement up to and including Type 2 gravels as specified.

24. Connections to Existing Main

Unit of Measurement: Each

This item includes: locating existing line or structure, supply and installation of all fittings or manhole as indicated. This item also includes excavation, bedding, backfilling including Type 2 gravel as specified and reinstatement.

25. Closed Circuit Television Inspection

Unit of Measurement: metre (m) for each inspection.

Method of Measurement: along centreline of pipe through manholes.

This item includes: CCTV inspections, deflection testing, records and reports as described in Halifax Water Supplementary Standard Specification Section 33 01 30 CCTV Inspection.

Contractor to conduct two CCTV inspections 1) post construction, as referenced above, and 2) prior to the end of warranty period of two years.

26. Removal of Existing Structures

Unit of Measurement: Each or metre (m)

Method of Measurement: number of structures removed or horizontal measurement of pipe.

This item is intended for removal of pipes/structures that are outside of the theoretical trench or excavation limits for new pipes/structures and includes: locating existing pipe or structure, excavation, disposal, replacement of required volume with select material, backfilling and reinstatement up to and including Type 2 gravels as specified. This item also includes the capping of all remaining pipes or plugging of holes in structures and delivery of removed items as specified.

27. Reserved.

28. Reserved.

29. Reserved.

STORM SEWER

30. Pipe

Unit of Measurement: metre (m)

Method of Measurement: along centreline of pipe through manholes.

.1 Pipe

This item includes: excavation, removal and disposal of existing pipe within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe complete with all fittings, service reconnects, environmental protection and reinstatement up to and including Type 2 gravels as specified.

.2 Spot Repair

This item includes: excavation, removal and disposal of existing pipe within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe (PVC DR35 diameter to match existing) complete with approved connection fittings (Unicouplings) and includes clear stone,

geotextile as specified for underdrains, and reinstatement up to and including Type 2 gravels as specified.

.3 Perforated Pipe

This item includes: excavation, bedding and backfilling, supply and placement of pipe complete with all fittings, service reconnects, and environmental protection, and includes clear stone, geotextile as specified for underdrains, and reinstatement up to and including Type 2 gravels as specified. This item also includes connection to any existing household outfalls and connection to existing or proposed catch basins or manholes as required.

31. Manholes

Unit of Measurement: Each

This item includes: excavation, removal and disposal of existing structure where existing structure is within or partially within excavation limits for new structure, bedding and backfilling, supply and placement of manholes as indicated and in accordance with Halifax Water Standard Details or as otherwise detailed on the drawings. Also includes supply and installation of new frame and grate or cover hardware as specified, adjustment to finished grade and reinstatement up to and including Type 2 gravels as specified.

32. Installation of Catchbasins

Unit of Measurement: Each

Method of Measurement: number of units installed by type and size.

This item includes: excavation, removal and disposal of existing structure where existing structure is within or partially within excavation limits for new structure, bedding and backfilling, supply and placement of catchbasins as indicated and in accordance with Halifax Water Standard Details or as otherwise detailed on the drawing. Also includes supply and installation of new frame and grate or cover hardware as specified, adjustment to finished grade and reinstatement up to and including Type 2 gravels as specified.

33. Catchbasin Leads

Unit of Measurement: metre (m)

Method of Measurement: along centreline of pipe from centre of catchbasin to centre of main sewer, centre of manhole, or termination point indicated.

This item includes: excavation, removal and disposal of existing pipe within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe complete with all fittings, connections and reinstatement up to and including Type 2 gravels as specified.

34. Services

Unit of Measurement: Each

This item includes: excavation, removal and disposal of existing pipes within or partially within theoretical trench, bedding and backfilling, supply and placement of pipe, bends and approved fittings at connection points and reinstatement up to and including Type 2 gravels as specified.

35. Connections to Existing Main

Unit of Measurement: Each

This item includes: locating existing line or structure and supply and installation of all fittings to catchbasin, or manhole as indicated. This item also includes excavation, bedding, backfilling including Type 2 gravel as specified and reinstatement.

36. Culverts

Unit of Measurement: metre (m)

Method of Measurement: along centreline of pipe.

This item includes: pipe, excavation and backfilling including Type 2 gravel as specified, pipe bedding and reinstatement.

37. Closed Circuit Television Inspection

Unit of Measurement: metre (m) for each inspection.

Method of Measurement: along centreline of pipe through manholes.

This item includes: CCTV inspections, deflection testing, records and reports. CCTV inspection is to be completed after all excavation for water main and sanitary and storm services are complete, and roadway is graveled and compacted for water main pressure test. Copy of CCTV inspection and report shall be provided to Halifax Water for review prior to placement of asphalt.

Contractor to conduct two CCTV inspections 1) post construction, as referenced above, and 2) prior to the end of warranty period of two years.

38. Removal of Existing Structure

Unit of Measurement: Each or metre (m)

Method of Measurement: number of catchbasins or manholes removed or horizontal measurement of pipe.

This item is intended for removal of pipes/structures that are outside of the theoretical trench or excavation limits for new pipes/structures and includes: locating existing pipe or structure, excavation, disposal, replacement of required volume with select material, backfilling and reinstatement up to and including Type 2 gravels as specified. This item also includes the capping of all remaining pipes or plugging of holes in structures and delivery of removed items as specified.

39.1 Culvert Headwall

Unit of Measurement: lump sum (l.s.) or cubic metre (m^3) or Each

Method of Measurement: volume of wall and footing constructed

This item includes: common excavation, granular base, supply and installation of headwall as specified, granular backfill, handrail, geosynthetic and all reinstatement.

39.2 Culvert Apron

Unit of Measurement: square metre (m^2)

Method of Measurement: horizontal measurement

This item includes: excavation, supply and placement of geotextile and all materials to specified thickness.

39.3 Inlet / Outlet Grate / Structure

.1 -- mm dia. Inlet Grate
.2 -- mm dia. Outlet Grate

Unit of Measurement: Each

This item includes: supply and placement of grate as specified.

.3 Inlet / Outlet Structure

Unit of Measurement: lump sum (l.s.)

This item includes: all labour and materials necessary to construct and install the inlet and/or outlet structures indicated in the project drawings. This includes, but is not limited to clearing, grubbing, common excavation, bedding, backfilling, rip-rap, geotextile, formwork, concrete reinforcing, railing and grate fabrication and installation, and connection or casting of pipe to structure.

39.4 Headwall Railing

Unit of Measurement: Each

This item includes: supply and installation of headwall railings as indicated in the project drawings. This includes but is not limited to common excavation, railing and grate fabrication and installation, including footings and fixings.

39.5 Ditch Cleaning

Unit of Measurement: metre (m)

This item includes: clearing brush, grubbing, cleaning ditches as described in the tender documents or as directed by the Engineer, 150 mm topsoil, and/or hydroseeding, and/or mulching as directed or as specified on the drawings to cover all areas that are disturbed by the ditching operation, removal and disposal of all excavated material, and clean-up activities, including hand work, to clean out culvert ends and around utilities.

Payment for ditching shall be at the contract unit bid price per linear metre and shall be full compensation for all materials, equipment, plant, labour, excavation, removal and disposal of excavated material, clean-up activities, traffic control, hydroseeding and/or mulching and all incidentals necessary to complete the work as specified.

39.6 Ditching

Unit of Measurement: metre (m)

This item includes: all excavation, grading, supply and installation of materials (including rip-rap) and removal and disposal of waste material (including vegetation) required to complete construction of ditching as specified in the Drawings.

STREET CONSTRUCTION

40. Gravels

Unit of Measurement: square metre (m²) or tonne (t)

Method of Measurement: slope measure of indicated area at mean depth or scale tickets signed by Engineer.

This item includes: mass excavation and embankment – common, supply, placement and compaction of gravel as indicated.

40.23 Type 1 Trench Gravel – 150 mm
40.24 Type 1 Trench Gravel – 200 mm

Unit of Measurement: square metre (m²) or tonne (t)

Method of Measurement: Average end area method between changes in trench cross section. Dimensions used to calculate end areas shall be theoretical trench width as per detail HWSD – 1000, and trench depth as indicated.

This item includes: mass excavation and embankment – common, supply, placement and compaction of gravel as indicated.

41. Placement Materials

.1 Reinstatement Tape

Unit of Measurement: linear metre (m)

Method of Measurement: slope measure

This item includes: the supply and installation of 2 mm x 50 mm reinstatement tape at asphalt joint in street cut by method as specified by supplier.

.2 Bituminous Prime

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure of surface area.

This item includes: supply and application.

.3 Glass Grid

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: supply and placement of glass grid or equivalent, in accordance with HRM standard detail HRM 29 and manufacturer's recommendations. Separate payment will be made for the leveling course of asphalt if required.

.4 Crack Sealing

.1 Clean and Seal Operation

Unit of Measurement: linear metre (m)

Method of Measurement: slope measure

This item includes: cleaning and filling of cracks in asphalt concrete. All crack sealing works shall be limited to sealing uncut cracks with the Clean and Seal Operation as specified. The work consists of the furnishing of all materials, tools, equipment and labour required to complete the work, and all incidentals. Refer to Section S-15 for the Clean and Seal Operation. The Owner reserves the right to schedule the crack sealing locations based on priority.

.5 Geosynthetics

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure.

Payment for geosynthetics will be made separately for each type of geosynthetics supplied and installed.

This item includes: supply and installation of geosynthetics and includes all equipment, labour and incidentals necessary to complete the work. Measurement of geosynthetics will be for the net surface of the work covered by the material. No additional payment will be made for required overlapping of the material as per the manufacturer's recommendations.

Payment for geosynthetics associated with the retaining walls is included in the unit price for those items.

42. Asphaltic Concrete

.1 Asphaltic Concrete

Unit of Measurement: square metre (m²) or tonne (t)

Method of Measurement: slope measure of surface area or scale tickets signed by Engineer.

.1 Type C-HF – 40 mm thick
.2 Type C-HF – 50 mm thick
.3 Type Special C – 40 mm thick
.4 Type Special C – 50 mm thick
.5 Type C-HF – 50 mm thick Polymer Modified
.6 Type B-HF – 50 mm thick
.7 Type B-HF – 60 mm thick
.8 Type B-HF – 75 mm thick
.9 Type B-HF – 100 mm thick
.10 Type D-HF – 40 mm thick
.11 Type D-HF – 50 mm thick
.12 Type D-HF – 65 mm thick
.13 Type D-HF – 75 mm thick
.14 Type D-HF – 50 mm thick Polymer Modified
.15 Type B-HF
.16 Type C-HF
.17 Type D-HF

This item includes: mass excavation and embankment – cleaning, supply, placement and compaction of asphaltic concrete as indicated (with polymer modified binder 58H-28 if specified in the Contract Documents), including dry sweeping milled surfaces prior to tacking, tack coat, temporary pavement markings and saw cutting as necessary. This item also includes supply, placement and compaction of asphalt concrete ramps installed at all limits including side streets and pedestrian ramps using hot mix asphalt (or approved equivalent) and a bond separator. Refer to section S-1 for further details.

.2 Cold Planing

Unit of Measurement: square metre (m²)

This item includes: the supply of all necessary materials, labour and equipment required for the planing / profiling of asphaltic concrete to the depth specified, delivery of all

milled material to a HRM designated site (East – Turner Drive, West – MacKintosh Street), cleaning of all milled surfaces, temporary pavement markings and all other work as designated by the Engineer. Profiler speed not to exceed 18.2 m/min (60 ft./min). This item also includes supply, placement and compaction of asphalt concrete ramps installed between the planed surface and the existing asphalt at all limits including side streets and pedestrian ramps using hot mix asphalt (or approved equivalent) and a bond separator. Refer to Section S-3 for further details.

.3 Asphaltic Concrete Miscellaneous

.1 Hand Patch

Unit of Measurement: square metre (m²) or tonne (t)

Method of Measurement: slope measure of surface area or scale tickets signed by Engineer.

This item includes: cleaning, dry sweeping milled surfaces prior to tacking, tack coat, supply, placement and compaction of asphaltic concrete as indicated. Refer to section S-1 for further details.

.2 Cut and Patch

Unit of Measurement: tonne (t)

Method of Measurement: slope measure of surface area or scale tickets signed by Engineer.

This item includes: mass excavation, cleaning, dry sweeping milled surfaces prior to tacking, tack coat, supply, placement and compaction of asphaltic concrete as indicated including temporary pavement markings and saw cutting as necessary. This item also includes 150 mm Type 1 gravel as per HRM Standard Details 59 and 60. Refer to section S-1 for further details.

.3 Planer Patch

Unit of Measurement: square metre (m²) or tonne (t)

Method of Measurement: slope measure of surface area or scale tickets signed by Engineer.

This item includes: mass excavation and embankment – common by planing, delivery of all milled material to a HRM

designated site (East – Turner Drive, West – MacKintosh Street), cleaning, dry sweeping milled surfaces prior to tacking, tack coat, supply, mechanical placement and compaction of asphaltic concrete as indicated including temporary pavement markings and saw cutting as necessary. Refer to sections S-1 and S-3 for further details.

.4 Profile Correction

Unit of Measurement: tonne (t)

Method of Measurement: slope measure of surface area or scale tickets signed by Engineer.

This item includes: cleaning, dry sweeping milled surfaces prior to tacking, tack coat, supply, placement and compaction of asphaltic concrete as indicated including temporary pavement markings and saw cutting as necessary. Refer to section S-1 for further details.

.5 Spreader (Mechanical Paver) Patch

Unit of Measurement: square metre (m²) or tonnes (t)

Method of Measurement: slope measure of surface area or scale tickets signed by Engineer.

This item includes: mass excavation and embankment – common by planing, delivery of all milled material to a HRM designated site (East – Turner Drive, West – MacKintosh Street), cleaning, dry sweeping milled surfaces prior to tacking, tack coat, supply, placement and compaction of asphaltic concrete as indicated including temporary pavement markings, reinstatement tape, 150 mm Type 1 gravel and saw cutting as necessary as per HRM Standard Detail HRM 59 and HRM 60. Refer to section S-1 for further details.

.6 Full Depth Reclamation

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure of surface area

This item includes but is not limited to: all labour, equipment and material required to undertake the work which includes excavation and pulverization of in-situ asphalt and gravels to depths indicated, supply and mixing of corrective aggregate (if necessary), grading and placement of

reclaimed material. For the complete description of work required for this item see supplementary specifications S-8 Full Depth Reclamation.

.7-.10 In Place Stabilization

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure.

This item includes but is not limited to: all labour, equipment and materials required to undertake the work, which includes injection of emulsion, mixing, grading, compaction, tack coat and temporary pavement markings. For the complete description of work required for this item see supplementary specifications S-8 Full Depth Reclamation.

.11 Asphalt Swale

Unit of Measurement: linear metre (m)

Method of Measurement: slope measure along centreline of swale

This item includes: mass excavation and embankment, dry sweeping milled surfaces prior to tacking, tack coat, supply, placement of asphalt swale as per detail drawing HRM 30 (by mechanical spreader, or by hand when not being installed in conjunction with a new lift of asphalt), compaction of asphalt concrete as indicated, temporary pavement markings and saw cutting as necessary. Refer to section S-1 for further details.

.12 Pulverization

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes but is not limited to: all labour, equipment and material required to undertake the work which includes pulverizing, initial grading and compaction. Maximum aggregate size of pulverized material shall be no greater than 50 mm. The contractor shall accurately take inventory of the existing roadway cross slope and reinstate as directed by the Engineer. This item also includes supply, placement and compaction of asphalt concrete ramps installed at all limits including side streets and pedestrian ramps using hot mix asphalt (or approved equivalent) and a bond separator.

For the complete description of work required for this item see supplementary specifications S-8 Full Depth Reclamation.

.13 Full Depth Asphalt Removal

Unit of Measurement: square metre (m²)

This item includes: the supply of all necessary materials, labour and equipment required for the full depth asphaltic concrete removal and delivery of all milled material to the Contractor's location of choice. If asphaltic concrete is removed by planing, milled material may be delivered to a HRM designated site (East – Turner Drive, West – MacKintosh Street). This item also includes cleaning of all milled surfaces, temporary pavement markings and all other work as designated by the Engineer. This item also includes supply, placement and compaction of asphalt concrete ramps installed between the planed surface and the existing asphalt at all limits including side streets and pedestrian ramps using hot mix asphalt (or approved equivalent) and a bond separator.

.14 Micro Surfacing with Scratch Course

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure of surface area

This item includes: supply, placement of scratch and final coat and compaction of asphaltic concrete of micro surfacing as indicated including cleaning, dry sweeping surfaces prior to tacking, tack coat, temporary pavement markings and saw cutting as necessary. Refer to section S-5 for further details.

.15 Single Chip Seal

Unit of Measurement: square metre (m^2)

This item includes: all material, labour and equipment required to install a single chip seal as described in Section S-16, Chip Sealing for Streets.

.16 Double Chip Seal

Unit of Measurement: square metre (m^2)

This item includes: all material, labour and equipment required to install a double chip seal as described in Section S-16, Chip Sealing for Streets.

.17 Full Depth Concrete Pavement Removal

Unit of Measurement: square metre (m^2)

Method of Measure: slope measure

This item includes: the supply of all necessary materials, labour and equipment required for the full depth concrete pavement removal and delivery of all material to the Contractors location of choice. This item also includes steel reinforcing removal and cutting as required, cleaning of all milled surfaces, temporary pavement markings and all other work as designated by the Engineer. This item also includes supply, placement and compaction of asphalt concrete ramps installed between the planed or gravel surface and the existing asphalt at all limits including side streets and pedestrian ramps using hot mix asphalt (or approved equivalent) and a bond separator.

43. Curb

.1 Concrete Curb and Gutter

.2 Concrete Curb

Unit of Measurement: metre (m)

Method of Measurement: slope measure along face of curb through catchbasins.

Item 1 and 2 include: mass excavation and embankment – common, 150 mm Type 1 granular base (extended 150 mm beyond the back of the curb), grade stakes placed at the curb alignment showing top of curb elevation at 10 m intervals (HRM approval required prior to placing curb and gutter (or concrete curb if specified), supply and installation of concrete curb and gutter (as per Standard Detail HRM 53) or concrete curb, and supply and placement of backfill to subgrade for topsoil, sidewalk or driveway. This item also includes the removal and disposal of the existing curb if the face of the proposed curb is within 1 m horizontally of the face of the existing curb. Notwithstanding section 6 of 01 22 00 Measurement and Payments, this item also includes the removal and disposal of the existing curb if the face of the

proposed curb is within 1 m horizontally of the face of the existing curb.

.3 Asphalt Curb

Unit of Measurement: metre (m)

Method of Measurement: slope measure along face of curb through catchbasins.

This item includes: preparing surface on which the curb is to be placed so that it is dry and free from all loose and foreign material, placement of tack coat prior to curb placement, placing the asphalt curb as per Standard Detail HRM 55 by a machine (if the length of curb exceeds 10 m in a continuous length) that is self-powered and capable of extruding and compacting the asphalt concrete to the line, grade and cross-section as shown on the drawings or as otherwise specified. Notwithstanding section 6 of 01 22 00 Measurement and Payments, this item also includes the removal and disposal of the existing curb if the face of the proposed curb is within 1 m horizontally of the face of the existing curb.

.4 Curb Removal

Unit of Measurement: metre (m)

Method of Measurement: slope measure along face of curb through catchbasins.

This item includes: mass excavation and embankment – common, and supply and placement of backfill to subgrade.

.5 Pre-Cast Concrete Curb – Supply and Install

Unit of Measurement: each (ea.)

This item includes: preparing surface on which the pre-cast concrete curb is to be placed so that it is dry and free from all loose and foreign material and the supply and installation of pre-cast concrete curb including galvanized rebar and steel dowel anchors as per the Drawings.

This item also includes installation of flexible delineators on proposed pre-cast concrete curb as shown in the drawings and as per manufacturer’s instructions and cutting of curb to adjust lengths.

.6 Pre-Cast Concrete Curb – Install Only

Unit of Measurement: each (ea.)

This item includes: transport of each unit from the HRM MacKintosh Depot to the job site, preparing surface on which the pre-cast concrete curb will be placed so that it is dry and free from all loose and foreign material and installation of pre-cast concrete curb including galvanized rebar and steel dowel anchors as per the Drawings. Asphalt shall be pre-drilled prior to installing dowels.

This item also includes installation of flexible delineators on proposed pre-cast concrete curb as shown in the drawings and as per manufacturer's instructions and cutting of curb to adjust lengths.

.7 Mountable Curb

Unit of Measurement: metre (m
Method of Measurement: slope measure along face of curb.

This items includes: common excavation and embankment, 150 mm Type 1 granular base (extended 150 mm beyond the back of the curb), grade stakes placed at the curb alignment showing top of curb elevation at 10 m intervals (HRM approval required prior to placing curb and gutter or concrete curb if specified), and supply and placement of backfill to subgrade for topsoil, sidewalk or driveway as per Standard Detail HRM 53 and as specified on the drawings. This item also includes all curb steel reinforcing as specified.

.8 Concrete Curb and Gutter with Macro-synthetic Fibers

Unit of Measurement: metre (m)

This item includes: mass excavation and embankment – common, 150mm Type 1 granular base (extended 150 mm beyond the back of the curb), grade stakes placed at the curb alignment showing top of curb elevation at 10 m intervals (HRM approval required prior to placing curb and gutter (or concrete curb if specified), supply and installation of concrete curb and gutter (as per Standard Detail HRM 53) complete with macro-synthetic fiber reinforcement, and supply and placement of backfill to subgrade for topsoil, sidewalk or driveway. Notwithstanding section 6 of 01 22 00 Measurement and Payments, this item also includes the removal and disposal of the existing curb if the face of the

proposed curb is within 1 m horizontally of the face of the existing curb.

This item shall be applied to concrete curb and gutter for Curb Extensions / Bump-Outs and includes macro-synthetic fiber reinforcement. The macro-synthetic fiber reinforced concrete curb and gutter shall extend along the complete limits of the Curb Extensions / Bump-Outs starting at the nearest control joint, including the curb taper radii and tangent, ending at to the nearest control joint or radius endpoint, as shown on project drawings. Refer to S-11 - Part B, for further details.

.9 Granite Curb (Install Only)

Unit of Measurement: metre (m)

Method of Measurement: slope measure along face of curb through catchbasins.

This item includes: mass excavation and embankment – common, 300 mm Type 1 granular base (extended 150 mm beyond the back and front of the concrete bed), grade stakes placed at the curb alignment showing top of curb elevation at 10 m intervals (HRM approval required prior to placing curb), cast-in-place concrete bed, and supply and placement of backfill to subgrade for sidewalk or driveway as per Standard Detail HRM 204. Notwithstanding section 6 of 01 22 00 Measurement and Payments, this item also includes the removal and disposal of the existing curb if the face of the proposed curb is within 1 m horizontally of the face of the existing curb.

44. Sidewalk

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure.

This item includes: mass excavation and embankment – common, bedding sand as required, 150 mm Type 1 granular base (extended 150 mm beyond edge of sidewalk structure), sidewalk as per Drawings, and supply and placement of backfill as indicated. This item also includes welded wire mesh when specified and jointing sand as required. Notwithstanding section 6 of 01 22 00 Measurement and Payments, this item also includes the removal and disposal of the existing sidewalk if it is within the limits of construction of the proposed sidewalk.

44.5 Asphalt Paths and Multi-Use Trails

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: mass excavation and embankment – common, removal of existing asphalt, 150 mm Type 1 granular base (extended 150 mm beyond edge of sidewalk structure), asphalt path or multi-use trail as per tender Drawings, and supply and placement of backfill as indicated. Notwithstanding section 6 of 01 22 00 Measurement and Payments, this item also includes the removal and disposal of the existing sidewalk if it is within the limits of construction of the proposed sidewalk.

44.10 Concrete Unit Pavers

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: mass excavation and embankment – common, bedding sand as required, 150 mm Type 1 granular base (extended 150 mm beyond edge of sidewalk structure), concrete base and drains as per details, and supply and placement of pre-cast concrete unit pavers. This item also includes welded wire mesh when specified and jointing sand as required. Notwithstanding section 6 of 01 22 00 Measurement and Payments, this item also includes the removal and disposal of the existing sidewalk if it is within the limits of construction of the proposed sidewalk.

44.12 Concrete or Asphalt Sidewalk Removal

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: mass excavation and embankment – common, removal and disposal of existing concrete sidewalk, asphalt sidewalk, asphalt path, or multi-use trail as per tender Drawings, supply and placement of backfill as indicated, and reinstatement.

44.15 Traffic Island

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: common excavation and embankment, 150 mm Type 1 granular base, doweling into adjacent curb, concrete traffic island placement as per Standard Detail HRM 52, and supply and placement of backfill as indicated. This item also includes welded wire mesh when specified. Notwithstanding section 6 of 01 22 00 Measurement and Payments, this item also includes the removal and disposal of the existing sidewalk if it is within the limits of construction of the proposed sidewalk.

45. Retaining Wall

Unit of Measurement: cubic metre (m^3) or square metre (m^2)

Method of Measurement: volume of wall and footing constructed or area of wall face above footing.

.1 Retaining Wall Including Reinstatement

This item includes: additional survey as required, design of the walls to suit dimensions and design criteria shown on Drawings, supply of shop drawings for review, revision and preparation of construction drawings to incorporate review comments, supply and installation of wall materials including pre-cast concrete wall components, geosynthetic, granular backfill, topsoil 300 mm thick, sod, geogrid, drains as indicated, common excavation, granular base, and associated reinstatement.

This item also includes sealed drawings and certification of finished retaining wall construction including the base gravels and subgrade, by a Professional Engineer (P.Eng.) licensed to practice in Nova Scotia.

.2 Retaining Wall Excluding Reinstatement

This item includes: additional survey as required, design of the walls to suit dimensions and design criteria shown on Drawings, supply of shop drawings for review, revision and preparation of construction drawings to incorporate review comments, supply and installation of wall materials including pre-cast concrete wall components, geosynthetic, granular backfill, geogrid, drains as indicated, common excavation, and granular base.

This item also includes sealed drawings and certification of finished retaining wall construction including the base gravels and subgrade, by a Professional Engineer (P.Eng.) licensed to practice in Nova Scotia.

46. Traffic Sign Base

.1 Urban Traffic Sign Post

Unit of Measurement: Each

This item includes: common excavation, backfill, supply and installation of concrete, reinforcing steel, iron pipe sleeve, sign post and water tight cap as per Standard Detail HRM 38. This item also includes surface reinstatement to original condition or better.

This item does not include the supply and installation of signs. If applicable, this item also includes the temporary connection of the removed sign post (and sign) to the new sign post.

.2 Rural Traffic Sign Post

Unit of Measurement: Each

This item includes: common excavation, backfill, supply and installation of telespar sign post and two piece breakaway anchor as per Standard Detail HRM 39. This item also includes surface reinstatement to original condition or better.

This item does not include the supply and installation of signs. If applicable, this item also includes the temporary connection of the removed sign post (and sign) to the new sign post.

.3 Remove Sign Post and Base

Unit of Measurement: Each

This item includes: common excavation, backfill, removal and disposal of existing sign post and base, and all reinstatement as required including landscaping.

. 4 Traffic Sign Post at Curb End Unit

Unit of Measurement: Each

This items includes: supply and installation of sign post with water tight cap at pre-cast curb end units as indicated on the Drawings including all associated hardware. This item does not include the supply and installation of signs.

.5 Urban Traffic Sign Installation

Unit of Measurement: Each

This item is to be used in conjunction with line item 46.1 – Urban Traffic Sign Post.

This item includes transportation of the proposed signage from the MacKintosh Depot, the supply of all required hardware and accessories for sign installation, installation of the sign, and welding of the post, all as per standard detail HRM 129.

.6 Rural Traffic Sign Installation

Unit of Measurement: Each

This item is to be used in conjunction with line item 46.2 – Rural Traffic Sign Post.

This item includes transportation of the proposed signage from the MacKintosh Depot, the supply of all required hardware and accessories for sign installation, and installation of the sign, all as per standard detail HRM 130.

.7 Utility Pole Sign Installation

Unit of Measurement: Each

This item is to be used when installing a sign on a utility pole.

This item includes transportation of the proposed signage from the MacKintosh Depot, the supply of all required hardware and accessories for sign installation, and installation of the sign, all as per standard detail HRM 130.

47.1 Adjust Existing Structures to Grade

.1 Shaft Adjustment (Manhole)

Unit of Measurement: Each

Method of Measurement: number of existing manholes adjusted to grade.

This item includes: excavation and backfill, removal of existing shaft section (800 mm inside diameter or less), reconstruction with pre-cast concrete sections and cast-in-

place concrete as specified, setting of frame and cover to finished grade and reinstatement to match existing.

This item also includes the placement of catchment devices in all manholes prior to work commencing on the manhole, and the removal thereof after all work is completed. This item also includes the removal and disposal of all debris accumulated during construction.

.2 Shaft and Intermediate Section Adjustment (Manhole)

Unit of Measurement: Each

Method of Measurement: number of existing manholes adjusted to grade.

This item includes: excavation and backfill, removal of existing shafting material, eccentric cone sections and intermediate sections, supply and installation of required pre-cast concrete sections, supply and placement of cast-in-place concrete as specified, setting of frame and cover to finished grade and reinstatement to match existing.

This item also includes the placement of catchment devices in all manholes prior to work commencing on the manhole, and the removal thereof after all work is completed. This item also includes the removal and disposal of all debris accumulated during construction.

.3 Shaft Adjustment (Catchbasin)

Unit of Measurement: Each

Method of Measurement: number of existing catchbasins adjusted to grade

This item includes: excavation and backfill, removal of existing adjusting section on top of capping section, reconstruction with cast-in-place concrete as specified, setting of frame and grate to finished grade and reinstatement to match existing. This item also includes the removal and disposal of all debris accumulated during construction.

.4 Shaft and Intermediate Section Adjustment (Catchbasin)

Unit of Measurement: Each

Method of Measurement: number of existing manholes adjusted to grade.

This item includes: excavation and backfill, removal of existing shafting material, eccentric cone sections and intermediate sections, supply and installation of required pre-cast concrete sections, supply and placement of cast-in-place concrete as specified, setting of frame and grate to finished grade and reinstatement to match existing. This item also includes the removal and disposal of all debris accumulated during construction.

.5 Type 1 Water Valve Adjustment

Unit of Measurement: Each

Method of Measurement: number of existing water valves adjusted to grade.

This item includes: the supply and installation of adjustable top and cap, excavation and adjustment of adjustable top, setting top to finished grade and reinstatement to match existing. Materials and specifications as per Halifax Water Supplementary Standard Specification, Section 33 11 00.

This item also includes the removal and disposal of all debris accumulated during construction.

.6 Type 2 Water Valve Adjustment

Unit of Measurement: Each

Method of Measurement: number of existing water valves adjusted to grade.

This item includes: excavation and adjustment of upper valve box extension sleeve, setting top to finished grade and reinstatement to match existing. This item also includes the removal and disposal of all debris accumulated during construction.

Materials and specifications as per Halifax Water Supplementary Standard Specification, Section 33 11 00.

.7 Type 3 Water Valve Adjustment

Unit of Measurement: Each

Method of Measurement: number of existing water valves adjusted to grade.
This item includes: the supply and installation of upper valve box and cap (and intermediate section if required); excavation and adjustment of upper valve box extension sleeve; centering over the valve operating stem, setting top to finished grade and reinstatement to match existing. This item also includes the removal and disposal of all debris accumulated during construction.

Materials and specifications as per Halifax Water Supplementary Standard Specification, Section 33 11 00.

.8 Type 4 Water Valve Adjustment

Unit of Measurement: Each

Method of Measurement: number of existing water valves adjusted to grade.

This item includes: the supply and installation of both the upper, intermediate, and lower valve box sections and cap, excavation, adjustment and replacement of upper valve box extension sleeve.

Item also includes the centering of the new valve box sections over the valve operating nut, the setting of the top to finished grade and reinstatement to match existing. This item also includes the removal and disposal of all debris accumulated during construction.

Materials and specifications as per Halifax Water Supplementary Standard Specification, Section 33 11 00.

47.2 Replace Frames and Grates or Covers (Including Final Grade Adjustment)

Unit of Measurement: Each

Method of Measurement: Number of sets of frame and grate or cover

This item includes: excavation and backfill, removal of existing shaft section (800 mm inside diameter or less), supply and installation of new adjustable frame and grate or cover as specified,

reconstruction with pre-cast sections and cast-in-place concrete as specified, setting of frame and cover to finished grade and reinstatement to match existing.

This item also includes the placement of catchment devices in all manholes prior to work commencing on the manholes, and the removal thereof after all work is completed. This item also includes the removal and disposal of all debris accumulated during construction.

47.3 Adjust Existing Adjustable Frames and Covers

Unit of Measurement: Each

Method of Measurement: Number of sets of frame and cover

This item includes: adjustment of adjustable frame and cover to finished grade and reinstatement to match existing. This item also includes the removal and disposal of all debris accumulated during construction.

47.4 Adjust Existing Adjustable Frames and Covers (Micro surfacing)

Unit of Measurement: Each

Method of Measurement: Number of sets of frame and cover

This item includes: adjustment of adjustable frame and cover to finished grade and reinstatement to match existing for micro surfacing and/or thin lifts of asphalt paving. This item also includes the removal and disposal of all debris accumulated during construction.

48. Type 2 Gravel or Surge Rock Below Subgrade

Unit of Measurement: cubic metre (m^3) or tonne (t)

Method of Measurement: average end area method or scale tickets signed by Engineer.

This item includes: excavation and disposal of unsuitable material below subgrade and supply, placement and compaction of gravel or surge rock and filter fabric as directed by Engineer.

49. Driveway Reinstatement

.1 Gravel

Unit of Measurement: tonne (t)

Method of Measurement: scale tickets signed by Engineer.

This item includes: excavation, supply, placement and compaction of Type 1 gravel (150 mm minimum thickness).

.2 Asphalt

Unit of Measurement: square metre (m²)

Method of Measurement: Slope measure or scale tickets signed by Engineer.

This item includes: excavation, supply, placement and compaction of Type D-HF asphalt as specified. It also includes excavation, supply, placement and compaction of 150 mm Type 1 gravel base and reinstatement tape along cut edge of existing asphalt.

.1 65 mm Type D asphalt
.2 90 mm Type D asphalt
.3 40 mm Type D asphalt

.3 Concrete

Unit of Measurement: square metre (m²)

Method of Measurement: Slope measure

This item includes: excavation, supply, placement and finishing of 150 mm thick concrete including welded wire mesh and installation of 200 mm long 10M dowels into the existing driveway at 600 mm c.c. It also includes excavation, supply, placement and compaction of 150 mm Type 1 gravel base.

.4 Brick Paver

Unit of Measurement: square metre (m²)

Method of Measurement: Slope measure

This item includes: excavation, supply and placement of brick pavers to reinstate existing brick work to original

condition. This item also includes supply, placement and compaction of 150 mm Type 1 gravel, bedding sand and jointing material.

.5 Exposed Aggregate

Unit of Measurement: square metre (m²)

Method of Measurement: Slope measure or scale tickets signed by Engineer.

This item includes: excavation, supply, placement and finishing of 150 mm thick concrete (match existing aggregate size and colour) including welded wire mesh. It also includes 150 mm Type 1 gravel base, the supply and installation of 10M dowels into the existing driveway at 600 mm c.c. and sealant. Refer to Section S-9 for further details.

LANDSCAPING

50. Topsoil and Sod

.1 150 mm Topsoil and Sod

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure.

This item includes: excavation, scarification of the existing soil, supply 150 mm topsoil, lime, fertilizer, sod, required accessories, and maintenance.

.2 Topsoil

Unit of Measurement: cubic metre (m³) or tonne (t)

Method of Measurement: average end area method or scale tickets signed by Engineer.

This item includes: excavation and disposal of unsuitable material and supply and placement of topsoil as directed.

51. Topsoil and Seed

.1 150 mm Topsoil and Seed

Unit of Measurement: square metre (m²)
Method of Measurement: slope measure.

This item includes: excavation, scarification of the existing soil, supply 150 mm topsoil, compaction, lime, fertilizer, mulch, erosion control agent, seed, and maintenance.

.2 Topsoil

Unit of Measurement: cubic metre (m^3) or tonne (t)

Method of Measurement: average end area method or scale tickets signed by Engineer.

This item includes: excavation and disposal of unsuitable material and supply and placement of topsoil as directed.

52. Trees, Shrubs and Groundcover

Unit of Measurement: Each or square metre (m^2)

Method of Measurement: Individual item or slope measure

This item includes: supply and installation of trees, shrubs and groundcover, planting mixture, mulch, lime and fertilizer, tree supports and accessories and maintenance as specified.

52.4 Planting Soil Mixture

Unit of Measurement: cubic metre (m^3) or tonne (t)

Method of Measurement: average end area method or scale tickets signed by Engineer.

This item includes: excavation and disposal of unsuitable material and supply and placement of planting soil mixture as directed.

53. Hydroseed

Unit of Measurement: square metre (m^2)

Method of Measurement: slope measure

This item includes: topsoil as specified, hydroseed mix, mulch, erosion control agent, water and fertilizer as specified and maintenance.

54. Tree Removal

Unit of Measurement: Each or lump sum (l.s.)

This item includes: mass excavation and embankment – common, removal and disposal of all trees including stumps and roots (to size indicated) as indicated on plan, backfill, and all reinstatement. Tree diameter shall be measured at 1.3 m from the ground.

54.5 Tree Trimming

Unit of Measurement: lump sum (l.s.)

This item includes: the careful trimming of trees and brush by a certified arborist.

All tree trimming and pruning should be completed prior to April 15th or succeeding August 31st. If this is not possible a Migratory Bird Assessment is required, and the contractor must provide the HRM Engineer with 48-hour notice prior to any work being conducted.

54.6 Migratory Bird Assessment

Unit of Measurement: lump sum (l.s.)

If tree trimming, pruning, or removal is required within the April 15th to August 31st timeframe, the contractor shall engage a Professional Ornithologist and must conduct an assessment to determine the presence of any nesting of migratory birds within the proposed limits of work and provide documentation thereof.

This item includes all labour, fees, and materials required to conduct this assessment and to provide the required documentation.

55. Chip Trees in Place

Unit of Measurement: Each or lump sum (l.s.)

This item includes: removal of trees, chipping on site and distributing on site as specified by Engineer.

56. Bark Mulch

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: excavation, supply 100 mm thick bark mulch and non-woven filter fabric.

57. Handrails and Fences

Unit of Measurement: metre (m) or each (ea)

Method of Measurement: slope measure along top rail.

This item includes: excavation and backfill, removal and disposal of existing fence, bollards, gates and/or footings, supply and placing concrete footings, installation and finishing of posts, rails, gates, fabric, fittings, bollards, and accessories as per the Drawings, temporary measures as required, and surface reinstatement as specified.

58. Tree Stump Removal

Unit of Measurement: Each

This item includes: mass excavation and embankment – common, cutting roots as required, removal and disposal of the tree trunk, removal and disposal of roots as directed, supply and placement of borrow as required to fill in all voids, 150 mm of topsoil and sod (if an individual pay item is not provided), lime, fertilizer, required accessories and maintenance.

59. Soil Cells

.1 Soil Cells

Unit of Measurement: cubic metre (m^3)

Method of Measurement: volume (measured at perimeter of soil cells)

This item includes: mass excavation and embankment – common, supply and install of soil cells including all required materials and accessories, including but not limited to geotextile, geogrids, aggregates, subbase material, thickened sidewalk edge, specified soil mixture, drainage system, and root barrier as required, all as per the Drawings and manufacturer details and specifications. This item also includes existing pipe and conduit protection, backfill, and Type 2 gravels as specified. Refer to Section 32 94 50 Structural Soil Cells for further information.

.2 Tree Grates

Unit of Measurement: Each (Ea.)

This item includes: the supply and installation of a decorative metal tree grate as specified, including but not limited to sub-grade preparation, granular base, concrete support shelf, grate frame and anchor bolts and as shown on the Drawings and per HRM Standard Detail HRM 187.

ADDITIONAL ITEMS

60. Trench Excavation – Rock

Unit of Measurement: cubic metre (m^3) or tonne (t)

Method of Measurement:

Average end area method between changes in rock cross section. Dimensions used to calculate end areas shall be theoretical trench width as per detail HWSD – 1000, and depth from surface of rock as exposed on sides of trench after excavation to bottom of specified bedding for each pipe in trench.

Boulders larger than one-half cubic metre, any portion of which is within theoretical trench, will be classified as rock. Boulders removed from trench shall be measured along the three maximum perpendicular axes.

This item includes: all incidental work for rock excavation and disposal of surplus material over and above cost of common excavation which is included in price for pipe and related items. Also includes replacement of required volume with select material.

61. Trench Excavation – Unsuitable Material

Unit of Measurement: cubic metre (m^3) or tonne (t)

Method of Measurement: average end area method for volume of unsuitable material less theoretical trench volume or ticket of surge material used to backfill.

This item includes: all excavation of unsuitable material beyond limits of the theoretical trench as per detail HWSD – 1000, and disposal. Written authorization of Engineer required.

62. Replacement of Unsuitable Trench Material with Type 2 Gravel or Surge Rock

Unit of Measurement: cubic metre (m^3) or tonne (t)

Method of Measurement: average end area method for volume of unsuitable material less theoretical trench volume or ticket of surge material.

This item includes: placing Type 2 gravel or surge rock in locations where unsuitable material has been excavated from the trench beyond the limits of the theoretical trench as per detail HWSD – 1000. It also includes compaction of the gravel and placement of filter fabric. Written authorization of Engineer required.

63. Topsoil Excavation

Unit of Measurement: cubic metre (m^3).

Method of Measurement: average end area method between cross sections taken before and after stripping topsoil.

This item includes: stripping and stockpiling or disposal of topsoil as directed.

64. Breaking Trench Rock Without Removal

Unit of Measurement: cubic metre (m^3).

Method of Measurement: average end area method between changes in rock cross section. Dimensions used to calculate end areas to be theoretical trench width as per detail HWSD – 1000, and depth from surface of rock as encountered during drilling to the lines and elevations indicated.

This item includes: breaking of rock to size indicated and excavation and backfilling test holes.

65.1 Painted Markings

.1 Painted Lines
.2 Painted Stop Bars
.3 Painted Yield Line

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in the colours, sizes, and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.4 Painted Crosswalks

Unit of Measurement: metre (m)

Method of Measurement: average of the slope measurement of both lines

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in the colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.5 Painted Zebra Crosswalk

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in the colours, sizes, and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.6 Painted Hatching-White
.7 Painted Hatching-Yellow
Unit of Measurement: square metre (m²)

Method of Measurement: slope measure of surface area including perimeter line.

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in the colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.8 Painted Intersection Box (Hatched)

Unit of Measurement: square metre (m²)

Method of Measurement: plan measurement

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in the colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.9 Painted Arrows

.1 Painted Arrow ¾ TAC size
.2 Painted Arrow ½ TAC size
.3 Painted Roundabout Arrow

Unit of Measurement: Each

Method of Measurement: number of units installed. Where there is more than one arrow per installation (i.e., “Thru-left” symbol) this shall be counted as one unit.

This item includes: accurate inventory of existing arrows and configurations, supply and application of arrows in the colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.10 Painted Bicycle Symbol

Unit of Measurement: Each

Method of Measurement: number of units installed.

This item includes: accurate inventory of existing bike symbols and configurations, supply and application of bicycle pavement markings in colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.11 Painted Advance Yield to Pedestrian Line

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.12 Painted Speed Hump/Table Markings

Unit of Measurement: Per speed hump/table location

Method of Measurement: number of speed humps/tables installed.

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.13 Painted Reserved Lane Diamond Symbol-White.

.14 Painted Shared Use Lane

Unit of Measurement: Each

This item includes: accurate inventory of existing pavement markings, the supply and application of symbols in the colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.16 Painted Speed Cushion Markings

Unit of Measurement: Per speed cushion

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.18 Painted Vehicle/Bike Zebra Conflict Marking, 1.8m x 0.6m Total (1.5m Green With 0.15m White Each End)

Unit of Measurement: each (ea.)

This items includes: accurate inventory of existing pavement markings, the supply and application of paint in the colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.19 Painted Driveway/Bike Zebra Conflict Marking, 1.3m x 0.6m Total (1.0m Green with 0.15m White Each End)

Unit of Measurement: each (ea.)

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in colours, sizes and configurations shown on the Drawings, as specified by the Engineer and as per HRM Red Book detail HRM 190 (using paint instead of thermoplastic). Also includes layout and pre-marking in accordance with S-1.

.21 Painted Trail Crosswalk Markings

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: accurate inventory of existing pavement markings, the supply and application of paint in colours, sizes and configurations shown on the Drawings, as specified by the Engineer and as per HRM Red Book detail HRM 93. Also includes layout and pre-marking in accordance with S-1.

.30 Painted New Intersection Markings

Unit of Measurement: lump sum (l.s.)

This item includes: supply and application of paint in the colours, sizes and configuration as indicated on the plan.

.31 Removal of Existing Painted Markings

Unit of Measurement: square metre (m^2), Each or lump sum (l.s.)

Method of Measurement: Plan Measurement, per item or as Lump Sum

This item includes: the supply and installation of all materials required to remove the pavement markings in the configuration shown on the drawing and as specified by the Engineer.

.32 Replacement of Existing Painted Markings

Unit of Measurement: lump sum (l.s.)

This item includes: accurate inventory of existing pavement markings and the supply and application of paint in the colours, sizes and configuration as necessary to replace the markings which existed prior to construction. Also includes layout and pre-marking in accordance with S-1.

.34 Painted Pedestrian/Bicycle Shared Use Symbol

Unit of Measurement: each (ea.)

Method of Measurement: number of units installed.

This item includes: supply and application of pedestrian/bicycle shared use pavement markings in colours, sizes and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

.35 Replacement of Existing Painted Markings

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: the supply and application of paint in the colours, sizes, and configurations shown on the drawings and as specified by the Engineer. Also includes layout and pre-marking in accordance with S-1.

65.2 Thermoplastic Markings

.1 Thermoplastic Lines
.2 Thermoplastic Stop Bars
.3 Thermoplastic Yield Line
.4 Thermoplastic Crosswalk
.5 Thermoplastic Zebra Crosswalk

Unit of Measurement: metre (m)

Method of Measurement: slope measure

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer’s instructions. This also includes layout, pre-

marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.6 Thermoplastic Hatching-White
.7 Thermoplastic Hatching-Yellow

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure of surface area including perimeter line.

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.8 Thermoplastic Intersection Box (Hatched)

Unit of Measurement: square metre (m²)

Method of Measurement: plan measurement

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.9 Thermoplastic Arrows
  .1 Thermoplastic Arrow ¾ TAC size
  .2 Thermoplastic Arrow ½ TAC size
  .3 Thermoplastic Roundabout Arrow

Unit of Measurement: Each

Method of Measurement: number of units installed

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.10 Thermoplastic Bicycle Symbols

.1 Thermoplastic Bicycle Symbol 1.2m x 2.1m, White on Black Background
.2 Thermoplastic Bicycle Symbol 1.2m x 2.1m, White on Green Background
.3 Thermoplastic Bicycle Symbol 0.6m x 1.2m, White on Green Background

Unit of Measurement: Each

Method of Measurement: number of units installed

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.11 Thermoplastic Advance Yield to Pedestrian Line

Unit of Measurement: metre (m)

Method of Measurement: slope measure

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.12 Thermoplastic Speed Hump/Table Markings

Unit of Measurement: Per speed hump/table location

Method of Measurement: number of speed humps/tables installed.

This item includes: supply and application of cold plastic markings in the materials, colors, and sizes as described above, as specified on HRM Standard Drawing 96 in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid and anti-slip elements.

.13 Thermoplastic Reserved Lane Diamond Symbol, White on Black Background

Unit of Measurement: Each

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.14 Thermoplastic Reserved Lane Diamond Symbol, White on Red Background

Unit of Measurement: Each

This item includes: the supply and application of cold plastic markings in the materials, colours, sizes and configurations shown on the drawings, in accordance with the MUTCD, and as specified by the Engineer. Cold plastic pavement markings shall include a reserved lane (diamond) symbol enclosed within a red contrast panel as per as per HRM Standard Detail 134 and shall be applied in accordance with Manufacturer's instructions.

This item also includes layout and pre-marking in accordance with S-1, asphalt surface preparation, adhesion to pavement, inspection and maintenance during warranty

period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid and anti-slip elements.

PreMark ViziGrip highskid surface panels by Ennis-Flint Products (or approved equivalent) can be used contingent on the Engineers approval.

.15 Thermoplastic Shared Use Lane Symbol 1.0m x 3.1m

.1 Thermoplastic Shared Use Lane Symbol, White on Black Background
.2 Thermoplastic Shared Use Lane Symbol, White on Green Background

Unit of Measurement: Each

Method of Measurement: number of units installed

This item includes: supply and application of cold plastic markings in the materials, colors, and sizes as described above, as specified by the Engineer and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. Arterials shall have the pre-markings applied immediately after the placement of each lift of asphaltic concrete and permanent markings shall be applied within 48 hours. All other streets shall have the permanent markings applied within one week after the placement of the final lift of asphaltic concrete. The surface of the preformed thermoplastic material shall contain factory applied anti-skid and anti-slip elements.

.16 Thermoplastic Shark Teeth 450mm x 150mm, 5 per row

Unit of Measurement: Row

Method of Measurement: number of rows installed

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.17 Thermoplastic Two Stage Left Turn Waiting Box, 2m x 3m, White on Green Background

Unit of Measurement: Each

This item includes: supply and application of cold plastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid and anti-slip elements.

.18 Thermoplastic Vehicle/Bike Zebra Conflict Marking, 1.8m x 0.6m total (1.5m green with 0.15m white ea. End)

.19 Thermoplastic Driveway/Bike Zebra Conflict Marking, 1.3m x 0.6m total (1.0m green with 0.15m white ea. End)

.20 Thermoplastic Bike/Pedestrian Zebra Conflict Marking, 2.5m long x 1.5m wide, 0.3m white, 0.3m space

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: supply and application of Ennis-Flint Durable PreMark EF Bike Lane cold plastic markings in the materials, colors, sizes, and configurations as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid and anti-slip elements.

.21 Thermoplastic Trail Crosswalk Markings

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: supply and application of cold plastic markings in the materials, colors, and sizes as described above, as specified by the Engineer and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed

thermoplastic material shall contain factory applied anti-skid and anti-slip elements.

.22 Thermoplastic Modified Two Stage Left Turn Bike Box, 1.8m x 2.6m, White on Green Background

Unit of Measurement: each (ea.)

This items includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied antiskid/anti-slip and retro-reflective elements.

.23 Thermoplastic White Single Line 300 mm wide, 3 m Spacing

Unit of Measurement: metre (m)

Method of Measurement: slope measure

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.24 Thermoplastic Left/Right Sharrow Turn Box

Unit of Measurement: each (ea.)

This items includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied antiskid/anti-slip and retro-reflective elements.

.30 Thermoplastic New Intersection Markings

Unit of Measurement: lump sum (l.s.)

This item includes: supply and application of preformed thermoplastic markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

.31 Removal of Existing Thermoplastic Markings

Unit of Measurement: square metre (m²), Each or lump sum (l.s.)

Method of Measurement: Plan Measurement, per item or as Lump Sum

This item includes: the supply and installation of all materials required to remove the thermoplastic pavement markings in the configuration shown on the drawing and as specified by the Engineer.

.32 Replacement of Existing Thermoplastic Markings

Unit of Measurement: lump sum (l.s.)

This item includes: accurate inventory of existing pavement markings and the supply and application of preformed thermoplastic markings in the colours, sizes and configuration as necessary to replace the markings which existed prior to construction. Also includes layout, pre-marking, asphalt surface preparation including milling (< 5 mm), adhesion to pavement, inspection and maintenance during warranty period. The surface of the preformed thermoplastic material shall contain factory applied anti-skid/anti-slip and retro-reflective elements.

65.3 MMA (Methyl Methacrylate) Markings

.1 MMA (Methyl Methacrylate) Lines
.2 MMA (Methyl Methacrylate) Stop Bars
.3 MMA (Methyl Methacrylate) Yield Line
.4 MMA (Methyl Methacrylate) Crosswalk

Unit of Measurement: metre (m)

Method of Measurement: slope measure

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.5 MMA (Methyl Methacrylate) Zebra Crosswalk

Unit of Measurement: metre (m)

Method of Measurement: slope measure

This item includes: supply and application of Ennis-Flint MMax MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.6 MMA (Methyl Methacrylate) Hatching-White
.7 MMA (Methyl Methacrylate) Hatching-Yellow

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure of surface area including perimeter line.

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.8 MMA (Methyl Methacrylate) Intersection Box (Hatched)

Unit of Measurement: square metre (m²)

Method of Measurement: plan measurement

This item includes: supply and application of Ennis-Flint MMax MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.9 MMA (Methyl Methacrylate) Arrows
- .1 MMA (Methyl Methacrylate) Arrow ¾ TAC size
- .2 MMA (Methyl Methacrylate) Arrow ½ TAC size
- .3 MMA (Methyl Methacrylate) Roundabout Arrow

Unit of Measurement: Each

Method of Measurement: number of units installed

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.10 MMA (Methyl Methacrylate) Bicycle Symbols

- .1 MMA (Methyl Methacrylate) Bicycle Symbol 1.2m x 2.1m, White on Black Background
- .2 MMA (Methyl Methacrylate) Bicycle Symbol 1.2m x 2.1m, White on Green Background
- .3 MMA (Methyl Methacrylate) Bicycle Symbol 0.6m x 1.2m, White on Green Background

Unit of Measurement: Each

Method of Measurement: number of units installed

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as

specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.11 MMA (Methyl Methacrylate) Advance Yield to Pedestrian Line

Unit of Measurement: metre (m)

Method of Measurement: slope measure

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.12 MMA (Methyl Methacrylate) Speed Hump/Table Markings

Unit of Measurement: Per speed hump/table location

Method of Measurement: number of speed humps/tables installed.

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.13 MMA (Methyl Methacrylate) Reserved Lane Diamond Symbol, White on Black Background

.14 Thermoplastic Reserved Lane Diamond Symbol, White on Red Background

.15 Thermoplastic Shared Use Lane Symbol 1.0m x 3.1m

.1 Thermoplastic Shared Use Lane Symbol, White on Black Background

.2 Thermoplastic Shared Use Lane Symbol, White on Green Background

Unit of Measurement: Each

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.16 MMA (Methyl Methacrylate) Shark Teeth 450mm x 150mm, 5 per row

Unit of Measurement: Row

Method of Measurement: number of rows installed

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.17 MMA (Methyl Methacrylate) Two Stage Left Turn Waiting Box, 2m x 3m, White on Green Background

Unit of Measurement: Each

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.18 MMA (Methyl Methacrylate) Vehicle/Bike Zebra Conflict Marking, 1.8m x 0.6m total (1.5m green with 0.15m white ea. End)

.19 MMA (Methyl Methacrylate) Driveway/Bike Zebra Conflict Marking, 1.3m x 0.6m total (1.0m green with 0.15m white ea. End)

.20 MMA (Methyl Methacrylate) Bike/Pedestrian Zebra Conflict Marking, 2.5m long x 1.5m wide, 0.3m white, 0.3m space

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: supply and application of Ennis-Flint MMax MMA (Methyl Methacrylate) (or approved equivalent)) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.21 MMA (Methyl Methacrylate) Trail Crosswalk Markings

Unit of Measurement: metre (m)

Method of Measurement: slope measurement

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.22 MMA (Methyl Methacrylate) Modified Two Stage Left Turn Bike Box, 1.8m x 2.6m, White on Green Background

Unit of Measurement: each (ea.)

This item includes: supply and application of Ennis-Flint MMax MMA (Methyl Methacrylate) (or approved equivalent)) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.23 MMA (Methyl Methacrylate) White Single Line 300 mm wide, 3 m Spacing

Unit of Measurement: metre (m)

Method of Measurement: slope measure

This item includes: supply and application of Ennis-Flint HPS-6 98:2 MMA (Methyl Methacrylate) (or approved equivalent) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.24 MMA (Methyl Methacrylate) Left/Right Sharrow Turn Box

Unit of Measurement: each (ea.)

This item includes: supply and application of Ennis-Flint MMax MMA (Methyl Methacrylate) (or approved equivalent)) markings in the materials, colors, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.30 MMA (Methyl Methacrylate) New Intersection Markings

Unit of Measurement: lump sum (l.s.)

This item includes: supply and application of MMA (Methyl Methacrylate) markings in the materials, colors, specifications, and sizes as specified on the Drawings and in accordance with Manufacturer's instructions. This also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

.31 Removal of Existing MMA (Methyl Methacrylate) Markings

Unit of Measurement: square metre (m^2), Each or lump sum (l.s.)

Method of Measurement: Plan Measurement, per item or as Lump Sum

This item includes: the supply and installation of all materials required to remove the MMA (Methyl Methacrylate) pavement markings in the configuration shown on the drawing and as specified by the Engineer.

.32 Replacement of Existing MMA (Methyl Methacrylate) Markings

Unit of Measurement: lump sum (l.s.)

This item includes: accurate inventory of existing pavement markings and the supply and application of preformed MMA (Methyl Methacrylate) markings in the colours, sizes, specifications, and configuration as necessary to replace the markings which existed prior to construction. Also includes layout, pre-marking, asphalt surface preparation including sweeping, application to pavement, inspection and maintenance during warranty period.

66. Preblast Survey

Unit of Measurement: lump sum (l.s.)

This item includes: all costs associated with conducting a preblast survey as described in HRM Bylaw B-600 Respecting Blasting. The preblast survey shall meet all requirements as described in Section 31 20 00 Earthwork.

67. Preblast Trenches

Unit of Measurement: cubic metre (m^3)

This item includes for all costs associated with drilling and blasting rock in trenches for future excavation operations. This item also includes all costs for services of the blasting consultant.

68. Trench Plugs

Unit of Measurement: Lump Sum (L.S.) or Each

This item includes: supply and placement of material for trench plugs as detailed in locations indicated on plan or as directed by Engineer.

69. Traffic Calming

1. Speed Hump

Unit of Measurement: Each

This item includes: supply and installation of asphalt speed hump as per Standard Detail HRM 31. Cross sections of each and every speed hump are to be surveyed per Standard Detail HRM 136 to verify that speed hump has

been constructed as intended and falls within required tolerance range. Contractor to provide survey information within two (2) weeks of construction to the Engineer for review. Speed hump will be acceptable only if it forms a shape relative to the design curve within the tolerance limits. Contractor shall be responsible to take steps necessary to correct any deficiencies that fall outside of required tolerance range.

.2 Speed Table

Unit of Measurement: Each

This item includes: supply and installation of asphalt speed table as per Standard Detail HRM 143. Cross sections of each and every speed table are to be surveyed per Standard Detail HRM 144 to verify that speed table has been constructed as intended and falls within required tolerance range. Contractor to provide survey information within two (2) weeks of construction to the Engineer for review. Speed table will be acceptable only if it forms a shape relative to the design curve within the tolerance limits. Contractor shall be responsible to take steps necessary to correct any deficiencies that fall outside of required tolerance range.

.3 Raised Crosswalk

Unit of Measurement: Each

This item includes: supply and installation of raised crosswalk as per the Drawings. Cross sections of every constructed raised crosswalk are to be surveyed per Standard Detail HRM 144 to verify that raised crosswalk has been constructed as intended and falls within required tolerance range. Contractor to provide survey information to the Engineer for review. Raised crosswalk will be acceptable only if it forms a shape relative to the design curve within the tolerance limits. Contractor shall be responsible to take steps necessary to correct any deficiencies that fall outside of required tolerance range.

.4 Speed Cushion

Unit of Measurement: Each

This item includes: supply and installation of asphalt speed cushion as per the Drawings. Survey points of every constructed speed cushion are to be gathered per Drawings

to verify that the speed cushion has been constructed as intended and falls within required tolerance range. Contractor to provide survey information to the Engineer for review. Speed cushion will be acceptable only if it forms a shape relative to the design shape, within a tolerance of ± 10 mm. Contractor shall be responsible to take steps necessary to correct any deficiencies that fall outside of required tolerance range.

EROSION AND SEDIMENT CONTROL

70. Erosion and Sediment Control Plan

Unit of Measurement: Lump Sum

This item includes the preparation of an erosion and sediment control plan in accordance with NSE requirements to be provided to the Engineer and submitted to Nova Scotia Environment one week following award. This plan shall be signed and stamped by a Professional Engineer licenced to practice in Nova Scotia. The contractor's representative shall be trained in erosion sediment & control practices.

71. Sediment Controls

.1 Silt Fence

Unit of Measurement: metre (m).

Method of Measurement: slope measure.

This item includes: supply, installation, maintenance and removal including stakes and fabric and reinstatement of area.

.2 Turbidity Curtain

Unit of Measurement: Each

This item includes: the supply, installation, maintenance and subsequent removal of the turbidity curtain. Top of boom must be marked with Contractor's company name and contact number in indelible and waterproof paint. Also includes all other costs incidental to this item.

.3 Flow Checks

Unit of Measurement: Each

This item includes: supply, installation, maintenance and removal.

.4 Soaker Bags

Unit of Measurement: Each

This item includes: supply, installation, maintenance and removal.

.5 Straw Bales

Unit of Measurement: Each

This item includes: supply, placement, maintenance and removal of straw bales in locations as directed by Engineer.

72. Ground Covers

Unit of Measurement: tonne (t) or square metre (m²).

Method of Measurement: scale tickets signed by Engineer or slope measure of indicated area at specified mean depth or thickness specified on the drawings..

.1 Straw or Hay Cover

.2 Gravel Cover

This item includes: supply, installation to thickness specified on drawings and maintenance.

.3 Rip Rap and Armour Stone Protection

This item includes: common excavation, supply and placement of geotextile and rock as specified, and reinstatement as required.

.4 Environmental Mat

Unit of Measurement: square metre (m²)

Method of Measurement: slope measure

This item includes: supply, installation and maintenance as specified.

73. Flow Diversions

Flow diversions shall be sized to handle the flow resulting from at minimum a 1:2 year rainfall event.

.1 Diversion Ditches

Unit of Measurement: metre (m).

Method of Measurement: slope measure of indicated width.

This item includes: laying out grades and lines, excavation and lining as required, maintenance, removal and reinstatement.

.2 Flow Diversion

Unit of Measurement: Each

This item includes: clearing, grubbing, and excavation for the supply, installation, maintenance, diversion channels and/or pumping and subsequent removal of barriers. Also includes all reinstatement and all other costs incidental to this item.

.3 Settlement Pond

Unit of Measurement: Each

This item includes: clearing, grubbing, excavation necessary for the installation, maintenance and subsequent removal of all settlement ponds required for project, reinstatement and all other costs incidental to this item. This item also includes fencing, as specified, to surround the pond.

ELECTRICAL

80. Direct Buried Conduit

Unit of Measurement: metre (m)

Method of Measurement: lineal metre (m) of direct buried conduit

This item includes: common excavation, backfilling, gravel reinstatement, bedding, compaction, jointing, electrical fluorescent tape, lumber, stub-ups (including the concrete pole riser where indicated), pole terminations, conduit, junction boxes, pull pits, provision of temporary service as required, connections to existing, ground wire if required, etc. necessary to complete the work.

This item does not include reinstatement of asphalt concrete, concrete sidewalk, concrete curb and gutter and topsoil and sod, which is to be paid for under separate pay items.

81. Traffic Concrete Base

Unit of Measurement: Each

This item includes: common excavation, backfill, reinforcing steel, concrete, formwork, rebar, anchor bolts, internal conduit to 450 mm outside base and connections to conduit runs, etc.

81.16 Removal of Abandoned Traffic Signal Bases

Unit of Measurement: Each (ea.)

This item includes: mass excavation and embankment, common excavation, removal and disposal of abandoned concrete bases, backfill, and reinstatement as specified.

81.17 Removal of Abandoned Street Light Signal Bases

Unit of Measurement: Each (ea.)

This item includes: mass excavation and embankment, common excavation, removal and disposal of abandoned concrete bases, backfill, and reinstatement as specified. This item does not include reinstatement of concrete sidewalk, concrete curb and gutter, topsoil and sod, which shall be paid for under separate pay items.

81.18 Install RRFB Post and Base

Unit of Measurement: Each (ea.)

This item includes: common excavation, backfill, supply and installation of concrete, reinforcing steel, iron pipe sleeve, and post as per Standard Details HRM 172 and 180.

This item does not include the supply and installation of RRFB equipment.

82. Overhead Wiring for Detector Loops

Unit of Measurement: metre (m)

Method of Measurement: lineal metre (m) of overhead wiring between indicated locations

This item includes: the supply of messenger and traffic signal cable, and installation in accordance with Standard Details HRM 82 and HRM 83.

This item does not include the installation of the detector loops which is paid separately.

83. Detectors

Unit of Measurement: lump sum (l.s.) or Each

This item includes: the supply and installation of detectors as specified, any required junction boxes and any required home run to the controller.

84. RA-5 Crosswalk Lights

Unit of Measurement: lump sum (l.s.)

This item includes: the supply and installation of all RA-5 crosswalk lights, poles, mast arms, installation of PXO controller(s) where required and any other necessary appurtenances. This item also includes the pulling of all wires, all connections, grounding, final wiring, testing, demonstration, and commissioning including CSA certification. This item also includes the removal of all traffic signal equipment not to be re-used plus delivery to the HRM MacKintosh Street depot. The Contractor shall schedule and supply the traffic control for overhead electrical inspections by the Engineer at the completion of the work.

85. Traffic Signal Installation

.1 Materials

Unit of Measurement: lump sum (l.s.)

This item includes the supply of all required traffic signal equipment required for a fully functional system including all traffic signal heads, pedestrian APS push buttons and cable, overhead wiring, LED countdown pedestrian digital modules, GPS Opticom, arm brackets, UPS Battery Backup as indicated, and all incidentals and associated hardware and wiring, etc. required to complete the work.

This item does not include the supply of traffic signal poles, combination signal street light poles, transformer bases, truss arms, traffic signal cable and signal controller, which will be supplied to the contractor by HRM, unless indicated otherwise on the drawings.

.2 Labour

Unit of Measurement: lump sum

This item includes: installation of all required traffic signal equipment; poles, mast arms, signals, push buttons, GPS Opticom, UPS Battery Backup as indicated, davit arms,

pulling of wires, wires, all connections, grounding, final wiring including overhead, testing, demonstration and commissioning including CSA certification not included under Item No. 85.1. Anti-seize compound to be applied to all screws in weather exposed equipment. This item also includes the installation of the controller on the concrete base and the removal of all traffic signal equipment not to be re-used plus delivery to the HRM MacKintosh Street depot. The Contractor shall schedule and supply the traffic control for overhead electrical inspections by the Engineer at the completion of the work.

86. Ornamental Street Light

Unit of Measurement: Each

This item includes: the supply and installation or relocation of the ornamental street light as shown on the drawings. This item also includes the pulling of wires, all connections, grounding, final wiring including overhead, testing, demonstration, and commissioning.

87. Area Lighting

Unit of Measurement: Each

This item includes: the supply and installation of the area lighting as shown on the drawings. This item also includes the pulling of wires, all connections, grounding, final wiring including overhead, testing, demonstration, and commissioning.

.3 Install Street Light on Utility Pole

Unit of Measurement: each (ea.)

This item includes: the supply and installation of street light fixtures, Acuity Photocell (Itron ready), and davit arms on existing utility poles as shown on the drawings. This item also includes wiring, connections, coordination and approvals with NS Power, inspection and permitting as required, testing, and commissioning.

88. Junction Box Removal

Unit of Measurement: Each

This item includes: locating, removal and disposal of existing junction boxes as indicated.

MISCELLANEOUS

90. Project Information Sign

Unit of Measurement: Each

This item includes: connection to an existing post, maintenance and subsequent removal of the Project Information sign thirty (30) days after Total Performance of the Work. Sign will be supplied by HRM.

92. Guiderails

.1 Galvanized Steel W-Beam Guiderail (Weak Post)

Unit of Measurement: Metre (m)

Method of Measurement: slope measure.

This item includes: mass excavation – common, backfill and compaction, supply and installation of galvanized steel weak-post W-beam guiderail including posts, rail, reflectors and accessories as per standard drawing HRM36, NSDPW drawings HS518 and HS519 and the Drawings. This item also includes the removal and disposal of existing guiderail and posts and supply of documentation regarding the disposal of creosote posts at an approved construction and demolition waste facility, if applicable.

.2 Galvanized Steel W-Beam Guiderail (Strong Post)

Unit of Measurement: Metre (m)

Method of Measurement: slope measure.

This item includes: mass excavation – common, backfill and compaction, supply and installation of galvanized steel strong-post W-beam guiderail including posts, rail, reflectors and accessories as per standard drawing HRM36, NSDPW drawings HS518 and HS519 and the Drawings. This item also includes the removal and disposal of existing guiderail and posts and supply of documentation regarding the disposal of creosote posts at an approved construction and demolition waste facility, if applicable.

.3 Guiderail Protection of Highway Sign Truss Structures

Unit of Measurement: Metre (m)

Method of Measurement: slope measure.

This item includes: mass excavation – common, backfill and compaction, supply and installation of galvanized steel W-beam guiderail protection of highway truss structures including posts, rail, reflectors, and accessories as per standard drawing HRM36, NSDPW drawings HS518, HS519, HS524, and the Drawings. This item also includes the removal and disposal of existing guiderail and posts and supply of documentation regarding the disposal of creosote posts at an approved construction and demolition waste facility, if applicable.

.4 Treated Wood Guiderail

Unit of Measurement: Metre (m)

Method of Measurement: slope measure.

This item includes: mass excavation – common, backfill and compaction, supply and installation of treated wood guiderail including timber posts, rail, reflectors and accessories as per the Drawings. This item also includes the removal and disposal of existing guiderail and posts and supply of documentation regarding the disposal of creosote posts at an approved construction and demolition waste facility.

.5 Galvanized Steel W-beam Guiderail (steel post)

Unit of Measurement: Metre (m)

Method of Measurement: slope measure.

This item includes: mass excavation – common, backfill and compaction, supply and installation of galvanized steel W-beam guiderail including steel posts, w-beam, reflectors, and accessories as shown on the Drawings. Steel posts to be W15x14 (metric) or W6x8.5 (imperial). This item also includes the removal and disposal of existing guiderail and posts and supply of documentation regarding the disposal of creosote posts at an approved construction and demolition waste facility.

All W-beam, spacing, reflectors, accessories, and other details as per HRM detail 36.

.6 Remove Guiderail

Unit of Measurement: Metre (m)

Method of Measurement: slope measure.

This item includes: mass excavation – common, backfill and compaction, removal and disposal of existing guiderail and posts as per the Drawings, the supply of documentation regarding the disposal of creosote posts at an approved construction and demolition waste facility, if applicable. This item also includes surface reinstatement.

.7 Bridge Approach – Guiderail with Steel Channel

Unit of Measure: Metre (m)

Method of Measurement: slope measurement

This item includes: mass excavation – common, backfill and compaction, supply and installation of galvanized steel W-beam guiderail and channel, including posts, rail, reflectors and accessories as per standard drawings HRM36, NSDPW drawings HS520, HS521 and HS522 at the terminal ends of the guiderail, and as per the Drawings. This item also includes the removal and disposal of existing guiderail and post and supply of documentation regarding the disposal of creosote posts at an approved construction and demolition waste facility, if applicable. This item shall also include the supply and installation of four (4) transition pieces required to provide a smooth connection between the approach rail to the bridge rails. New barriers to meet requirements of NSDPW Standard Specification Division 5, Section 6.

94. Tactile Indicators

.1 Tactile Walking Surface Indicator Plates

Unit of Measurement: Each (ea)

This item includes: supply and installation of Tactile Walking Surface Indicators as per standard detail HRM 131 and manufacturer’s instructions and reinstatement as per Drawings and specifications. This item also includes any TWSI wedges or incidentals as required.

.2 Directional Tiles

Unit of Measurement: square metre (m2)

Method of Measurement: slope measure of directional tile plates

This item includes: mass excavation and embankment – common, sub-grade preparation, 150 mm Type 1 granular base, 150 mm cast-in-place concrete base, supply and placement of directional tiles in accordance with the Drawings and standard detail HRM 199, bedding and polymeric jointing sand, and supply and placement of backfill as indicated.

95. Pavement Marking Drawing

.1 Scaled and Surveyed Pavement Marking Drawing

Unit of Measurement: Each

This item includes: the supply of a paper hard copy and an electronic pavement marking drawing that is to scale and from a survey for each street that is identified to require a scaled and surveyed drawing in this contract document, or on any drawing included with this contract document, or both. Each drawing shall be as specified in section 3.2, Pavement Marking Drawings, of Section S-4, Pavement Markings, of this contract document, for all locations that require a scaled and surveyed drawing.

.2 Non-scaled Pavement Marking Drawing

Unit of Measurement: Each

This item includes: the supply of a paper hard copy and an electronic pavement marking drawing not to scale for each street that is identified to require a non-scaled drawing in this contract document, or on any drawing included with this contract document, or both. Each drawing shall be as specified in section 3.2, Pavement Marking Drawings, of Section S-4, Pavement Markings, of this contract document, for all locations that require a non-scaled drawing.

.3 Pavement Marking Description

Unit of Measurement: Each

This item includes: a pavement marking description for each street that is identified to require a pavement marking description in this contract document, or on any drawing included with this contract document, or both. Each description shall be as specified in section 3.2, Pavement Marking Drawings, of Section S-4, Pavement Markings, of this contract document, for all locations that require a pavement marking description.

96. Daylighting Underground Utilities

.1 Exploratory Digging

Unit of Measurement: Each

This item includes exploratory digging by machine at the direction of the Engineer. This may be done to determine the nature of the soil, to see if there is rock present, to confirm that there is no infrastructure present, or for other reasons at the discretion of the Engineer. This item includes all labour, equipment and materials required to do the work. This work also includes disposal of excess material and reinstatement as required.

.2 Daylighting Underground Utilities

Unit of Measurement: Each

This item includes daylighting underground utilities by hand digging or hydro excavation to identify and locate underground infrastructure. This item includes all labour, equipment and materials required to do the work. This work also includes disposal of excess material and reinstatement as required.

98. Surveyed Planing Layout

Unit of Measurement: Each

This item includes: material and labor required to survey existing road centerline and edge of pavement every 15 m for complete roadway. This item also includes confirming existing road cross slopes and recording changes in cross slope when greater than 0.5% when planing. Contractor shall show markings along the road to indicate cut or fill from edge of pavement, equal to the width of

the planer used to plane the road. Confirm limits of survey planing with HRM Representative prior to construction.

99. Hydro Excavation Services

Unit of Measurement: Lump Sum (LS)

This item includes: all labour and equipment to carry out hydro excavation activities where shown on the Project Drawings, including locates for all utilities in the area, all required permits and fees, coordination with the engineer and access for HRM surveyors to confirm location of exposed pipelines, and reinstatement including backfilling of gravels and replacement of asphalt after hydro-excavation is complete. All work to be completed in accordance with all safety requirements including safe work around gas mains.

100. Traffic Control

Unit of Measurement: Lump Sum (LS)

This item includes: all costs for providing labour, material, equipment, and personnel to accommodate adequate vehicular, transit, active transportation, and pedestrian traffic control as stipulated in the HRM Traffic Control Manual Supplement (latest edition), Administrative Order No. 2018-005-ADM – Respecting Construction Site Management, Contract Specifications and drawings.

This item also includes all safety measures required to complete the work including fencing to protect the public from entering the construction site where required and maintaining existing access for vehicles and pedestrians as required.

102. Streetscaping

.1 Bike Rack

Unit of Measurement: Each (Ea.)

This item includes: all labour and materials required for the installation of a post and ring bike rack as per HRM Standard Detail HRM 167, including and concrete base as specified and as shown on the Drawings and standard detail.

This item also Includes excavation and embankment – common, sub-grade preparation, 150 mm Type 1 granular base (extended 150 mm beyond edge of concrete

structure), concrete slab, anchor bolts, and backfill as required.

Confirm post and ring bike rack location with HRM Representative prior to installation.

.2 Backless Transit Bench

Unit of Measurement: Each (Ea.)

This item includes: the supply and installation of a black metal decorative bench and footings in accordance with the HRM Municipal Design Guidelines, Part A, Section 3.3.2. The bench shall be black powder coated, solid cast aluminum ends, seats to be flat bars and H.S. steel tubes or aluminum tubes, fully welded and assembled on delivery.

The bench shall be between 430 mm and 485 mm from final grade (level ground surface). Any bench to be placed on slopes shall be shimmed to provide a level seating surface and bolted either directly to concrete or to concrete below unit pavers.

The Contractor may select from products listed below (or approved equivalent)

- Maglin MLB300B-M
- Maglin MLB300-MH
- Canaan Metal Backless Park Bench CAL-953B
- Canaan Metal Backless Park Bench CAL-=957B
- DuMor Model 446-60
- DuMor Model 446-60q01
- DuMor Model 282-60

Confirm backless bench type, location and positioning onsite with HRM Representative prior to installation.

.3 Flexible Delineator

.1 Supply and Install Flexible Delineator

Unit of Measurement: Each

This item includes: supply and installation of flexible delineators and associated hardware, preparation of the surface on which the delineators are to be placed so they are free from all loose and foreign material, and installation of flexible delineators as detailed in the drawings and as per manufacturers instruction.

.2 Install Flexible Delineator

Unit of Measurement: each (ea.)

This item includes: delivery of delineators from HRM MacKintosh Depot to the project site, preparation of the surface on which the flexible delineator is to be placed so that it is dry and free from all loose and foreign material, installation of flexible delineators as per manufacturer's instructions including the supply of all required fasteners and associated hardware, survey layout, and delivery of all unused, removed, or surplus flexible delineators to the HRM MacKintosh Depot. Delineators to be supplied by HRM.

103 Temporary Utility Pole Support

Unit of Measurement: each (ea.)

This item includes: design, supply and installation of temporary shoring and/or bracing of utility poles where clearance requirements of the utility pole owner cannot be maintained. Shoring and/or bracing shall not cause damage to utility poles. Shoring and/or bracing design shall be submitted for review and approval of the utility pole owner prior to installation. Also included is the removal of temporary shoring and/or bracing following stabilization of surrounding soil.

STRUCTURES 110 Bridge Bearing Replacement

.1 Bridge Bearing Replacement – Fixed
.2 Bridge Bearing Replacement – Free
.3 Bridge Bearing Replacement – Uni-Directional

Unit of Measure: each

This item incudes supply of all materials and labour required to complete the removal and replacement of bearings as outlined in the Drawings. This includes, but is not limited to, access, labour, shop drawings signed by an engineer licensed to practice in Nova Scotia, bridge jacking/temporary support, temporary works, concrete removal/disposal, bearing removal/disposal, supply/installation of steel plates/keeper/anchors, design/supply/installation of new bearings, supply/installation of new concrete/rebar, supply/installation grout and reinstatement. New bearings shall meet the requirements of NSDPW Standard Specification Division 5, Section 19.

111 Structure – Remove Existing

Unit of Measure: Lump Sum (LS)

This item incudes removal and disposal of all or portions of the existing structure as outlined in the Drawings. This includes all labour, access, excavation, containment, and equipment required to remove the existing structure (including concrete and rebar) without damaging concrete and rebar noted to remain.

112 Steel Bridge Barrier

Unit of Measure: Metre (m)

Method of Measurement: Linear metres of barrier incorporated into the construction as measured along the inside face of the bottom barrier rail

This item incudes supply, fabrication and installation of steel bridge barrier rails and posts including all associated hardware, anchorages, and accessories. Item includes all labour, access, equipment required for installation, temporary measures as required, and surface reinstatement as shown in the Drawings. New barriers to meet requirements of NSDPW Standard Specification Division 5 Section 11.

113 Bridge Drains

.1 Deck Drain

Unit of Measure: each

This item incudes supply, fabrication, galvanizing, and installation of deck drain (including concrete work, rebar modifications, anchorages, hardware/connections, etc.) as shown in the Drawings. Item includes all labour, access and equipment required for installation as shown in the Drawings and as approved by the Engineer. Deck drains shall meet the requirements of NSDPW Standard Specification Division 5 Section 4.

.2 Membrane Drain

Unit of Measure: each

This item incudes supply, fabrication, galvanizing, and installation of membrane drain (including concrete work, rebar modifications, anchorages, hardware/connections, etc.) as shown in the Drawings. Item includes all labour,

access and equipment required for installation as shown in the Drawings and as approved by the Engineer. Membrane drains shall meet the requirements of NSDPW Standard Specification Division 5 Section 4.

114 Waterproofing Concrete Bridge Decks

Unit of Measure: Square Metres (m²)

Method of Measurement: Area of surface of bridge deck/approach slab covered with waterproofing measured along the plane of the deck surface.

This item incudes the preparation of the surface, the supply and placing of tack coat, the supply and placing of the membrane reinforcement, waterproofing and protection boards and sealing of interface. Item includes all labour, materials, access and equipment required for installation. Bridge deck waterproofing to follow requirements of NSDPW Standard Specification Division 5, Section 9.

115 Bridge Concrete

.1 Cast-in-place Concrete

Unit of Measure: Cubic Metres (m³)

Method of Measurement: Volume of concrete incorporated into final structure.

This item includes forming and casting concrete. Item includes all materials, aggregates, cement, supplementary cementing materials, water, admixtures, rebar, grouted rebar, threadbar, steel armour angles, approach slab joint sealant, silicone joint sealant (curb/sidewalk joints), backwall joint seal, asphalt waterproofing, excavation, backfilling, compaction and other materials, tools, equipment, falsework, forms, bracing, labour, curing, surface finishing and all other items of expense required to complete the concrete work as noted in the Drawings. Supply, fabrication and installation of rebar is not considered separately and is included as incidental to the concrete quantity, including shop drawings signed by an engineer licensed to practice in Nova Scotia. Cast-in-place concrete to follow technical requirements of NSDPW Standard Specification Division 5, Section 7 and Division 5, Section 18. Penalty/Bonus adjustment and payment for cold weather concreting do not apply.

.2 Strip Footings

Unit of Measurement: metre (m)

Method of Measurement: linear measured along top of footing

This item includes surface preparation, bedding, supply and placement of high performance concrete footings complete with shop drawings, reinforcement, formwork, curing, and finishing.

.3 Precast Bridge Units

Unit of Measurement: Lump Sum (LS)

This item includes: design and submission of stamped design to the Engineer; supply and placement of pre-cast bridge units as shown on the Drawings. If applicable, this item also includes the supply and installation of a pre-cast concrete barrier.

.4 Precast Concrete Girders

Unit of Measurement: metre (m)

Method of Measurement: linear measure

This item incudes full compensation for all labour, materials, plant and services, submissions, shop drawings necessary to manufacture, deliver and erect members in the final position, as shown on the shop drawings and in accordance the Drawings. Precast concrete girders to follow technical requirements of NSDPW Standard Specification Division 5, Section 8. Also included under this item is the supply and installation of Girder Bearing Plates. Bearing plates to follow the technical requirements of NSDPW Standard Specification Division 5, Section 4.

116 Bridge Concrete Repair

.1 Partial Depth Concrete Repair – Vertical (Provisional)

Unit of Measure: Square Metres (m^2)

Method of Measurement: Area of exterior vertical surface of partial depth repair as measured on-site up to 150 mm deep.

This item includes partial depth removal (up to 150 mm deep), forming and casting partial depth repairs on vertical faces. Item includes all materials, aggregates, cement, supplementary cementing materials, water, admixtures, rebar and other materials, tools, equipment, falsework, forms, bracing, labour, curing, surface finishing and all other items of expense required to complete the concrete work. Supply, fabrication and installation of rebar is not considered separately and is included as incidental to the concrete quantity, including shop drawings signed by an engineer licensed to practice in Nova Scotia. Partial depth repair to follow technical requirements of NSDPW Standard Specification Division 5, Section 13. Positive/negative price adjustment does not apply.

For repair areas with a depth up to 150 mm, the repair area will not be adjusted. For repair areas with a depth that exceeds 150 mm, the area of concrete repair shall be increased by fifty percent (50%) for each additional 150mm of depth. The Contractor shall receive the Engineer's approval prior to commencing work on all repairs with a depth greater than 150 mm. When concrete removal exceeds 150 mm at intersecting surfaces, only one of the surfaces shall be measured for payment beyond 150 mm.

.2 Partial Depth Concrete Repair – Horizontal (Provisional)

Unit of Measure: Square Metres (m²)

Method of Measurement: Area of top surface of partial depth repair as measured onsite up to 150 mm deep.

This item includes partial depth removal (up to 150 mm deep), forming and casting partial depth repairs on horizontal faces completed from the top. Item includes all materials, aggregates, cement, supplementary cementing materials, water, admixtures, rebar and other materials, tools, equipment, falsework, forms, bracing, labour, curing, surface finishing and all other items of expense required to complete the concrete work. Supply, fabrication and installation of rebar is not considered separately and is included as incidental to the concrete quantity. Partial depth repair to follow technical requirements of NSDPW Standard Specification Division 5, Section 13. Positive/negative price adjustment does not apply.

For repair areas with a depth up to 150 mm, the repair area will not be adjusted. For repair areas with a depth that exceeds 150 mm, the area of concrete repair shall be

increased by fifty percent (50%) for each additional 150mm of depth. The Contractor shall receive the Engineer's approval prior to commencing work on all repairs with a depth greater than 150 mm. When concrete removal exceeds 150 mm at intersecting surfaces, only one of the surfaces shall be measured for payment beyond 150 mm.

.3 Full Depth Concrete Repair

Unit of Measure: Square Metres (m²)

Method of Measurement: Area of top surface of full depth repair as measured onsite

This item incudes removal and disposal of existing reinforced concrete deck (full depth) at various locations as outlined in the Drawings. This includes all labour, access, containment, and equipment required to remove the existing deck (including concrete and rebar) without damaging concrete and rebar noted to remain. Item includes all materials, aggregates, cement, supplementary cementing materials, water, admixtures, rebar and other materials, tools, equipment, falsework, forms, bracing, labour, curing, surface finishing and all other items of expense required to complete the concrete work. Supply, fabrication and installation of rebar is not considered separately and is included as incidental to the concrete quantity. Full depth repair to follow technical requirements of NSDPW Standard Specification Division 5, Section 13. Positive/negative price adjustment does not apply.

117 Piles

.1 Micro-Piles

Unit of Measure: Metres (m)

Method of Measurement: Linear metres of micro-pile incorporated into the work as measured from the bottom of rock anchor to the top of casing pipe.

This item includes supply and installation of micro-pile for the new bridge integral abutments, incorporated into the finished work to the limits as shown on the Drawings and as approved by the Engineer. This item includes all materials to complete micro-pile casing and rock anchor including protective shoe, drilling, threadbar, nuts, metal plate, spacers, cast-in-place (tremie) concrete and pile splices.

.2 Piles – Delivered

Unit of Measure: Metres (m)

Method of Measurement: Linear metres of piles delivered and as specified on the plans measured from the bottom of pile (tip) to the top of the pile (cut-off), plus one additional metre. In the event the driven length exceeds the estimated length shown on the plans, the quantity for payment may be increased if it is determined the piling delivered to site and as shown on the plans was not sufficient to complete the work.

This item includes supply, delivery and handling of the piles, steel plates or pile shoes used to reinforce the pile tip, pile cap plates, pile splices, and all equipment, tools, labour, and incidentals necessary to complete the work and as approved by the Engineer. Piles shall meet the requirements of Section 31 62 16.16 and NSDPW Standard Specification Division 5 Section 1.

.3 Piles – Driven

Unit of Measure: Metres (m)

Method of Measurement: Linear metres of piles remaining in place below the cut-off elevation shown on the plans. Measurement will be determined from the pile driving records.

This item includes all handling and storing, falsework, placing, erecting, driving, cutting, installation of splice plates, installation of pile tip reinforcing plates or pile shoes, installation of pile cap plates, and all labour, material, equipment, tools, and incidentals necessary to complete the work and as approved by the Engineer. Payment shall also include the supply, removal and reinstallation of any pile not properly installed due to an obstruction or other impediment

Also included under this item is accommodations for the dynamic pile testing by the Engineer. Piles shall meet the requirements of Section 31 62 16.16 and NSDPW Standard Specification Division 5 Section 1.

118 Fill Against Structure (FAS)

Unit of Measure: Tonne (t)

Method of Measurement: weigh scale tickets approved by the Engineer

This item incudes supply, placement, furnishing all materials, including water if and when required for compaction and shall cover the supply of all equipment, plant, labour and incidentals necessary to complete the work to the limits as shown on the Drawings and as approved by the Engineer. Work under this item shall also include the supply and installation of perforated drain assembly located within the Fill Against Structure behind each abutment, as detailed on the Drawings, which is considered incidental to this work. Fill Against Structure shall meet the requirements of NSDPW Standard Specification Division 3 Section 10.

****** END OF SECTION 01 22 00 ******

INDEX TO CLAUSES

PART 1 – GENERAL

1.1 Work Included
1.2 Related Sections
1.3 Reference Standards

PART 2 – EXECUTION

2.1 Fine Grading
2.2 Adjusting Tops of Castings
2.3 Water Main Leakage Testing
2.4 Pavement Markings
2.5 Quality Management Plan

PART 3 – MATERIALS

3.1 General
3.2 Aggregates
3.3 Asphalt Binder
3.4 Anti-Stripping Agents
3.5 Tack Coat

PART 4 – MIX DESIGN REQUIREMENTS

4.1 Mix Requirements

PART 5 – TRANSPORTATION, PLACEMENT AND CONSTRUCTION

5.1 Transportation of Hot Mix Asphalt
5.2 Placing of Hot Mix Asphalt
5.3 Use of Paving Equipment
5.4 Placement by Hand
5.5 Tack Coat Application
5.6 Compaction
5.7 Joints

PART 6 – QUALITY CONTROL AND QUALITY ASSURANCE

6.1 General
6.2 Quality Control
6.3 Quality Assurance
6.4 Sampling
6.5 Asphalt Mix Properties and Compaction
6.6 Thickness

6.7 Price Adjustment Phasing

PART 7 – PRICE ESCALATION/DE-ESCALATION – PERFORMANCE GRADEDA ASPHALT BINDER

7.1 General

PART 8 – WARM MIX ASPHALT

8.1 General

PART 9 – WARRANTY

9.1 General

PART 10 – MEASUREMENT FOR PAYMENT

10.1 General

PART 1 - GENERAL

This specification covers the preparation of Superpave Hot Mix Asphalt (HMA) materials and paving utilised during HRM construction, HRM maintenance activities and development projects relating to pavement works.

The HMA shall comprise a mixture of mineral aggregate, filler and asphaltic binder combined and be placed in accordance with this specification.

This standard does not address any safety concerns related to the use of its contents. It is the responsibility of the user of this specification to establish appropriate safe work practices applicable to the work detailed within.

1.1 Work Included

This section specifies requirements for constructing asphalt concrete pavement. Work includes fine grading, supply and placing of tack coat, and HMA materials and paving.

1.2 Related Sections

The latest editions of the following shall apply to this specification.

.1	Concrete	Section 03 30 00
.2	Earthwork	Section 31 20 00
.3	Walks, Curbs and Gutters	Section 32 16 00
.4	Reinstatement	Section 32 98 00
.5	Precast Manholes, Catch-Basins and Structures	Section 33 39 00
.6	Standard Details	Section 39 00 00
.7	Specification for Performance Graded Asphalt Binder	S-2
.8	Pavement Markings	S-4C
.9	Concrete	S-11 Part A
.10	Walks, Curbs and Gutters	S-11 Part B
.11	Precast Concrete	S-11 Part C

1.3 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 Canadian General Standards Board (CGSB) 1-GP-74M Paint, Traffic, Alkyd

.2 Nova Scotia Department of Public Works Standard Specification - Highway Construction and Maintenance

.3 Transportation Association of Canada; Manual of Uniform Traffic Control Devices for Canada

.4 AASHTO M 156, Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

.5 AASHTO T 283, Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage

.6 AASHTO T 304, Standard Test Method for Uncompacted Void Content of Fine Aggregate

.7 Asphalt Institute MS-2, Asphalt Mix Design Methods

.8 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

.9 ASTM C117, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

.10 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate

.11 ASTM C128, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate

.12 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

.13 ASTM C1097, Standard Specification For Hydrated Lime For Use In Asphalt Cement Or Bituminous Paving Mixtures

.14 ASTM D75, Standard Practice for Sampling Aggregates

.15 ASTM D140, Standard Practice for Sampling Asphalt Materials

.16 ASTM D242, Standard Specification for Mineral Filler For Bituminous Paving Mixtures

.17 ASTM D546, Standard Test Method for Sieve Analysis of Mineral Filler for Asphalt Paving Mixtures

.18 ASTM D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

.19 ASTM D2172, Standard Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures

.20 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

.21 ASTM D2726, Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures

.22 ASTM D2950, Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

.23 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Asphalt Mixtures

.24 ASTM D3665, Standard Practice for Random Sampling of Construction Materials

.25 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

.26 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

.27 ASTM D5361, Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing

.28 ASTM D5444, Standard Test Method for Mechanical Size Analysis of Extracted Aggregate

.29 ASTM D6307, Standard Test Method for Asphalt Content of Asphalt Mixture by Ignition Method

.30 ASTM D6928, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

.31 ASTM D7113, Standard Test Method for Density of Bituminous Paving Mixtures in Place by the Electromagnetic Surface Contact Methods

.32 ASTM D7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

.33 NSTIR TM-2, The Petrographic Analysis of Coarse Aggregate

.34 NSTIR TM-3, Determination of Percent Fractured Particles in Processed Coarse Aggregates

PART 2 - EXECUTION

2.1 Fine Grading

.1 Fine grade gravel surface to within 10 mm of elevations and cross sections indicated immediately prior to placement of asphalt materials. Add or remove gravel as required. Compact to 100% Standard Proctor Maximum Dry Density or as directed by the Engineer.

2.2 Adjusting Tops of Castings

Prior to placing HMA surface course:

.1 Prior to installing catchment devices, the contractor shall provide all testing equipment, labour, incidentals, traffic control, etc. required to undertake an inspection of the system to document conditions prior to commencing work. This inspection must be done in the presence of the Engineer.

.2 Install catchment devices in all manholes prior to work commencing on the manhole. Such catchment devices shall be constructed and installed in a manner so as not to impede the flows through the manhole.

.3 Adjust manhole covers and catch basin frames to match asphalt surface, using manufactured grade rings or cast in place concrete.

.4 For streets where full depth asphalt removal is not occurring (i.e. mill and repave) the adjustment area of the manhole is to be filled with temporary hot/cold mix asphalt so that after milling a minimum of 40 mm of asphalt will remain.

.5 Manhole frame to be installed (reset) after base asphalt has been placed and just before finish asphalt layer is placed unless otherwise approved by Engineer. Note: after setting Utility or other fixed (non-adjustable) manholes, the vertical edges of the structure need to be clearly marked with caution paint.

.6 Adjust valve boxes to finished asphalt surface. Raise or lower top sections of the valve boxes.

.7 Upon manhole adjustment, removal of catchment device and all works associated with restoration around the manhole, the contractor shall provide all testing equipment, labour, incidentals, traffic control, etc. required to undertake an inspection of the system to verify its cleanliness. This inspection must be done in the presence of the Engineer.

2.3 Water Main Leakage Testing

.1 After placement of the asphaltic concrete base course and prior to the placement of the asphaltic concrete surface course, contractor to provide 24 hours notice to Halifax Water for leakage testing. Allow access to and coordinate with Halifax Water for leakage testing.

2.4 Pavement Markings

.1 Arterials shall have the pre-markings (tabs on milled surface, temporary tape on micro and pavement) applied immediately after the placement of each lift of asphaltic concrete and permanent markings shall be applied within 48 hours. All other streets shall have the permanent markings applied within one week after the placement of the final lift of asphaltic concrete.

.2 Surface to be dry and clean prior to the application of pavement markings. Apply paint at application rate indicated with spray gun to lines and at locations indicated. Dimensions and colour to HRM's Pavement Markings, Section S-4 specification.

2.5 Quality Management Plan

.1 The Contractor shall submit to the Engineer, a Quality Management Plan (QMP) for review a minimum of 15 working days prior to commencement of any asphalt work as part of the project(s). The Engineer will provide written approval of the Contractor's QMP (Contractor QMP Approval Letter) in a timely manner, prior to commencement of this work.

The Contractor has the option to submit a comprehensive QMP to the Engineer for review, prior to the construction season and commencement of any asphalt work as part of the project(s). This QMP shall be applicable for the entire construction season (ends December 30th of the calendar year) and pertains to all asphalt work expected for that season, by the Contractor.

The QMP is required to include the following as a minimum.

.1 A Paving Plan

.2 A Quality Control Inspection and Testing Plan (QC ITP).

.3 A Cold Weather Paving Plan

.2 The Engineer will provide written approval of the Contractor's QMP (QMP Approval Letter). This letter shall be submitted to the Engineer for each project succeeding project award and prior to construction. Specifically, the Contractor's QMP Approval Letter shall be submitted for each project as part of the preconstruction documents identified in HRM Construction's Contractor Required Pre

Construction Information list, for which they intend to use the plan, and shall include a revision number, project name and submission date.

.3 If the Engineer deems the Contractor's QMP submission unacceptable, the Contractor shall provide iterations in a timely manner until the QMP is considered adequate by the Engineer. Construction shall not commence without submission of the Contractor's QMP Approval Letter for the project.

.4 At the Engineer's discretion, a project specific QMP may be requested at any time to fit the criteria of a unique project. This request will be identified in contract specifications during the tendering process.

.5 If deemed necessary by the Contractor, an amended QMP can be submitted to the Engineer for review and approval throughout the construction season.

.6 The Paving Plan shall include the following:

.1 Identification of quality and quantity of equipment and personnel to be used for achieving quality end product as outlined in this specification.

.2 Identification of conditions where paving will be ceased including asphalt concrete not being placed during rain or snow or on asphalt surfaces which are wet and/or unclean, and on any surface which has ponded water.

.3 Confirmation that conventional HMA per the regular paving plan shall not be permitted when the ambient air temperature is below 5°C.

.4 The paving sequence.

.5 The procedure that will be implemented to establish the compaction rolling pattern.

.7 The QC ITP shall include the following:

.1 The type and amount of testing to be carried out by the Contractor.

.2 The methods of testing to be used.

.3 The equipment (field and laboratory), location of laboratory, staff to be used for QC testing.

.4 Confirmation that a laboratory that has current CCIL Type B Certification or AMRL equivalent certification or other equivalent certified laboratory acceptable to the Engineer shall be used for all QC testing. Testing of the samples shall be conducted under the direction and constant supervision of at least one technician certified to perform the QC tests according to CCIL or equivalent certification.

.5 Typical remedies to be implemented if the QC testing results indicate that the project requirements are not being met.

.6 The Contractor shall be required to update and resubmit the QC ITP to the Engineer for approval, as conditions or changes warrant.

.7 Confirmation that all QC testing results and interpretation of testing results will be provided to the Engineer within 24 hours of completion of testing.

.8 The Cold Weather Paving Plan shall include the following:

.1 Identify the condition under which the cold weather paving plan will be implemented including when paving operations are to take place between 0 - 5°C ambient air temperature. The wind chill temperature (if any) will also be considered by the Engineer when determining whether the cold weather paving plan shall apply or if paving shall be permitted.

.2 Confirmation that Warm Mix Asphalt (WMA) shall be used for all cold weather paving (0 to 5 °C ambient air temperature) and identification of the WMA technology proposed to be used.

.3 Confirmation that a joint heater or echelon paving will be used.

.4 Identification of the increased temperature testing frequency at the job site to ensure that the asphalt meets HRM specification.

.5 Details regarding how compaction will be achieved per the requirements of the specification.

.6 Details regarding how compaction of granular layers will be checked and confirmed prior to paving commencing.

.9 The submitted QMP is required to be reviewed and approved by the Engineer prior to the start of paving. Once accepted by the Engineer the QMP becomes a part of the Contract and shall be enforced accordingly. Any changes to the QMP shall be communicated to the Engineer in advance of the change and shall include information regarding mobile laboratories location, laboratory equipment, and staff changes.

PART 3 - MATERIALS

3.1 General

The Contractor shall be responsible for the supply, storage and handling of all material utilised to produce the HMA described in this specification.

3.2 Aggregates

Aggregates shall be crushed pit run, quarried stone or sand conforming to the quality requirements of this specification. All aggregates shall be free from coatings of clay, silt, or other deleterious organic matter.

The Contractor shall submit to the Engineer the location of all proposed aggregate sources at the commencement of each construction season. Any subsequent aggregate source changes must be requested in writing to the Engineer prior to material acceptance.

.1 Fine Aggregates

Fine Aggregate shall consist of clean, hard, durable, rough-surfaced grains, free from clay, loam and other foreign matter. The portion of the material passing the 4,750 µm sieve shall be known as fine aggregate.

Fine aggregate shall conform to the physical requirements as stipulated in Table 1 for the mix type.

Table 1 - Fine Aggregate Physical Requirements[1]

Material Property	Test Method[2]	Specified Value
		A-HF, BHF, C-HF, D-HF and E-HF
Absorption	ASTM C128	< 2.0
Angularity[3]	ASTM C125 2AASHTO	≥ 45.0
Sand Equivalent	ASTM D2419	≥ 50
Soundness[4]	ASTM C88	<10
Micro Deval	ASTM D7428	< 20
Plasticity Index[5]	ASTM D4318	0 (Non-Plastic)

(1) Applies to each individual aggregate component in the asphalt mixture

(2) Latest Edition
(3) Does not apply to Natural Blend Sand Component
(4) Test to be conducted utilizing Sodium Sulphate ($NaSO_4$)
(5) Test required for fine aggregate from pit run sources or natural fines only.

.2 Coarse Aggregates

Coarse Aggregate shall consist of hard, durable crushed stone or crushed gravel particles, reasonably uniform in quality and free from soft or disintegrated pieces. The portion of material retained on the 4,750 µm sieve shall be known as coarse aggregate.

Coarse Aggregates shall conform to the physical requirements as stipulated in Table 2 for the mix type.

Table 2 - Coarse Aggregate Physical Requirements(1)

Material Property	Test Method(2)	Specified Value	
		Base Course (A-HF and B-HF)	Surface Course (C-HF, D-HF and E-HF)
Absorption	ASTM C127	< 1.75	< 1.75
Petrographic Number(3)	NSTIR TM2	≤ 135	≤ 135
% Fractured Particles - Two Face	NSTIR TM3	> 85	> 95
Flat or Elongated Particles 5:1	ASTM D4791	< 10	< 10
Micro Deval	ASTM D6928	< 20	< 15
Aggregate Soundness(4)	ASTM C88	< 15	< 15

(1) Applies to each individual aggregate component in the asphalt mixture
(2) Latest edition
(3) Coarse Aggregate Sources may be blended to meet Petrographic Number
(4) Test to be conducted utilizing Sodium Sulphate ($NaSO_4$)

.3 Gradation of Combined Aggregates

The gradation of the combined processed aggregate for the asphalt concrete shall conform to the values shown in Table 3 for the mix type specified in the contract documents when tested by washed sieve analysis according to ASTM C117, C136 and D546.

Table 3 - Combined Processed Aggregate Gradations for Each Mix Type(1)

Sieve Size (µm)	Cumulative Percent Passing				
	A-HF	B-HF	C-HF	D-HF	E-HF
37,500	100	-	-	-	-
25,000	90 – 100	100	-	-	-
19,000	70 – 90	90 – 100	100	-	-
12,500	60 – 80	70 – 90	90 – 100	100	100
9,500	-	60 – 75	70 – 90	90 – 100	95 – 100
4,750	25 – 60	35 – 58	45 – 68	52 – 75	90 – 100
2,360	15 – 45	25 – 45	25 – 55	25 – 55	45 – 90
1,180	-	-	-	-	30 – 60
600	-	-	-	-	-
300	-	3 – 20	6 – 20	5 – 20	15 – 30
150	-	-	-	-	-
75	1 – 7	2 – 8	2 – 10	2 - 10	6 – 12

(1) A maximum of 15% natural sand will be permitted to achieve required gradation

.4 Mineral Filler

Mineral filler, when required, shall comprise finely divided mineral matter such as rock dust, hydrated lime, hydraulic cement, pozzolanic material, fly ash or other suitable mineral matter. All mineral fillers must conform to the requirements of ASTM D242, Standard Specification for Mineral Filler for Bituminous Paving Mixtures. All mineral fillers utilised must have a plasticity of zero.

.5 Reclaimed Asphalt Pavement (RAP)

No RAP shall be permitted in C-HF, D-HF, and E-HF asphalt mixes for Traffic Category C mixes. For Traffic Category A and B mixes the proportion of RAP in C-HF, D-HF, and E-HF mixes shall be limited to a maximum of 15%. Up to 30% RAP by mass of mix is allowed in A-HF and B-HF mix types for all Traffic Categories.

When 16% to 30% RAP is used in asphalt mixtures placed as intermediate or base courses the selected binder grade used in the new asphalt shall be one grade lower for both high and low temperature stiffness than the binder grade

requirement for virgin asphalt. For example, if the specified binder grade is 58S-28, the required binder grade for mixtures using 16% to 30% RAP shall be 52S-34S.

Suitable RAP shall not contain any other additives including, but not limited to, Sulphur, crumb rubber, asphalt rubber, asbestos, produced sand, paving fabrics and reinforcement grids.

3.3 Asphalt Binder

The Performance Graded Asphalt Binder (PGAB) shall be prepared by the refining of petroleum. The Contractor will be responsible for the supply and transportation of the PGAB. Material storage, transportation and material properties will comply with HRM's Performance Graded Asphalt Binder Specification, Section S-2, for the PGAB specified in the Contract Documents.

3.4 Anti-Stripping Agents

An anti-stripping additive may be required in the Hot Mix Asphalt Concrete. Resistance of Compacted Hot Mix Asphalt to Moisture-Induced Damage tests in accordance with AASHTO T283 shall be completed following the mix design procedure, to determine the required amount of anti-stripping additive. All asphalt mixes are required to have a minimum Tensile Strength Ratio (TSR) of 80%, as determined by AASHTO T283.

Additionally, the tested specimens are to be inspected by the laboratory developing the mix design for any visual evidence of moisture damage as demonstrated by the loss of asphalt coating on the aggregate matrix. If coating loss is evident, even if TSR values are 80% or greater, the test procedure is to be repeated incorporating an approved anti-stripping agent. The testing procedure is repeated at increments of 0.2% Liquid Anti-Stripping (LAS), or as recommended by the Manufacturer; or 0.5% hydrated lime, until such time that the moisture damage is not evident.

Either hydrated lime ($Ca(OH)_2$) or LAS additives approved by the Engineer can be utilised.

The TSR test report must contain, as a minimum, the following:

- The source and percentage of aggregates used within the proposed asphalt concrete mix.
- The type and percentage of asphalt binder used.
- The percentage of air voids.
- The Tensile Strength Ratio (TSR); and
- Visual inspections of the mix.

Where LAS agents are required as an additive to the PGAB, the dosage added will be the minimum dosage required to satisfy the above criteria.

Contractors electing to utilize LAS agents in their PGAB are required to ensure all appropriate safety precautions are taken in the handling, use and blending of this material. All workers are to be formally trained with respect to working with PGAB containing LAS additives.

In addition to anti-stripping additives herein, an additional minimum of 0.5% hydrated lime may be required to be added to the mix as requested by the Engineer per the Contract.

Hydrated lime shall be added to the aggregates by the dry method or the wet method.

For the dry method, hydrated lime shall be taken from the lime storage facility and combined with aggregate with an appropriate mixing device. Prior to the addition of the hydrated lime, the aggregate source must be dampened to improve aggregate coating.

For the wet method, a slurry containing one-part hydrated lime to three parts water by mass shall be used. The slurry shall be prepared in a central mixing tank. When the wet method of lime addition is utilised, no addition of water to the aggregate prior to the mixing of the slurry mix and aggregate will be required.

Both the coarse and fine aggregate components must be treated with hydrated lime.

Regardless of the process or mixing equipment used, the process shall result in the production of aggregates that are uniformly and homogeneously coated with the hydrated lime, and that are free of clumps and balls prior to entering the dryer at the HMA plant.

3.5 Tack Coat

On Local roads the Contractor is required to use non-tracking emulsion based tack, except when paving at temperatures below 5°C, in which case conventional RS-1 tack shall be used. The requirements of the non-tracking emulsion tack coat prior to dilution, are shown in Table 4.

Table 4 - Local Roads Tack Coat Requirements Non-Tracking Emulsion Requirements (Prior to Dilution)		
Test Type	**Specification Range**	
	Minimum	**Maximum**
Test on Emulsion		
SF Viscosity, 25°C, SFs	20	
Sieve Test		0.1
Dist. Residue	55	
Oil Portion of Dist., %		Trace
Settlement, 5 days, %	-	3
Demulsibility, 35 ml, 0.02 N $CaCl_2$, %	60	
Particle Charge	(-) or (+)	
Test on Residue		
Penetration, 25°C, dmm	20	55
Ash Content, %		1.0

*Non-tracking tack can be used on all other road classifications

Rapid Setting Emulsified Asphalt (RS-1) may be used as tack coat on Minor/Major Collectors and Arterials. The requirements for RS-1 are shown in Table 5.

Table 5 - Minor/Major Collectors and Arterials Tack Coat Requirements Rapid Setting Emulsified Asphalt (RS-1) Requirements		
Test Type	**Specification Range**	
	Minimum	**Maximum**
Test on Emulsion		
SF Viscosity, 25°C, SFs	20	100
Dist. Residue	55	
Settlement, 5 days, %		3.0
Storage Stability, %		1.5
Sieve Test, %		0.1
Demulsibility, %	60	
Particle Charge	Negative	
Test on Residue		
Penetration, 0.1 mm	100	200
Ductility, cm	60	
Solubility, %	97.5	

PART 4 - MIX DESIGN REQUIREMENTS

4.1 Mix Requirements

The Contractor shall undertake a laboratory-based mix design using current aggregate stockpiles and once completed the mix design will be designated as the Design Mix Formula (DMF). 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 qualified testing laboratory shall be certified by Canadian Council of Independent Laboratories (CCIL) to a minimum of Superpave Mix Design Testing - Type A, Aggregate Testing - Type D, and retain a minimum of one CCIL certified laboratory asphalt technician and one CCIL certified laboratory aggregate technician on staff. A single technician may hold both asphalt and aggregate certifications and satisfy the requirements.

The asphalt mix design shall follow the Superpave method of the DMF as outlined in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2). The DMF shall meet the requirements of Table 6 for the mix type specified. The mix design, in all instances, must be current and reflective of the aggregate that is to be utilised in the HMA. The Contractor shall submit the DMF to the Engineer at least 14 days prior to the initial start of asphalt mix plant production and resubmit for each subsequent change in supplier or source of materials.

Table 6 - Mix Properties Requirements

HRM Traffic Category	Design Traffic in Equivalent Single Axle Loads	Number of Gyrations		
		N_{ini}	N_{des}	N_{max}
A	0.3 to 3 Million	7	75	115
B	3 to 10 Million	7	75	115
C	> 10 Million	8	100	160

HRM Traffic Category	Mix Type	Property	Requirement
A, B and C	A-HF	Design PGAB Content - %	≥ 4.6
	B-HF		≥ 4.8
	C-HF		≥ 5.1
	D-HF		≥ 5.6
	E-HF		-(1)
A	All Mixes	Density(2) at N_{ini} - %	≤ 90.5
B and C			≤ 89.5
A, B and C	All Mixes	Density(2) at N_{des} - %	96.5
A, B and C	All Mixes	Density(2) at N_{max} - %	≤ 98.0

HRM Traffic Category	Mix Type	Property	Requirement
A, B, and C	A-HF	Voids in Mineral Aggregate (VMA) - %	≥ 12.0
	B-HF		≥ 13.0
	C-HF		≥ 14.0
	D-HF		≥ 15.0
	E-HF		≥ 16.0
A, B and C	All Mixes	Voids Filled with Asphalt (VFA) - %	65 – 78
A, B and C	A-HF, B-HF, C-HF and D-HF	Dust to Binder Ratio	0.6 – 1.2
	E-HF		0.9 – 2.0
A, B and C	All Mixes	Modified Lottman Test, TSR - %	≥ 80

(1) There is no minimum asphalt cement content requirement; however, the mix shall meet all other mix property requirements.
(2) Density expressed as a percentage of Theoretical Maximum Specific Gravity (G_{mm}) of mix.
(3) All mixes shall be designed to 3.5% air voids.

The DMF submission to the Engineer shall include, but not be limited to, the following information:

- Mix type for which the DMF was completed and a description of the probable usage of the mix in projects.
- All test results, mix design worksheets, and graphs.
- Material proportions and sources.
- The amount of RAP in percent by mass and volumetric data.
- Designation of the fine aggregate and the coarse aggregate.
- PGAB grade, source and percent by mass of the new PGAB and RAP sourced binder (if applicable).
- A graph of the temperature-viscosity relationship for the PGAB that is to be used in the mix.
- Information on additives, including source, type, percent by mass of asphalt cement, and test results according to Asphalt Institute MS-2.
- Information regarding fines that are returned to the mix, aggregate breakdown during production, and the resultant change in the aggregate gradations.
- Complete gradations for all coarse and fine aggregates.
- The volumetric properties for the mix selected in accordance with Table 6. Graphs shall be submitted for the air voids, voids in mineral aggregate, voids filled with asphalt, dust-to-asphalt ratio, bulk relative density, maximum relative density, and the

gyratory curves of the mix plotted against asphalt cement content.
- Aggregate absorptions.
- Bulk specific gravity and saturated surface dry density for each aggregate.
- Mix bulk specific gravity according to ASTM D2726.
- Theoretical maximum specific gravity.
- When RAP is permitted for use, extracted bulk relative density, percentage of asphalt binder sourced from the RAP, and gradation for the RAP used in the mix.
- All visual observations made during the design process with particular attention and comments regarding stripping and coating for both the coarse and fine aggregates.
- The mixing and compaction temperature used in the mix design and the compaction temperature of the reheated mix to be employed in the testing of the production mix.
- The typical mix weight to produce a gyratory specimen with a height of 115 mm ± 5 mm.

The final DMF, once reviewed and approved by the Engineer, will be implemented as the initial trial for plant mix start up with any necessary adjustments immediately being made by the Contractor. These adjustments, if any, will result in the Job Mix Formula (JMF). Any additional adjustments will result in an additional documented JMF. Copies of all JMF reports will be provided to the Engineer for their review and approval. JMF reports shall be provided to the Engineer for review and prior to asphalt paving per the new JMF A maximum of three (3) JMF reports will permitted for a DMF for each project.

Adjustments to DMF for each JMF shall be within the limits shown in Table 7.

Table 7 – Permitted Limits for DMF Adjustment

Property	Maximum Allowable Adjustment(1)
Percent PGAB content	± 0.3%
Percent Passing the 37,500 µm, 25,000 µm and 19,000 µm sieves	± 5.0%
Percent Passing the 12,500 µm and 9,500 µm sieves	± 4.0%
Percent Passing the 4,750 µm, 2,360 µm and 1,180 µm sieves	± 5.0%
Percent Passing the 600 µm, 300 µm and 150 µm sieves	No limits
Percent Passing the 75 µm sieve	± 1.0%

(1) The field adjustment is applied against the actual DMF property value.

All JMF's shall meet the requirements of Tables 3 & 6, and Subsection 4.1 of this specification. All quality control tests will be measured against the documented JMF.

PART 5 - TRANSPORTATION, PLACEMENT AND CONSTRUCTION

5.1 Transportation of Hot Mix Asphalt

The HMA shall be transported from the mixing plant to the work site in tight vehicles with the bottoms cleaned of all foreign materials. Vehicles shall be equipped with tarps of water-repellent material with a maximum mesh size of 0.5 mm when stretched, a minimum melting point of 200°C and of sufficient size to completely cover truck bodies from edge of box to edge of box and abut the tailgate.

Tarps shall be in good condition and shall have no holes or tears. The tarps shall be securely tied down so there is no visible opening between the truck box and tarp. Vehicles shall also be equipped with wind deflectors at the front of the truck box. Tarps must always be used during the transportation of HMA to the respective job site unless otherwise stated by the Engineer.

The use of hydrocarbon-based fuels or solvents to lubricate the truck bodies or to clean tools or equipment is not permitted. A biodegradable release agent shall be supplied by the Contractor to clean or lubricate tools, equipment, and truck bodies.

The maximum temperature of the HMA/WMA as it is discharged from the mixing chamber shall not exceed the maximum mixing temperature from the DMF/JMF by more than 20°C, up to a maximum of 170°C for HMA, 165°C for WMA. The temperature of HMA immediately prior to initial rolling shall not be less than 120°C. The temperature of WMA immediately prior to initial rolling shall not be less than 100ºC.

5.2 Placing of Hot Mix Asphalt

The mixing and compaction temperature ranges for the HMA shall be determined from the supplier temperature-viscosity charts current for the calendar year as supplied with the approved DMF. Laboratory asphalt mixing shall occur within temperature ranges such that the viscosity of the PGAB is 170 ± 20 centistokes. Asphalt compaction shall occur within temperature ranges such that the viscosity of the PGAB is 280 ± 30 centistokes.

Asphalt concrete shall be placed upon a prepared gravel surface that has been approved by the Engineer, which is free from standing water, and cleaned of all loose or foreign material including fine dust.

The placing of asphalt concrete shall be at a constant and even rate of speed compatible with the rate of compaction rolling and plant output.

Asphalt concrete shall be placed upon a milled and/or existing asphalt surface, which is free of standing water, and cleaned of all loose or foreign material including fine dust. Hand sweeping, power sweeping, power blowers, vacuum sweepers, and/or pressure washers may be required between successive lifts of asphalt or on

milled surfaces when deemed necessary by the Engineer, prior to placement of tack coat.

Placement shall not take place during rain. Placement shall not take place at temperatures below 5°C, without an approved Cold Weather Paving Plan (included as part of an approved Quality Management Plan), and prior to approval by the Engineer. A course shall not be placed upon a previously laid course within 12 hours following final compaction of the prior course, or until the temperature of the previous course is 50°C or less, whichever occurs first.

Asphalt concrete ramps shall be installed at all limits including side streets and pedestrian ramps using HMA (or approved equivalent) and a bond separator. Asphalt ramps are to be installed before work is completed for the day, and before the area is opened to live traffic. Asphalt ramps to be constructed to at least a 20 to 1 horizontal to vertical ratio.

5.3 Use of Paving Equipment

Base and surface course asphalt mixes shall be laid by means of mechanical self-propelled pavers and a Material Transfer Vehicle (MTV) as requested by the Engineer per the Contract. The MTV is defined as a self-propelled transfer unit and insert hopper. The MTV shall transfer asphalt concrete mixtures from an unloading truck and re-mix the material prior to transferring the mix to the paver, without direct contact with the paver.

The hot mix shall be dumped in the centre of the paver hopper or MTV and care shall be exercised to avoid overloading and spillage of the hot mix and segregation.

The longitudinal alignment of the paver shall be controlled by following a line which is set from the curb and gutter or alignment stakes. This means of control shall be placed at each outer edge of the pavement so that the spreader is directed at all times by a string line and not by the edge of the preceding course, except for the trailing paver(s) when pavers are operated in echelon.

The automatic screed controls and all compaction aids on the paver shall be in operation while the hot mix is being placed, however the automatic screed controls shall not be used when placing a single course on granular grade.

The paver(s) shall operate continuously at a uniform speed as necessary to match the output of the plant; however, in no case shall the speed of a paver exceed 18 m/min.

Pavers working in echelon shall maintain a distance of less than 60 m between them.

If the HMA for surface course paving comes from more than one mixing plant, the HMA from each plant shall be placed by a separate paver.

5.4 Placement by Hand

Where areas are not accessible by paving equipment, hand placement will be permitted. Care must be taken during hand placement to avoid segregation of the coarse and fine aggregate. Lutes and rakes must be utilised during hand placement to thoroughly loosen and uniformly distribute the mix. Any lumps that do not readily break down must be removed.

All hand tools must be heated prior to hand placement operations to keep them free from sticking asphalt. Care must be taken when heating the tools to ensure the mix is not overheated.

Prior to rolling, the surface must be checked with a 3 m straightedge for level, and any irregularities must be corrected at the expense of the Contractor.

5.5 Tack Coat Application

Where a HMA is to be placed as an overlay to an existing asphalt wearing or milled surface, a tack coat must be applied to the surface prior to the placement of the HMA. The tack coat material shall be as per Section 3.5 of this specification. The method of application shall be as recommended by the manufacturer and shall be subject to the approval of the Engineer. The tack coat utilised must be appropriate for the prevailing weather conditions.

Where tack coat is required by the Engineer, an application rate of 0.25 L/m² ± 0.05 L/m^2 for non-tracking and 0.15 L/m² ± 0.05 L/m^2 for RS-1 shall be utilized. On milled surfaces the application rate shall be increased to 0.30 ± 0.05 L/m^2 L/m² for non-tracking and 0.20 L/m² ± 0.05 L/m^2 for RS-1. Regardless of the rate of application, tack coat application shall be uniform and to the visual satisfaction of the Engineer.

New HMA may be applied directly over a freshly placed mat without applying a tack coat when multiple lifts are being placed and the fresh mat is free of any type of contamination or debris. However, a tack coat must be applied if more than 24 hours expires between consecutive lifts.

5.6 Compaction

Compaction of the asphalt concrete shall be with any combination of rollers that can achieve the specified smoothness, grade and density. However, the Contractor is required to utilise a fully functional pneumatic tire roller on all paving projects. A ‘paving’ project shall be defined as a contract which involves full-width replacement or overlay of new HMA.

Trench reinstatement or partial-width road paving will be considered ‘patching’ projects.

The Contractor shall demonstrate a rolling pattern for achieving compaction at the start of paving operations, and the degree of compaction will be verified by the Engineer.

Rollers shall be in good condition, capable of reversing direction without backlash, and they shall be operated by competent and trained operators. The speed of steel-wheeled rollers and pneumatic rollers shall not exceed 5 km/h. The speed shall be slow enough to avoid displacement of the asphalt concrete. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected.

Rolling shall proceed continuously until all roller marks are removed and the specified compaction is achieved.

Water or a biodegradable release agent shall be used on the roller wheels or tires to prevent adhesion of asphalt concrete. Hydrocarbon fuels or solvents shall not be permitted.

Breakdown rolling shall take place as closely behind the paver as the temperature and condition of the mat will allow.

Secondary rolling shall follow the breakdown rolling as closely as possible while the asphalt concrete is still viscous enough to achieve the specified compaction. Secondary rolling shall be by means of a pneumatic rubber tire roller.

Final rolling shall be performed while the asphalt concrete is still viscous enough to permit the removal of roller marks.

Sufficient rollers must be maintained on the job site to ensure full compaction of the asphalt mix before the temperature of the mix falls below 80°C.

The surface, after final rolling, shall be smooth and true to the established crown and grade.

All defective areas identified or agreed to by the Engineer shall immediately be repaired by removing the asphalt concrete and replacing it with the same type of HMA used in that particular lift as per the specifications, and to the satisfaction of the Engineer.

The surface shall be free from roller marks or any depressions exceeding 5 mm when measured with a 3 m straight edge held parallel to the centerline.
The surface shall have a cross slope of 20 mm/m to 35 mm/m or as specified by the Engineer (in areas of normal crown).

5.7 Joints

Joints shall be constructed in a careful and skillful manner by experienced and competent personnel. Joints shall be smooth, well-bonded and tightly sealed.

.1 Transverse Joints

Transverse joints shall be formed by butt joints. When forming butt joints, the edge of the previously placed asphalt concrete shall be cut back to its full depth to expose a fresh surface. The exposed fresh surface shall be coated with tack coat or heated before asphalt concrete is placed in contact with it. Heat shall be applied to the joint using a method approved by The Engineer, with care taken not to overheat the existing asphalt concrete. The freshly placed asphalt concrete shall be raked to the proper depth and grade and then the transverse joints shall be rolled transversely (perpendicular to the travel lanes) and the compacted joint shall be inspected with a 3 m straightedge. If there is more than a 6 mm depression, the joint shall be reconstructed.

Should any separation of the construction joint be present on or before 2 years after 100 percent completion of the project section, the Contractor will be required to undertake corrective action as outlined in Table 8, at their own cost, prior to the end of the current construction year:

Table 8 - Joint Rehabilitation under Warranty Period

Gap in Construction Joint	Required Corrective Action
3 - 20 mm	The affected joint must be cleaned, hot-air lanced, and filled with appropriate sealant
> 20 mm	Milled, tacked and replaced with equivalent HMA at a minimum width of 300 mm

.2 Keyed Joints

When overlaying existing asphalt concrete pavement, keyed joints shall be constructed at both ends of the Project repaved area, at all intersecting roads, ramps, and at all bridge decks in the repaved area, to avoid a feather joint. Keys will only be required between the final lift of pavement and the existing pavement, unless otherwise directed by the Engineer.

The existing asphalt concrete pavement shall be removed to expose a vertical surface of a depth equal to the thickness of the final lift against which new asphalt concrete may be placed. The minimum slope measured parallel to the centerline of the milled area shall be 200 horizontal to 1 vertical (200H:1V). The angle that the joint makes with the centerline shall not exceed forty-five degrees (45°) or as otherwise directed by the Engineer.

When existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a smooth asphalt taper at the joint area to a slope of at least 20 horizontal to 1 vertical (20H:1V). The taper may be placed on tar paper and shall be removed just prior to paving the keyed area or as directed by the Engineer. The transverse joint shall be straight and have a vertical face when the taper is removed.

The associated cost of providing all keys shall be included in the price per tonne of asphalt concrete.

The paver shall not move more than 20 m from any keyed joint until that joint has been rolled and checked with a straight edge. If the joint is not satisfactory to the Engineer, it shall be immediately corrected before the paver may proceed.

.3 Longitudinal Joints

Longitudinal joints in successive asphalt lifts shall be offset by 150 mm. Longitudinal joints in the top lift shall not be constructed within a travel lane except when paving in echelon or when paving tapers. Base course mats may have joints located within the lane, but not in the wheel path.

Where practical, pavers shall be used in echelon to lay full-width pavement sections, when traffic can be diverted and when production of the mixture can be maintained. Echelon paving may require a road closure permit if traffic cannot be maintained. During echelon paving successive pavers shall be within 60 m of the leading paver. The pavers shall follow one behind the other close enough that cooling of the longitudinal joints between the mats is minimized and in no case is less than 125°C. Adjacent mats must be completed to provide for exposed joint edges of maximum length of 100 m at the end of each day.

Longitudinal Joints with temperatures less than 80°C must be tacked prior to placement of the successive mat. Adjacent mats must be completed to provide for exposed joint edges of maximum length of 100 m at the end of each day. When paving is conducted on multi-lane roads, the maximum length of permissible edge mat at the end of each day may be increased should the Engineer deem it safe to do so. The Contractor will not be permitted to leave exposed joints longer than 24 hours should conditions permit paving the following working day. Multi-lane roads are defined as roads with widths requiring more than two mat widths to traverse the full width of pavement.

Should any separation of the construction joint be present on or before 2 years after 100 percent completion of the project section, the Contractor will be required to undertake corrective action as outlined in Table 9, at their own cost, prior to the end of the current construction year:

Table 9 - Joint Rehabilitation under Warranty Period

Gap in Construction Joint	Required Corrective Action
3 - 20 mm	The affected joint must be cleaned, hot-air lanced, and filled with appropriate sealant
> 20 mm	Milled, tacked and replaced with equivalent HMA at a minimum width of 300 mm

PART 6 - QUALITY CONTROL and QUALITY ASSURANCE

6.1 General

All work and materials supplied under this specification are subject to close and systematic inspection by the Engineer, at any time throughout construction. The Engineer shall be afforded full access both at the Site and any production plant to determine whether the material being supplied is in accordance with this specification.

All materials supplied and works carried out under this specification shall be approved based on the results of QA testing and inspection by the Engineer.

Conversion of in-place pay volume (pay area times thickness) to unit tonnage for asphalt shall be at the rate of 2.3 tonnes per cubic metre.

6.2 Quality Control

The Contractor shall be responsible for carrying out all QC testing per their approved QMP. The Contractor shall conduct QC procedures, including sampling and testing, as is necessary to ensure that all hot mix aggregates, all PGAB and all HMA/WMA to be used in the work is according to the requirements of this specification.

The Contractor shall be responsible for the interpretation of the QC test results and the determination of any action to be taken to ensure that all materials and work conform to the requirements of this and other relevant specifications.

All QC results shall be promptly communicated to the Engineer, no later than 24 hours after completion of testing.

6.3 Quality Assurance

Quality Assurance (QA) will be the responsibility of the Engineer. Acceptance of materials and work performed, and determination of payment adjustments will be based on QA testing. In addition to QA testing used to determine payment adjustments, the Engineer may, at its sole discretion, examine, inspect, or test any aspect of the

Contractor's work as deemed appropriate. Such inspections and testing shall not relieve the Contractor of their responsibilities for QC inspection and testing.

All QA testing shall be completed in a certified laboratory that is CCIL Type B and C, or AMRL accredited, or equivalent. Testing of the samples shall be conducted under the direction and constant supervision of CCIL certified technician.

The Engineer may reject visually defective HMA areas based on, but not limited to the following defects: flushing, bleeding, segregation, fat spot, surface damage, and surface contamination. Such defective HMA or areas shall be removed from the work and replaced with acceptable HMA.

When the HMA fails to consistently meet the requirements of this specification, the Engineer may refuse further material until the mix properties are verified for compliance.

6.4 Sampling

.1 Samples of asphalt cement, aggregate, asphalt loose mix and cores shall be taken by the Contractor in the presence of the Engineer. Sample locations and timing will be determined by the Engineer. All core samples to be taken from the roadway following paving shall be reviewed and approved by the Engineer prior to the coring taking place.

Core specimens shall not be sampled within 600 mm of longitudinal joints and edge of pavements, 10 m from transverse joints, or 1.5 m from ironworks. HRM reserves the right to request cores on patching and reinstatement for hardware adjustments and curb placement.

.2 The Contractor shall have representatives available on site to obtain loose mix within 30 minutes of being notified that a loose sample will be required and within two hours of being notified that core samples will be required. The Engineer is responsible for sample labelling, storage, and transportation to the QA testing laboratory.

.3 All sampling shall be done in triplicate, with one sample being for QA testing, one for QC testing, and the third sample being held for testing in case of appeals to the QA testing results. Samples to be held in case of disputes arising, will be labelled as appeal samples and stored by the Engineer.

.4 Sampling Frequency

For each mix type, a Lot is defined as a portion of the paving being considered for acceptance or unit price adjustment. The total quantity of plant produced asphalt will be categorized into Lots based on three Work Categories. Each

of the Work Categories is defined in Table 10, including the loose asphalt mix and core sampling required for each.

Table 10 - Work Categories for Sampling

Work Category	Typical Lot Definition	Loose Mix Samples	Core Sample
1	1000 tonnes	Lot to be divided into 3 approximately equal segments with 1 loose mix sample per segment	Lot to be divided into 5 approximately equal segments with 1 core per segment
2	One days production, and less than 1000 tonnes, and greater than 200 tonnes	Lot to be divided into 2 approximately equal segments with 1 loose mix sample per segment	Lot to be divided into 3 approximately equal segments with 1 core per segment
3	Less than 200 tonnes	1 loose mix sample	1 core

For Work Category 1 if it is the last time that the mix is produced and the criterion of 1,000 tonnes for a Lot cannot be met (i.e. less than 1,000 tonne of mix remain) then the following shall apply:

- If the remaining plant production is 500 tonne or less, it will be added to the previous lot. One additional loose sample will be obtained from the remaining plant production. The total new lot tonnage (i.e. greater than 1,000 tonnes) will be divided into 5 approximately equal segments, with one core sample being obtained per segment.
- If the remaining plant production is greater than 500 tonne but less than 1,000 tonne, the remaining production will be categorized as a new Lot. The Lot will be divided into two approximately equal segments and one loose sample will be obtained per segment. For coring, the lot will be divided into 3 approximately equal segments, and one core sample being obtained per segment.

For Work Category 3 core sampling will be at the discretion of the Engineer based on project and site conditions.

For Work Category 3 sampling and testing may be waived at the discretion of the Engineer based on project and site conditions.

In all cases, additional number and frequency of testing may be determined by the Engineer.

Sample locations will be selected on a stratified random basis. A stratified random sample is defined as a representative sample taken in an unbiased manner, by dividing a Lot into approximately equal segments. A random sample is taken from each area or segment.

Reinstatement of the sample core holes shall be the responsibility of the Contractor. Compaction requirements for filling all sample core holes shall be the same as the adjacent undisturbed pavement. All sample core holes shall be cleaned, dried, and filled and then compacted using a Marshall Hand Compaction Hammer, a mechanical, self-powered gas, electric, or air powered compactor immediately after sampling.

Regardless of the Work Category, the Engineer reserves the right to collect and test a minimum of one sample of virgin PGAB from the plant for each asphalt mix type. The Engineer will advise the Contractor when a PGAB sample is required. The sample will be obtained by the Contractor in the presence of the Engineer.

6.5 Asphalt Mix Properties Properties and Compaction

.1 Acceptance for all mix properties and compaction shall be based on Quality Assurance results for each attribute.

.2 The Engineer shall determine if a rejectable Lot may remain in the work without repairs. When the Engineer has determined that a rejectable Lot may remain in the work without repair, the lot shall be subjected to an additional payment adjustment reflecting the extent of the non-conformance as determined by the Engineer. If repair of the lot is chosen in lieu of a payment adjustment or if the Engineer determines that a rejectable lot requires repair, the lot shall be repaired at the Contractor’s expense.

.3 Appeals of the QA testing results shall be sent in writing to the Engineer within five (5) business days of receiving test results. The results of all appeals testing, and the payment adjustment calculated from such testing will be binding. Should the payment adjustment remain the same or increase, based on the new results, the Contractor will be responsible for the cost of the additional testing. Should the payment adjustment be eliminated or be reduced based on the results of appeals testing, the cost of the appeal testing will be borne by HRM.

.4 Loose mix samples shall not be taken from the first or last loads of the day. On projects where less than 200 tonnes of

asphalt is placed, payment adjustments shall not apply, however criteria will be reviewed for acceptance/rejection.

.5 Unit Price Adjustments will be applied to each Lot as per the formula below. The Price Adjustment for compacted density will be applied independently of Price Adjustments determined for mixture properties. The Unit Price Adjustment for mixture properties will be the largest negative Unit Price Adjustment of the following: Air Void Content, Voids in Mineral Aggregate (VMA) or the mixture constituents (475mm, 0.075mm sieve, AC content).

$$\mathbf{PA_{LOT} = PA_{DEN} + PA_{MIX}}$$

Where:
PA_{MIX} = the largest applicable negative PAs as follows:

1. PA_{AV}; or
2. PA_{VMA}; or
3. $PA_{GRAD} + PA_{ABC}$; or
4. If $PA_{AV} + PA_{GRAD} + PA_{ABC} = 0$, and $PAM_{VA} > 0$, then PA_{VMA} is applied.

.6 Price Adjustment for Density (PA_{DEN})

Table – 11 PA_{DEN}

% of Maximum Theoretical Density	Price Adjustment ($ per Tonne)
≥93.0	$ 1.50
92.5-92.9	$ 0
92.4	- $ 1.00
92.3	- $ 1.20
92.2	- $ 1.40
92.1	- $ 1.60
92.0	- $ 1.70
91.9	- $ 2.10
91.8	- $ 2.40
91.7	- $ 2.80
91.6	- $ 3.10
91.5	- $ 3.50
91.4	- $ 4.20
91.3	- $ 4.90
91.2	- $ 5.60
91.1	- $ 6.30
91	- $ 7.00
90.9	- $ 7.70
90.8	- $ 8.40
90.7	- $ 9.10
90.6	- $ 9.80
90.5	- $ 10.50
90.4	- $ 11.40
90.3	- $ 12.20
90.2	- $ 14.00
90.1	- $ 15.70
90	- $ 17.50
<90	Reject

(1) All projects shall have payment based on the price adjustment determined by the mean density of the lot.
(2) $1.50 per metric tonne bonus will be extended should the average of all cores in the project area of consideration meet or exceed 93.0% with no individual core below 92.0%.
(3) Lots with any individual core below 89.5% will be rejected.
(4) Additional cores will be taken by HRM to delineate poorly compacted area(s) to be removed, irrespective to percentage of cores applicable.

.7 Price Adjustment for Voids (PA_{AV})

Table 12 - PA_{AV}	
Mean of the Deviations of Actual Air Void Content from the Target (3.5%)	**Price Adjustment For Asphalt Air Void Content ($ per Tonne)**
0.00 to 1.00	0
1.01 to 1.10	-0.5
1.11 to 1.20	-1
1.21 to 1.30	-2
1.31 to 1.40	-4
1.41 to 1.50	-6
1.51 to 1.60	-8
1.61 to 1.70	-10
1.71 to 1.80	-12
1.81 to 1.90	-14
1.91 to 2.00	-16
> 2.00	Reject

.8 Price Adjustment for Voids in Mineral Aggregate (PA_{VMA})

Table 13 - PA_{VMA}	
Average Deviation of Actual VMA Content from the Mix Type Specified Value	**Price Adjustment For VMA Content ($ per Tonne)**
- 0.50 to ≥1.00	0
-0.51 to -0.60	-0.5
-0.61 to -0.70	-0.60
-0.71 to -0.80	-0.70
-0.81 to -0.90	-0.80
-0.91 to -1.00	-0.90
-1.01 to -1.10	-1.00
-1.11 to -1.20	-2.00
-1.21 to -1.30	-3.00
-1.31 to -1.40	-4.00
-1.41 to -1.50	-5.00
>-1.51	Reject

.9 Price Adjustment for Gradation (PA_{GRAD})

Table 14 - PA_{GRAD}

Sieve Size (µm)	Mean of the Deviations of the Gradation from the JMF			Price Adjustment for Gradation
	A-HF, B-HF	C-HF	D-HF, E-HF	$ per Tonne
4,750	0.00 to 6.00	0.00 to 5.00	0.00 to 5.00	0.0
	6.01 to 6.20	5.01 to 5.20	5.01 to 5.20	-0.5
	6.21 to 6.40	5.21 to 5.40	5.21 to 5.40	-1.0
	6.41 to 6.60	5.41 to 5.60	5.41 to 5.60	-1.5
	6.61 to 6.80	5.61 to 5.80	5.61 to 5.80	-2.0
	6.81 to 7.00	5.81 to 6.00	5.81 to 6.00	-2.5
	7.01 to 7.20	6.01 to 6.20	6.01 to 6.20	-3.0
	7.21 to 7.40	6.21 to 6.40	6.21 to 6.40	-3.5
	7.41 to 7.60	6.41 to 6.60	6.41 to 6.60	-4.0
	7.61 to 7.80	6.61 to 6.80	6.61 to 6.80	-4.5
	7.81 to 8.00	6.81 to 7.00	6.81 to 7.00	-5.0
	8.01 to 9.00	7.01 to 8.00	7.01 to 8.00	-10
	9.01 to 10.00	8.01 to 9.00	8.01 to 9.00	-15
	>10.00	>9.00	>9.00	Reject
75	0.0 to 0.80	0.0 to 0.50	0.0 to 0.50	0.0
	0.81 to 0.90	0.51 to 0.60	0.51 to 0.60	-1.0
	0.91 to 1.00	0.61 to 0.70	0.61 to 0.70	-2.0
	1.01 to 1.10	0.71 to 0.80	0.71 to 0.80	-3.0
	1.11 to 1.20	0.81 to 0.90	0.81 to 0.90	-5.0
	1.21 to 1.30	0.91 to 1.00	0.91 to 1.00	-7.5
	1.31 to 1.50	1.01 to 1.20	1.01 to 1.20	-12.0
	>1.50	>1.20	>1.20	Reject

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

a) The Lot will be rejected if the average of the Lot test results for the 4,750µm sieve size falls outside the gradation limits specified in Table 3.

b) The Lot payment will be reduced by $5.00 per tonne if the average of the Lot test results for the 75µm sieve size exceeds, up to the maximum of 1.0%, the upper gradation limit specified in Table 3.

c) The Lot will be rejected if the average of the Lot test results for the 75µm sieve size exceeds, by more than 1.0%, the upper gradation limit specified in Table 3.

.10 Price Adjustment for Asphalt Binder Content (PA_{ABC})

Table 15 - PA_{ABC}

Mean of the Deviations of Actual Asphalt Binder Content from JMF		Price Adjustment for Asphalt Binder Content ($ per Tonne)
A-HF, B-HF	0.00 to 0.40	0.00
	0.41 to 0.45	-1.00
	0.46 to 0.50	-2.00
	0.51 to 0.55	-3.00
	0.56 to 0.60	-4.00
	0.61 to 0.65	-5.00
	> 0.66	Reject
C-HF, D-HF, E-HF	0.00 to 0.30	0.00
	0.31 to 0.35	-1.25
	0.36 to 0.40	-2.50
	0.41 to 0.45	-3.75
	0.46 to 0.50	-5.00
	> 0.51	Reject

6.6 Thickness

.1 For new construction as well as paving atop a milled surface, the average compacted thickness of the hot mix asphalt mat shall be within 5 mm with all core results within 10 mm of the thickness as specified by the contract documents or by the Engineer.

.2 For all mix types and layer thicknesses, the lift thickness for a Lot shall be calculated as the average of the lift thicknesses measured for each sample obtained from that Lot.

3. The calculated Price Adjustment for Thickness (PA_T) using Table 15. Based on the thickness test results determined by the Engineer's testing agency, the following unit price adjustment table will be applied:

Table 16 - PA_T[10][11]	
Scenario of Core Results	**Price Adjustment / square metre**
1) Average Core Results greater than total specified thickness	+$0.50 / mm)[12]
2) Average Core Results deficient more than 5 mm relative to the total specified thickness	-$1.00 / mm)[13]
3) For each individual Core Result deficient more than 10 mm relative to the total specified thickness	(-$1.50 / mm[14]) / (total # of core samples taken on project)

[10] Items 1 & 2 will not apply on projects in which hot mix asphalt payment is on a per mass (metric tonne) basis.

[11] Table will be applied in numerical order. When item 2 applies, item 3 will not be applied on the same project. Items 1 and 3 will each be applied on a project if applicable.

[12] Applied to a maximum of 5 mm or $2.50 / m² unit price adjustment. No price adjustment will be applied if any compaction penalty applies.

[13] Thickness deviation will be difference between average and specified thickness.

[14] Thickness deviation on individual core results is as follows:

[(Specified Thickness - 10 mm tolerance) - Actual Thickness]

.4 Should the Contractor wish to appeal the thickness results obtained from QA testing, the Engineer shall be notified of the dispute in writing within 5 business days of receiving the QA test results. Duplicate cores taken at the time of sampling for QA testing shall be measured for thickness in the case of dispute. The results from the measurement of these duplicate cores and the associated payment adjustment shall be binding. Should the price adjustment for thickness remain the same or increase, the Contractor will be responsible for the cost of the appeal testing. Should the price adjustment be eliminated or be reduced, the cost of the appeal testing will be borne by HRM.

6.7 Price Adjustment Phasing Price adjustments for mix properties and compaction will be phased in. Prices adjustments will be reduced by 50% for projects conducted between Jan 1, 2025 and Dec 31, 2025.

Reductions will not apply to price adjustments for thickness.

PART 7 - PRICE ESCALATION / DE-ESCALATION - PERFORMANCE GRADED ASPHALT BINDER (PGAB)

7.1 General

The Contractor may be assessed a price increase or decrease for asphalt concrete mix placed under the contract (not including off road asphalt work if the tonnage is less than 200 tonne), if the Monthly Asphalt Binder Rack Price (MABRP) for the PGAB specified differs by more than $10.00 per tonne of PGAB, from the month prior to the month in which this tender closes and the month(s) in which the asphaltic concrete placement is performed. The MABRP will be the weighted average posted rack price established for the month, based on the rack prices provided by each approved supplier. This information can be reviewed on the Nova Scotia Department of Public Works website at the end of each month: https://novascotia.ca/tran/trucking/rackprice.asp

Participation in the price escalation / de-escalation program for performance graded asphalt binder (PGAB) used in asphaltic concrete mix is mandatory.

The Engineer's assessment of a price increase/decrease will be based on the difference between the posted weighted average MABRP for the month prior to the month in which the tender closes, and the weighted average MABRP for the month(s) in which the asphaltic concrete placement is performed.

Price differentials will only be applied for MABRP differences of $10.00 or more per tonne of PGAB. Corresponding amounts will be calculated based on the number of tonnes of asphalt concrete mix placed and accepted by the Engineer multiplied by $0.50 per tonne of hot mix for each full $10.00 incremental difference in the posted MABRP.

Where the contract unit rate for asphaltic concrete is by the square metre, conversion to tonnes shall be calculated based on the measured surface area of asphalt placed multiplied by the average thickness determined from the cores multiplied by 2.3 tonnes per cubic metre.

Price adjustments due to the Contractor or amounts owing to HRM will be paid/recovered when all the asphaltic concrete placement is completed.

Asphaltic concrete associated with vertical deflections including, but not limited to speed humps and tables, will not be included or considered for escalation/de-escalation.

All efforts shall be taken to complete the work in a timely manner and price adjustments will not be applied for any time periods where liquidated damages are being charged.

Examples of price adjustment calculations follow:

Example #1

1. Project tender closed June 5
2. Paving work carried out in June and July (total of 5,000 tonnes of hot mix)
3. 3,000 tonnes of hot mix placed in June and 2,000 tonnes placed in July
4. MABRP for PG 58-28 posted for month of May is $598.71
5. MABRP for PG 58-28 posted for month of June is $593.33
6. MABRP for PG 58-28 posted for month of July is $741.93

Weighted average price (for months in which mix was placed)
((3,000 x $593.33) + (2,000 x $741.93)) / 5,000 = $652.77

Price Differential = $652.77 - $598.71 = $54.06 or 5 full increments of $10.00

Amount Owing to the Contractor = 5,000 tonnes x (5 x $0.50) = $12,500.00

Example #2

1. Project tender closed May 8
2. Paving work carried out in June and July (total of 5,000 tonnes of hot mix)
3. 3,000 tonnes of hot mix placed in June and 2,000 tonnes placed in July.
4. MABRP for PG 58-28 posted for month of April is $500.00
5. MABRP for PG 58-28 posted for month of May is $500.00
6. MABRP for PG 58-28 posted for month of June is $493.33
7. MABRP for PG 58-28 posted for month of July is $475.00

Weighted average price (for months in which mix was placed)
((3,000 x $493.33) + (2,000 x $475.00)) / 5,000 = $486.00

Price Differential = $486.00 - $500.00 = -$14.00 or 1 full increment of $10.00

Amount Recovered from the Contractor = 5,000 tonnes x (1 x $0.50) = $2,500.00

PART 8 - WARM MIX ASPHALT

8.1 General

The following WMA products or technologies are approved for use on HRM projects:

- Gencor Ultraform GX
- Astec Double Barrel Green Foaming
- Evotherm M1 and P25
- Cecabase RT Bio 10
- Advera WMA
- Zycotherm SP
- Green Mantra Ceranovus

The Contractor shall inform the Engineer of when WMA is used on HRM projects. The WMA must meet the Superpave mix properties

outlined in S-1 and shall provide the manufactures recommended compaction temperatures for Superpave compliance testing.

The Engineer shall be notified of every project containing WMA prior to paving.

In no case shall the temperature of the WMA exceed 165ºC. WMA shall have temperatures of at least 105ºC immediately prior to loading into the spreader hopper.

PART 9 – WARRANTY

9.1 General

The 2-year warranty shall begin upon substantial completion of the project. During this period any failure to the asphaltic concrete including but not limited to segregation, cracking, surface deformation, spalling, delamination, debonding, and joint failure shall be repaired and/or reconstructed at the contractor's expense to the satisfaction of the Engineer. The cost of materials, hauling, labour and all other related work including traffic control required for repair and/or reconstruction of unacceptable areas shall be borne by the contractor.

Regarding lane width requirements for remediation, the minimum repair shall include replacement of the affected lifts of asphaltic concrete by cold planing to the center joint, all repairs shall be full lane width. If echelon paving was specified or used during the original paving, the repair patch shall be the full width that was paved in echelon. If the deficiency continues below the surface lift of asphaltic concrete, then both lifts shall be removed and reconstructed as necessary.

PART 10 – MEASUREMENT FOR PAYMENT

10.1 General

Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 Measurement and Payment, of the Contract.

****** END OF SECTION S-1 ******

Section S-1 Appendix A – Asphalt Mix Type and Usage

The following recommendations may be used by designers to determine suitable asphalt mix types for different applications and lift thicknesses for selected mix types.

Asphalt Mix Type	Typical Mix Application
A-HF	Nominal maximum aggregate size for the mix is 25.0 mm. The mix would be suitable for a lower binder/base course. A layer of B-HF would typically be placed on top, followed by a surface course of C-HF or D-HF. Typical layer thicknesses range from 100 mm to 60 mm.
B-HF	Nominal maximum aggregate size for the mix is 19.0 mm. The mix would be suitable for a binder/base course. A layer of surface course of C-HF or D-HF asphalt mix would be placed on top. Typical layer thickness would range from 50 mm to 90 mm.
C-HF	Nominal maximum aggregate size for the mix is 12.5 mm. The mix would be suitable for a surface course. Typical layer thickness would range from 40 mm to 60 mm.
D-HF	Nominal maximum aggregate size for the mix is 9.5 mm. The mix would be suitable for a surface course. Typical layer thickness would range from 30 mm to 50 mm.
E-HF	Nominal maximum aggregate size for the mix is 4.75 mm. The mix would be suitable for a thin overlay as a preservation treatment. Typical layer thickness would range from 20 mm to 40 mm.

Section S-1 Appendix B – Traffic Category Typical Applications

The following table provides the typical applications for the different traffic categories.

Traffic Category	Equivalent Single Axle Loads	Typical Application
A	0.3 to 3 Million	Parking lots, local road, and minor collectors
B	3 to 10 Million	Major collectors and minor arterials
C	> 10 Million	Major arterials, highways, and bus routes

INDEX TO CLAUSES

PART 1 - GENERAL

1.1 Work Included
1.2 Related Sections
1.3 Reference Standards

PART 2 - SUBMISSIONS AND DESIGN REQUIREMENTS

2.1 Contracts Completed in Calendar Year

PART 3 - MATERIALS

3.1 Physical Requirements
3.2 General Requirements

PART 4 – CONSTRUCTION METHODS

4.1 Tankers, Storage Tanks

PART 5 – QUALITY CONTROL / QUALITY ASSURANCE

5.1 PGAB Documentation
5.2 Laboratory Testing Qualifications
5.3 Anti-Stripping Additive
5.4 Samples for Testing
5.5 Quality Control Plan
5.6 Acceptance
5.7 Appeal Testing

PART 6 – MEASUREMENT FOR PAYMENT

6.1 General

PART 1 – GENERAL

This specification covers the supply and transportation of various grades of Performance Graded Asphalt Binder (PGAB) to the Contractor's plant for use in the manufacturing of hot mix asphaltic concrete.

This standard does not address any safety concerns related to the use of its contents. It is the responsibility of the user of this specification to establish appropriate safe work practices applicable to the work detailed within.

1.1 Work Included

PGAB shall be comprised of asphaltic-based cement that is produced from petroleum residue either with or without the addition of non-particulate organic modifiers.

Quality Control (QC) and Quality Assurance (QA) procedures are described herein. The Contractor shall be responsible to submit the QC test results and to ensure that all materials meet specification.

Initial acceptance of PGAB shall be based on samples taken and tested by the supplier's designated laboratory, subject to the conditions detailed in this specification.

To determine final acceptance of the product, the Engineer will conduct QA testing to confirm QC test results supplied by the Contractor. QA testing will be conducted on a random basis from samples recovered from the Contractor's asphalt storage tank(s) located at the hot mix plant.

1.2 Related Sections

The latest editions of the following shall apply to this specification.

.1 Specification for Hot-Mix Asphalt Concrete S-1

1.3 Reference Standards

.1 AASHTO M 332, Standard Specification for Performance Graded Asphalt Binder Using Multiple Stress Creep Recovery

.2 ASTM D 140, Standard Practice for Sampling Asphalt Materials

.3 ASTM D 4402, Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer

PART 2 - SUBMISSIONS AND DESIGN REQUIREMENTS

2.1 Contracts Completed in Calendar Year

For each grade of PGAB specified in the Contract, the Contractor shall supply the following items to the Engineer annually, and at any time when a change occurs:

- The PGAB Supplier and the facility type and location that the product will be supplied from.
- Applicable mixing compaction temperatures for the product.
- Documentation of construction, storage and handling requirements, including the material safety data sheet, recompaction temperature, mix discharge temperature, and recommended extraction procedure.
- When the asphalt cement contains any zinc oxide or iron carboxylates or a combination, added as Hydrogen Sulphide (H2S) scavengers, they must be declared.
- When the PGAB contains any polyphosphoric acid (PPA) and a liquid anti-stripping additive is incorporated into the PGAB at the PGAB suppliers depot:
    - Information on how much anti-stripping additive was added to the PGAB
    - Documentation from the PGAB supplier stating that the PPA modified PGAB with the liquid anti-stripping additive added at the PGAB supplier's depot shall meet all asphalt cement material requirements specified in the Contract Documents including AASHTO M 332 for the PGAB grade specified.

In the event that the Contractor wishes to change the source of supply during the progress of the Contract, the Contractor shall apply for approval, in writing, to the Engineer. The application for change in source shall include all the documentation required above. Approval in writing must be given by the Engineer before the source of supply is changed.

Asphalt escalation/de-escalation shall be as per S-1 - Specification for Hot Mix Asphalt Concrete.

PART 3 - MATERIALS

3.1 Physical Requirements

The PGAB as outlined in Table 2 shall conform (**with or without liquid anti-stripping additive**, or other approved additives) to the

requirements of AASHTO M332 for the performance grade specified in the contract. In addition to the requirement of AASHTO M 332 and Table 2, the PGAB required in the contract shall comply with the additional requirements detailed in Table 3.

3.2 General Requirements

The PGAB shall be homogeneous, free of water and any contamination and shall not foam when heated to the temperatures specified by the manufacturer for the safe handling and use of the product.

PGAB shall not contain more than 0.3% PPA or 0.3% elemental sulfur (S) in addition to the typical sulfur that is naturally present in the asphalt binder, and these shall only be used as catalysts for the purpose of modification with epoxy (E)-type or styrene-butadiene (SB)-type polymer modifiers. PGAB shall not contain any orthophosphoric acid.

PGAB shall not be air blown or catalytically oxidized in any manner. PGAB shall not contain any air blown or catalytically oxidized residues.

The PGAB shall not contain any of the following additives added for PGAB modification: atactic polypropylene; carbon black polyisobutylene; polyisoprene; natural rubber; alkaline bases; insoluble particulates or fibres; salts of iron, copper, manganese and/or cobalt; silicates; styrene-butadiene rubber (random copolymer latex); synthetic waxes (paraffin waxes, naphthenic waxes); synthetic and saturated oils (including but not limited to the following: vegetable oils or modified vegetable oils; (paraffin oils, polyalphaolefins (PAO), lube oils, and re refined lube oils.); waste oils (including but not limited to the following: cracked residues, re-refined high vacuum distillate oils; tall oils, vacuum tower asphalt extenders; waste cooking oils, waste engine oils, waste engine oil residues, re-refined engine oil residue (REOB)). **The PGAB supplier shall declare in writing that they have not added the PGAB additives listed above.**

If modifiers or additives other than styrene-butadiene (e.g., SB diblock, SBS triblock, SBS radial, SBS high vinyl, SB tapered, etc.) or epoxy-type (e.g. reactive elastomeric terpolymers) polymers are used for the modification of neat asphalt cement, pre-approval from the Engineer is required.

PART 4 - CONSTRUCTION METHODS

4.1 Tankers, Storage Tanks Tankers used to transport PGAB and PGAB storage tanks located at asphalt concrete mixing plants shall meet the following requirements:

- Be free from hydrocarbon fuels or solvents, such as gasoline, diesel, varsol, etc.;
- Have a sampling spigot as outlined in ASTM D 140; and
- Be equipped with thermometers, accurate and capable of reading to the nearest 2°C.

PART 5 - QUALITY CONTROL / QUALITY ASSURANCE

5.1 PGAB Documentation For each grade of PGAB specified in the Contract, the Contractor shall supply a copy of current test data to the Engineer prior to the use of the product(s). The PGAB shall have been graded by conducting the required testing specified in AASHTO Designation M 332 (Standard Specification for Performance Graded Asphalt Binder) and the additional tests required in Table 3 of this specification.

5.2 Laboratory Testing Qualifications The laboratory conducting the QC and QA testing shall have participated in the most recent AASHTO proficiency sample correlation program for PGAB and shall have obtained proficiency ratings in the program satisfactory to the Engineer. Alternatively, the laboratory shall have satisfactorily participated in any equivalent correlation program acceptable to the Engineer. Documentation of the laboratory's participation and proficiency shall be provided to the Engineer upon request.

5.3 Anti-Stripping Additive When a liquid anti-stripping agent is to be incorporated into the mix, samples of PGAB for QC and QA are to be taken after the anti-stripping agent has been added to the PGAB.

5.4 Samples for Testing All QA samples shall be a minimum size of one litre and shall be taken from the Contractor's storage tank in accordance with ASTM D 140. Sampling will be conducted by the Contractor and witnessed by the Engineer. For each QA testing sample that is required to be taken, as instructed by the Engineer, an additional

sample shall be taken by the Contractor and provided to the Engineer in the event an appeal test is required. PGAB sampling will be based on a random basis determined by the Engineer.

The Engineer will verify the sampling, packaging, and transport of all samples (including set-aside samples) for QA testing.

5.5 Quality Control Plan

The Contractor shall provide a QC Plan to the Engineer detailing the QC activities related to the use of PGAB. The Supplier's QC Plan may be used for this purpose, provided that specific storage/handling details, are furnished by the Contractor. The QC Plan shall be submitted at least seven (7) days prior to the start of the construction season. Hot mix asphalt production shall not commence until the QC Plan is accepted by the Engineer.

As a minimum, the QC Plan shall provide the following information:

- The type of facility from which the product(s) will be supplied (refinery, terminal) and its location.
- The method and frequency for initial testing, specification compliance testing and any other testing employed to either guide the manufacturing process of the PGAB or to ensure the on-going compliance of the product(s) to Table 2.
- If specification compliance testing is carried out prior to shipping the product(s) from the Supplier's facility to the hot mix asphalt plant, the QC Plan shall provide an outline of the procedures to be followed for checking transport vehicles before loading to prevent contamination of shipments.
- The QC Plan shall provide an outline of procedures detailing how anti-strip additive products and dosage rates will be identified on shipping documentation. Tests employed to ensure compliance of the product(s) to Table 2 and Table 3, after anti-strip additives are incorporated in the product(s), shall be identified in the QC plan.
- The QC Plan shall detail the methods to be used to identify and provide for the exclusion of materials which do not conform to specifications, prior to incorporating into the asphalt mix. The QC Plan shall also detail how such materials will be identified and dealt with if they are inadvertently incorporated into the asphalt mix. The QC Plan shall detail how such occurrences

will be documented, and the methods of disposition of such materials.

5.6 Acceptance

.1 Lot Sizes

Each grade of PGAB in a tender will be a Lot. A change of the source of the PGAB will result in a new Lot.

.2 Quality Control

Initial acceptance of PGAB will be based on QC test results submitted by the Contractor, subject to the conditions specified herein. The Contractor shall be responsible to submit the Supplier's QC test result data for each Lot of PGAB, as described below. The PGAB shall meet the requirements of AASHTO M 332 for the specified performance grade and the additional requirements noted in Table 3 of this specification.

.3 Quality Assurance

At the discretion of the Engineer, QA testing will be carried out for a Lot of PGAB for the purposes of verifying QC testing results to ensure that the materials used in the work conform to the quality requirements of Table 2 and Table 3.

When requested by the Engineer, one PGAB sample shall be obtained from the plant for a Lot. All samples shall be appropriately labeled (date, time, contract, PGAB type, anti-stripping agent type/dosage) and delivered to the Engineer within 48 hours of sampling.

If a QA test result for any sample indicates non-compliance with this specification, the Engineer will advise the Contractor of the test result and may conduct a true grade classification to determine the actual high and low temperature grade of the sample, rounded to the nearest 0.5°C.

Test results for lots which do not comply with the performance grading requirements shall be categorized based on individual deviations from the design maximum or minimum temperature defined below. Price adjustments,

where applicable, will be expressed as a percentage of the Contractor's unit bid price for the hot mix within the lot.

Table 1 – Price Adjustment	
Temperature Deviation	**Price Adjustment (% of Mix Price)**
≤ 3°C	10 %
> 3 & ≤ 6°C	20 %

.4 Price Reduced / Rejected Lots

The Engineer will review the test results and determine the disposition of the mix using any PGAB product which does not conform to Table 2 and Table 3. Hot mix constructed using PGAB for which test results indicate that the product did not conform to specification will be dealt with as follows:

Price Reductions: As per the above table

Rejection: The Engineer reserves the right to reject all asphalt concrete mix produced with PGAB lot temperature deviations exceeding 6°C from the specified minimum and maximum temperature grade. Rejected lots shall be removed and replaced at the Contractor's expense.

For rejected lots the full thickness of the asphalt lift of pavement shall be removed by cold milling. The hot mix used to replace the rejected pavement shall meet the same requirements as those originally specified. Repair areas will be retested for acceptance with the cost of retesting to be borne by the Contractor.

5.7 Appeal Testing

The Contractor shall serve notice of appeal to the Engineer, in writing, within 5 business days of receipt of the QA test results. Appeal re-testing may be carried out on set-aside samples only if the cost of the impact of non-compliance, as determined by the Engineer, exceeds the cost of retesting.

The Contractor may have a representative present during testing at HRM's QA facility. During the period of testing, the Contractor's representative shall comment on anything concerning the testing

which they do not consider to be valid, and the Engineer shall respond to all comments to resolve them. All comments shall be presented in writing and shall be responded to be writing.
The appeal testing will determine the actual performance high and low temperatures, rounded to the nearest 0.5°C, of the PGAB, and the outcome is binding on HRM and the Contractor.

The cost of the appeal testing, including sample delivery, shall be borne by the Contractor unless the testing confirms total conformance of the material sample to contract specifications, in which case the cost will be borne by HRM.

PART 6 – MEASUREMENT FOR PAYMENT

6.1 General

.1 Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 Measurement and Payment, of the Contract.

Table 2 – Performance Graded Asphalt Binder Specification					
Performance Grade	PG-58				
	-16	-22	-28	-34	-40
Average 7-day Maximum Pavement Design Temperature, °C[1]	<58				
Minimum Pavement Design Temperature, °C	>-16	>-22	>-28	>-34	>-40
Original Binder					
Flash Point Temperature, T48: Minimum °C[1]	230				
Viscosity, ASTM D 4402:[2] Maximum, 3 Pa.s (3000cP) Test Temperature, °C	135				
Dynamic Shear, TP5[3] G*sinδ[4], Minimum, 1.00 kPa Test Temperature @ 10 rad/s, °C	58				
Rolling Thin Film Oven (T240)					
Mass Loss, Maximum %	1.0				
Dynamic shear, TP5: G*/sinδ[4], Minimum, 2.20 kPa Test Temperature @ 10 rad/s, °C	58				
MSCR, AASHTO T350 Standard Traffic, "S" $J_{nr3.2}$, max 4.5 kPa^{-1} J_{nrdiff}, max 75.0% Test Temperature, °C	58				
MSCR, AASHTO T350 Heavy Traffic, "H" $J_{nr3.2}$, max 2.0 kPa^{-1} J_{nrdiff}, max 75.0% $R_{3.2}$[5] Test Temperature, °C	58				
MSCR, AASHTO T350 Very Heavy Traffic, "V" $J_{nr3.2}$, max 1.0 kPa^{-1} J_{nrdiff}, max 75.0% $R_{3.2}$[5] Test Temperature, °C	58				
MSCR, AASHTO T350 Extremely Heavy Traffic, "E" $J_{nr3.2}$, max 0.5 kPa^{-1} J_{nrdiff}, max 75.0% $R_{3.2}$[5] Test Temperature, °C	58				
Pressure Aging Vessel Residue (R28)					
PAV Aging Temperature, °C[6]	100				

Table 2 – Performance Graded Asphalt Binder Specification					
Performance Grade	PG-58				
	-16	-22	-28	-34	-40
Dynamic shear, TP5: G*sinδ(4), Maximum, 5000 kPa Test Temperature @ 10 rad/s, °C	25	22	19	16	13
Physical Hardening(7)	Report				
Creep Stiffness, TP1(8) S, Maximum, 300 Mpa m-value, Minimum, 0.300 Test Temperature, @ 1.0 mm/min, °C	-6	-12	-18	-24	-30
Direct Tension, TP3:(8) Failure strain, Minimum, 1.0% Test Temperature @ 1.0 mm/min, °C	-6	-12	-18	-24	-30

(1) Pavement temperatures are estimated from air temperatures using an algorithm contained in the LTPP Bind program and may be provided by the specifying agency, or by following the procedures as outlined in MP2 and PP28.

(2) This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.

(3) For quality control of unmodified PGAB production, measurement of the viscosity of the original PGAB may be used to supplement dynamic shear measurements of G*/sinδ at test temperatures where the asphalt is a Newtonian fluid.

(4) G*/sinδ = high temperature stiffness, and G*sinδ = intermediate temperature stiffness.

(5) The following minimum percent recovery values shall be provided for asphalt binders carrying Heavy Traffic “H”, Very Heavy Traffic “V”, and Extremely Heavy Traffic “E”:

- Heavy Traffic “H”: $R_{3.2} \geq 30.0\%$
- Very Heavy Traffic “V”: $R_{3.2} \geq 35.0\%$
- Extremely Heavy Traffic “E”:
  - For $0.25\ kPa^{-1} < J_{nr3.2} \leq 0.5\ kPa^{-1}$: $R_{3.2} \geq 45.0\%$
  - For $J_{nr3.2} \leq 0.25\ kPa^{-1}$: $R_{3.2} \geq 55.0\%$

(6) The PAV aging temperature is based on simulated climatic conditions and is one of three temperatures: 90°C, 100°C, or 110°C. The PAV aging temperature is 100°C for PG58- and above, except in desert climates, where it is 110°C.

(7) Physical Hardening - TP1 is performed on a set of asphalt beams according to Section 13.1, except that the conditioning time is extended to 24 hrs ± 10 minutes at 10°C above the minimum performance temperature. The 24-hour stiffness and m-value are reported for information purposes only.

(8) If the creep stiffness is below 300 MPa, the direct tension test is not required. If the creep stiffness is between 300 and 600 Mpa, the direct tension failure strain requirement can be used in lieu of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.

Table 3 – Additional Test Requirements for Performance Graded Asphalt Binder			
Property/Attribute	**Test Method**	**PGAC Grade**	**Requirement**
Ash Content	ASTM D8078	All PGAB Grades	≤ 0.6
Low Temperature Limiting Grade (°C)	MTO LS 308	All PGAB Grades	≤ -28
Grade Loss (°C)		XX-28	≤ -6.0
Crack Tip Opening Displacement (mm)	MTO LS 299	All PGAB Grades	≥ 10.0

INDEX TO CLAUSES

PART 1 - GENERAL

1.1 Work Included
1.2 Work Excluded
1.3 Related Sections
1.4 Codes, Bylaws, Ordinances and Regulations

PART 2 - PRODUCTS

2.1 Equipment

PART 3 - EXECUTION

3.1 General

PART 4 – MEASUREMENT FOR PAYMENT

4.1 General

INDEX TO CLAUSES

PART 1 - GENERAL

1.1 Work Included
1.2 Related Sections
1.3 Reference Standards
1.4 Shop Drawings
1.5 Codes, Bylaws, Ordinances and Regulations
1.6 Certificates
1.7 Handling and Storage

PART 2 - PRODUCTS

2.1 General
2.2 Temporary Pavement Markings
2.3 Permanent Pavement Markings
2.4 Contact Cement

PART 3 - EXECUTION

3.1 General
3.2 Pavement Marking Drawings
3.3 Paint
3.4 Pavement Marking Tape
3.5 Temporary Pavement Markings
3.6 Arrows, Symbols and Letters

PART 1 - GENERAL

1.1 Work Included	.1	This section specifies the requirements for the application of pavement markings. The Work consists of the furnishing of all materials, tools, equipment and labour to lay down pavement markings for the delineation and control of traffic.
	.2	Those materials which are not specified and/or indicated but are necessary for the complete installation of the work shall be deemed the responsibility of the Contractor and shall be included at no extra cost to the Contract.
1.2 Related Sections	.1	S-1 Specification for Hot Mix Asphaltic Concrete.
	.2	S-2 Specification for Performance Graded Asphalt Binder.
1.3 Reference Standards	.1	Manual of Uniform Traffic Control Devices for Canada (MUTCD), (5^{th} Edition), latest revision.
1.4 Shop Drawings	.1	Submit shop drawings in accordance with Section 01 10 00 for items listed in Supplementary Specifications.
1.5 Codes, Bylaws, Ordinances and Regulations	.1	All work covered by this section shall be performed according to applicable Halifax Regional Municipality Codes, bylaws, Ordinances, and Regulations.
	.2	Nova Scotia Department of Transportation and Infrastructure Renewal "Temporary Work Place Traffic Control Manual" (latest revision).
	.3	HRM Traffic Control Manual Supplement.

PART 2 - PRODUCTS

2.1 General	.1	All material supplied shall be new.
2.2 Temporary Pavement Markings	.1	Paint: to CGSB 1-GP-71. Color to conform to CGSB 1-GP-12C, 505-308 for yellow and 513-301 for white.
	.2	Reflectorized self adhesive marking tape.
	.3	Milled surfaces shall have reflective temporary pavement marking "tabs".
	.4	Temporary markings shall be removed within 24 hours once permanent markings have been applied.

2.3 Permanent Pavement Markings

.1 Yellow paint: to CGSB 1-GP-71. Color to conform to CGSB 1-GP-12C, 505-308. Add 75 g/L titanium dioxide and 100 g/L lead chromate.

.2 White paint: to CGSB 1-GP-71. Color to conform to CGSB 1-GP-12C, 513-301. Add 150 g/L titanium dioxide

.3 Glass beads: overlay type and to CGSB 1-GP-74M, premix type to CGSB 1-GP-149M.

.4 Marking tape: 3M Stamark 380IES or equivalent

2.4 Contact Cement

.1 3M Stamark Surface Preparation Adhesive P-50 or equivalent.

PART 3 - EXECUTION

3.1 General

.1 Clean pavement surface of all dirt, dust, oil, surface water and pavement markings that have been previously or poorly applied.

.2 Thoroughly clean distributor tank before refilling with materials of different colour.

.3 Pavement markings which are partially impacted at any intersection shall have the complete marking painted.

.4 All incorrectly painted pavement markings are to be removed by grinding, resulting in minimal scarring and removal of at least 95% of existing markings. Markings shall be removed in such a way that the pavement surface is not damaged below a depth of 3 mm (⅛"). Grooving, rutting or other significant damage is not acceptable. Removal equipment used for pavement making removal shall be capable of vacuuming the debris they generate simultaneously with the grinding operation.

3.2 Pavement Marking Drawings

Where a pavement marking drawing is provided, the Contractor is required to paint markings as indicated on the drawing. Where a pavement marking drawing is not provided, the Contractor is to accurately inventory existing markings. HRM approval of the Contractor's inventory drawing is required prior to the removal of the existing pavement markings. In locations where a pavement marking drawing is not provided, the following shall apply to assist the Contractor in establishing uniformity in the development of pavement marking drawings/descriptions. This checklist should be used as a guide to ensure that all of the basic elements are covered.

For locations which require a scaled and surveyed drawing:

The contractor shall submit a pavement marking drawing that is to a 1:250 scale for signalized intersections and approaches, and a 1:500 scale on all other streets unless otherwise approved by the Engineer. Drawings shall be submitted in PDF form and printed to either an 11 x 17 or A-1 size. The pavement marking drawing shall be produced from a survey and shall inventory the existing pavement markings. The contractor shall be responsible for including any revisions as directed by HRM Traffic Management. The inventory shall include pavement markings at all intersections crossed or at the limit of streets in the contract, except for continuous center or lane lines.

The pavement marking drawing shall be submitted no later than 10 business days before scheduled removal of pavement markings and/or asphalt.

The pavement marking drawing shall include:

- Project name, street name, limits, tender number and date
- Indicate north arrow and scale
- Use a legend to define all symbols (as per HRM Red Book detail DS 13)
- Show colours, sizes and configurations of existing pavement markings (crosswalks, arrows, solid/dashed lines, hatching, bicycle symbols, etc.)
- Dimension individual lane widths, bike lane widths, length/width of hatching, stop bar setbacks, etc.
- Layout pavement markings in accordance with the HRM Red Book and the Manual of Uniform Traffic Control Devices for Canada, unless otherwise indicated.
- Pre-marking for permanent pavement markings shall be laid out by survey based on the reviewed pavement markings plan.

For locations which require a non-scaled drawing:

The contractor shall submit a pavement marking drawing, not to scale for the identified street. Drawings shall be submitted in PDF form and printed to either an 11 x 17 or A-1 size. The pavement marking drawing shall inventory the existing pavement markings and the contractor shall be responsible for including any revisions as directed by HRM Traffic Management. The inventory shall include pavement markings at all intersections crossed or at the limit of streets in the contract, except for continuous center or lane lines.

The pavement marking drawing shall be submitted no later than 10 business days before scheduled removal of pavement markings and/or asphalt.

The pavement marking drawing shall include:

- Project name, street name, limits, tender number and date
- Indicate north arrow and scale or NOT TO SCALE (N.T.S.)
- Use a legend to define all symbols (as per HRM Red Book detail DS 13)
- Show colours, sizes and configurations of existing pavement markings (crosswalks, arrows, solid/dashed lines, hatching, bicycle symbols, etc.)
- Dimension individual lane widths, bike lane widths, length/width of hatching, stop bar setbacks, etc.
- Layout pavement markings in accordance with the HRM Red Book and the Manual of Uniform Traffic Control Devices for Canada, unless otherwise indicated.

For locations which require a description:

The contractor shall submit a pavement marking description for the identified street. This pavement marking description shall inventory the existing pavement markings and the contractor shall be responsible for including any revisions as directed by HRM Traffic Management. The inventory shall include pavement markings at all intersections crossed or at the limit of streets in the contract, except for continuous center or lane lines. The pavement marking description shall include:

- Project name, street name, limits, tender number and date.
- Indicate colours, sizes and configurations of existing pavement markings (crosswalks, arrows, solid/dashed lines, hatching, bicycle symbols, etc.).
- Indicate individual lane widths, bike lane widths, length/width of hatching, stop bar setbacks, etc.

3.3 Paint

.1 Apply paint only when air temperature is above 12 degrees Celsius and in dry weather.

.2 Apply markings to within a tolerance of 12 mm of the dimensions indicated with a 5 mm maximum deviation in any 3.0 metre of length.

.3 Apply paint under pressure at a rate to achieve a paint thickness of not less than 0.253 mm (10 mils) when sprayed on the surface.

.4 Apply glass beads to all pavement markings. Apply glass beads at a rate of 300 g/m^2

.5 Protect newly painted markings from traffic by barricades or cones or other suitable method until paint has dried sufficient so as to not be damaged by traffic.

3.4 Marking Tape

.1 Apply marking tape only when the air temperature, pavement temperature, and weather conditions meets or exceeds manufacturer's recommendations.

.2 Apply markings to within a tolerance of 12 mm of the dimensions indicated with a 5 mm maximum deviation in any 3.0 metre of length.

.3 Apply marking film into the surface of newly laid asphalt and in accordance with manufacturer's recommendations. Roll marking tape into the asphalt surface using a two-wheel or three-axle tandem roller.

.4 Protect newly laid markings from traffic by barricades or cones or other suitable method until asphalt has cooled or markings have set sufficiently so as to not be damaged by traffic.

3.5 Temporary Pavement Markings

.1 Apply temporary lane markings (tabs on milled surface, temporary tape on micro and pavement) to Arterials immediately after the placement of each lift of asphaltic concrete. Permanent markings shall be applied within 48 hours. For all other streets, apply temporary lane markings to base course of asphalt if the placement of the surface course of asphalt will not be proceeding within one week of the completion of the base course. All other streets shall have the permanent markings applied within one week after the placement of the final lift of asphaltic concrete. Pavement markings on speed humps shall be applied within 48 hours.

.2 Apply temporary pavement markings to section 3.3 and 3.4.

3.6 Arrows, Symbols and Letters

.1 Prepare templates to match patterns supplied by Owner. Obtain approval of all templates prior to use.

Arrows to be ¾ size of Transportation Association of Canada standards listed in the Uniform Traffic Control Devices for Canada.

.2 Apply painted arrows, symbols, and letters in accordance with section 3.3.

.3 Arrows, symbols, and letters applied with marking tape to section 3.4.

**** End S-4 ****

PART 1 – GENERAL

This section specifies the requirements for the asphaltic concrete planing and profiling.

This standard does not address any safety concerns related to the use of its contents. It is the responsibility of the user of this specification to establish appropriate safe work practices applicable to the work detailed within.

1.1 Work Included

.1 The Work consists of the furnishing of all materials, tools, equipment and labour required for the planing/profiling and removal of asphaltic concrete from existing roadways.

.2 Those materials which are not specified and/or indicated but are necessary for the complete installation of the work shall be deemed the responsibility of the Contractor and shall be included at no extra cost to the contract.

1.2 Work Excluded

.1 Adjustment of underground appurtenance and structures.

1.3 Related Sections

The latest editions of the following shall apply to this specification.

.1	Specification for Hot Mix Asphaltic Concrete	S-1
.2	Specification for Performance Graded Asphalt Binder	S-2

1.4 Codes, Bylaws, Ordinances and, Regulations

.1 All work covered by this section shall be performed according to applicable Halifax Regional Municipality Codes, bylaws, Ordinances, and Regulations.

.2 Nova Scotia Department of Public Works “Temporary Work Place Traffic Control Manual” (latest revision).

.3 HRM Traffic Control Manual Supplement (latest revision).

PART 2 - PRODUCTS

2.1 Equipment

.1 Cold planing machine or heater planer specifically designed for automatically controlled profiling to pre-assigned depths with the following capabilities:

- Automatic controls for accurately establishing profile grades at each edge of the machine by referencing from existing pavement or an independent grade reference.
- Capable of automatically maintaining a designed cross slope from a single reference.

- Self propelled with sufficient power, traction, and stability to maintain an accurate depth of cut.
- Equipped with means to control dust, excessive noise, fire and/or overheating of adjacent materials (i.e. trees, grass, hedges).

PART 3 - EXECUTION

3.1 General

.1 Location, depth, width and grade shall be as directed by the Engineer and project documents.

.2 Locate and protect from damage any appurtenances within the site, such as manhole covers, water valves, curb and gutters, etc.

.3 Plane pavement surface so that surface remaining has a constant and continuous cross fall, and an even texture longitudinally and transversely, free from grooves and/or ridges.

.4 Remove asphalt which cannot be removed by planing/profiling using other methods approved by the Engineer.

.5 Do not disturb appurtenances such as manhole covers, water valves, etc. during planing/profiling operations. Clearly mark appurtenances to avoid a traffic hazard after planing/profiling operations are completed. Install temporary asphalt ramps to avoid traffic hazard. Asphalt ramps to be constructed to at least a 20 to 1 horizontal to vertical ratio.

.6 Immediately following the cold planing operation and prior to the traffic being allowed on the cold planed surface, the Contractor shall sweep the surface and remove any bonded asphalt concrete material left by the cold planing machine.

.7 Prior to excavation around any manhole within the workplace (existing or newly constructed as part of the tender), the Contractor shall supply and install catchment devices in all manholes prior to work commencing on the manhole. Such catchment devices shall be constructed and installed in a manner so as not to impede the flows through the manhole and shall be removed after all work is completed. Catchment devices shall be regularly inspected during the course of the work to ensure that continue to function as intended.

.8 Make transverse faces at end of work period vertical. Install temporary asphalt ramps to avoid traffic hazard. Asphalt ramps are to be installed before work is completed for the day, and before the area is opened to live traffic.

.9 Clearly mark longitudinal faces at end of work period to avoid traffic hazard. Signing in accordance with the Temporary Workplace Traffic Control Manual (latest revision).

.10 Where hardware adjustments are not made within 48 hrs on arterial and collector roadways, temporary asphalt ramps shall be installed.

.11 Clean up site prior to shutdown at the end of each working day.

.12 Paving of Arterials and Major Collectors shall take place within one week from milling, unless directed by the Engineer.

PART 4 – MEASUREMENT OF PAYMENT

4.1 General

.1 Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 Measurement and Payment, of the Contract.

****** End S-3 ******

INDEX TO CLAUSES

PART 1 - GENERAL

1.1 Work Included
1.2 Related Sections
1.3 Reference Standards
1.4 Codes, Bylaws, Ordinances and Regulations
1.5 Quality Control
1.6 Quality Assurance

PART 2 - PRODUCTS

2.1 General
2.2 Polymer Modified Emulsified Asphalt (Binder)
2.3 Aggregates
2.4 Mineral Filler
2.5 Water
2.6 Polymer Modifier
2.7 Additives
2.8 Tack Coat
2.9 Mix Design
2.10 Equipment

PART 3 - EXECUTION

3.1 General
3.2 Trial Area
3.3 Placement/Weather Limitations
3.4 Surface Preparation
3.5 Application
3.6 Temporary Pavement Markings
3.7 Clean Up
3.8 Protection of Work
3.9 Testing
3.10 Liability

PART 4 – MEASUREMENT FOR PAYMENT

4.1 General

PART 1 – GENERAL

This section specifies the requirements for polymer modified micro-surfacing.

This standard does not address any safety concerns related to the use of its contents. It is the responsibility of the user of this specification to establish appropriate safe work practices applicable to the work detailed within.

1.1 Work Included

.1 The reference to micro-surfacing shall be understood to include both surface and scratch course application unless otherwise specified.

.2 Micro-surfacing shall consist of thoroughly cleaning the existing surface, applying a homogeneous proportioned mixture of cationic polymer modified emulsified asphalt, high quality mineral aggregate, mineral filler, water and other additives to the existing pavement surface.

.3 Those materials which are not specified and/or indicated but are necessary for the complete installation of the work shall be deemed the responsibility of the Contractor and shall be included at no extra cost to HRM.

1.2 Related Sections

The latest editions of the following shall apply to this specification.

.1	Specification for Hot Mix Asphaltic Concrete	S-1
.2	Specification for Performance Graded Asphalt Binder	S-2
.3	Pavement Markings	S-4

1.3 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 AASHTO T304, Standard Test Method for Uncompacted Void Content of Fine Aggregate

.2 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

.3 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate

.4 ASTM C128, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate

.5 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

.6 ASTM D36, Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

.7 ASTM D75, Standard Practice for Sampling Aggregates

.8 ASTM D242, Standard Specification for Mineral Filler For Bituminous Paving Mixtures

.9 ASTM D546, Standard Test Method for Sieve Analysis of Mineral Filler for Asphalt Paving Mixtures

.10 ASTM D2170, Standard Test Method for Kinematic Viscosity of Asphalts

.11 ASTM D2397, Standard Specification for Cationic Emulsified Asphalt

.12 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

.13 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

.14 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

.15 ASTM D6928, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

.16 ASTM D6930, Standard Test Method for Settlement and Storage Stability of Emulsified Asphalts

.17 ASTM D6997, Standard Test Method for Distillation of Emulsified Asphalt

.18 ASTM D7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

.19 ISSA TB-139, Classify Emulsified Asphalt/Aggregate Mixture Systems by Modified Cohesion Tester Measurement of Set and Cure Characteristics

.20 ISSA TB-114, Wet Stripping Test for Cured Slurry Seal Mix

.21 ISSA TB-100, Wet Track Abrasion of Slurry Surfaces

.22 ISSA TB-147, Measurement of Stability and Resistance to Compaction, Vertical and Lateral Displacement of Multi-layered Fine Aggregate Cold Mixes - Method A

.23 ISSA TB-109, Measurement of Excess Asphalt in Bituminous Mixtures by Use of a Loaded Wheel Tester and Sand Cushion

.24 ISSA TB-113, Trial Mix Procedure for Slurry Seal Design

.25 ISSA TB-144, Classification of Aggregate Filler - Bitumen Compatibility by Schulze-Breuer and Ruck Procedures

.26 NSTIR TM-2, The Petrographic Analysis of Coarse Aggregate

.27 NSTIR TM-3, Determination of Percent Fractured Particles in Processed Coarse Aggregates

1.4 Codes, Bylaws, Ordinances and Regulations

.1 All work covered by this section shall be performed according to applicable Halifax Regional Municipality Codes, bylaws, Ordinances, and Regulations.

.2 Nova Scotia Department of Public Works “Temporary Work Place Traffic Control Manual” (latest revision).

.3 HRM Traffic Control Manual Supplement (latest edition).

1.5 Quality Control

.1 Quality Control (QC) testing is the responsibility of the Contractor throughout every stage of the work from and including the production of the aggregates and polymer modified asphalt emulsion to the design and placement of the final product.

.2 In the Contractor QMP prepared per Section S-1, the Contractor shall include details regarding micro-surfacing placement methods to be used and QC testing methods and frequency, unless stated otherwise by the Engineer.

.3 The Contractor shall provide the Engineer with a copy of all QC test results within 24 hours of testing.

1.6 Quality Assurance

.1 During the progress of the work, Quality Assurance (QA) testing may be conducted by the Engineer or their representative to ensure compliance with the specifications.

.2 Sampling for all QA testing shall be carried out by the Contractor, under observation by the Engineer. Labelling of the samples obtained shall be the responsibility of the Engineer.

.3 Results of the QA testing shall be available to the Contractor.

.4 QA testing performed by the Engineer or their representative shall not be considered QC testing.

PART 2 - PRODUCTS

2.1 General

.1 No recycled or other waste materials shall be permitted in the micro-surfacing material.

2.2 Polymer Modified Emulsified Asphalt (Binder)

.1 The binder shall be a polymer modified cationic type CQS-1HP emulsion.

.2 The polymer modified emulsified asphalt shall be homogeneous after mixing and show no signs of separation within 14 days of delivery. The addition of polymers or other additives after the manufacturing of the emulsified asphalt shall not be permitted.

.3 The emulsified asphalt shall conform to the requirements of ASTM D2397 for CQS-1HP emulsion, with the amendments listed in Table 1 below.

Table 1 - Amendments to ASTM D2397

Test Method	Property	Requirements
ASTM D6997	Residue by Distillation	62% minimum
ASTM D6930	Settlement and Storage Stability of Emulsified Asphalt, 24 hr.	1% maximum
	Tests on Residue	
ASTM D36	Softening Point	57°C minimum
ASTM D2170	Kinematic Viscosity @ 135°C	650 mm²/s minimum

2.3 Aggregates

.1 The aggregates shall consist of 100% crushed, quarried rock material, meeting the physical properties provided in Table 2 below.

Table 2 – Aggregate Physical Properties[1]		
Test Method	**Property**	**Requirements**
Coarse Aggregate		
ASTM C127	Absorption	< 1.75
NSTIR TM-2	Petrographic Number	≤ 120
NSTIR TM-3	% Fracture Particles – Two Face	100
ASTM D4791	Flat or Elongated Particles 5:1	< 10
ASTM D6928	Micro Deval	< 15
ASTM C88	Aggregate Soundness[2]	< 15
Fine Aggregate		
ASTM C128	Absorption	< 2.0
AASHTO T304(A)	Angularity	≥ 45.0
ASTM D2419	Sand Equivalency	≥ 65
ASTM D7428	Fine Aggregate Micro-Deval	< 20
ASTM C88	Aggregate Soundness[2]	< 10
ASTM D4318	Plasticity Index	0 (Non-Plastic)

(1) Applies to individual aggregate sources.
(2) Test to be conducted utilizing Sodium Sulphate ($NaSO_4$)

.2 The aggregate gradation shall conform to the requirements for Type II and Type III M provided below in Table 3.

.3 The aggregate stockpile shall be within the specified tolerances. The Engineer reserves the right to sample aggregate stockpiles to ensure the gradation conforms to the specifications.

.4 Type III M modified shall be used on all streets except for low volume residential streets.

Table 3 – Aggregate Gradation		
Sieve	**Type II**	**Type III M**
9.5 mm	100	100
6.7 mm	---	95-100
4.75 mm	90-100	80-95
2.36 mm	65-90	50-75
1.18 mm	45-70	33-55
600 µm	30-50	25-40
300 µm	18-30	15-30
150 µm	10-21	7-20
75 µm	5-15	5-15

2.4 Mineral Filler .1 The requirement for use of mineral filler, to a maximum of 3% and meeting the requirements of ASTM D242, shall be determined by the mix design.

2.5 Water .1 The water shall be potable and shall be free of harmful salts and contaminants.

2.6 Polymer Modifier .1 The polymer solids shall be milled or blended into the emulsifier solution prior to the emulsification process.

.2 The polymer modifier shall consist of a minimum of 3% polymer solids by mass of asphalt residue.

2.7 Additives .1 Additives may be added to the emulsion mix during construction to provide control of the quick-set properties and increase of adhesion. They shall be included in the mix design and compatible with the other components of the micro-surfacing.

2.8 Tack Coat .1 On Local roads the Contractor is required to use non-tracking emulsion based tack, except when paving at temperatures below 5°C, in which case conventional RS-1 tack shall be used. The requirements of the non-tracking emulsion tack coat prior to dilution, are shown in Table 4.

Table 4 - Local Roads Tack Coat Requirements Non-Tracking Emulsion Requirements (Prior to Dilution)		
Test Type	**Specification Range**	
	Minimum	**Maximum**
Test on Emulsion		
SF Viscosity, 25°C, SFs	20	
Sieve Test		0.1
Dist. Residue	55	
Oil Portion of Dist., %		Trace
Settlement, 5 days, %	-	3
Demulsibility, 35 ml, 0.02 N $CaCl_2$, %	60	
Particle Charge	(-) or (+)	
Test on Residue		
Penetration, 25°C, dmm	20	55
Ash Content, %		1.0

*Non-tracking tack can be used on all other road classifications

On Minor/Major Collectors and Arterials the Contractor is required to use Rapid Setting Emulsified Asphalt (RS-1) as tack coat. The requirements for RS-1 are shown in Table 5.

Table 5 - Minor/Major Collectors and Arterials Tack Coat Requirements Rapid Setting Emulsified Asphalt (RS-1) Requirements		
Test Type	**Specification Range**	
	Minimum	**Maximum**
Test on Emulsion		
SF Viscosity, 25°C, SFs	20	100
Dist. Residue	55	
Settlement, 5 days, %		3.0
Storage Stability, %		1.5
Sieve Test, %		0.1
Demulsibility, %	60	
Particle Charge	Negative	
Test on Residue		
Penetration, 0.1 mm	100	200
Ductility, cm	60	
Solubility, %	97.5	

2.9 Mix Design

.1 The Contractor shall designate the mix proportions and prepare the mix design.

.2 The aggregate and the polymer modified emulsified asphalt shall be assessed to confirm compatibility. The Contractor shall supply the results of the physical tests for the aggregate.

.3 All component materials used in the mix design shall be representative of the material proposed by the Contractor for use on the contract.

.4 The Contractor shall submit to the Engineer the mix design and the results of the tests listed in Table 6. The material shall not be placed until the Engineer has received and approved the mix design. The mix proportions shall be within the following limits:

Table 6 - Micro-Surfacing Mix Properties

Residual Asphalt		6.0% - 11.5% by dry mass
Mineral Filler		0.0% - 3.0%
Test	**Property**	**Requirements**
ISSA TB-139	Wet Cohesion	-
	@ 30 minutes min. (set)	12 kg-cm minimum
	@ 60 minutes min. (traffic)	20 kg-cm minimum
ISSA TB-114	Wet Stripping	Pass (90% min.)
ISSA TB-100	Wet Track Abrasion Loss	-
	One Hour Soak	538 g/m² maximum
	Six Day Soak	807 g/m² maximum
ISSA TB-147	Lateral Displacement	5% maximum
	Specific Gravity after 1,000 Cycles of 56.7 kg	2.1 maximum
ISSA TB-109	Excess Asphalt by LWT Sand Adhesion	538 g/m² maximum
ISSA TB-113	Mix Time @ 25ºC	Controllable to 120 sec min.
ISSA TB-144	Classification Compatibility	11 Grade Points Minimum (AAA, BAA)

.5 The micro-surfacing shall be designed so that traffic can be allowed on the surface within one hour.

2.10 Equipment

.1 Rotary Power Brooms shall be capable of cleaning gravel, sand, dirt and other debris from bituminous surfaces.

.2 Mixing Equipment shall be specifically designed and manufactured to place micro-surfacing. The material shall be mixed by an automatic sequenced, self-propelled micro

surfacing mixing machine, which shall be a continuous flow mixing unit, able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, control setting additive, and water to a revolving multi-blade double shaft mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, control additive and water to maintain an adequate supply to the proportioning controls.

.3 Proportioning Devices shall have individual volume or weight controls for proportioning each material to be added to the mix (i.e. aggregate, mineral filler, emulsified asphalt, additive, and water) shall be provided and properly marked. These proportioning devices are usually revolution counters or similar devices and are used in material calibration and determining the material output at any time.

.4 Calibration of Proportioning Devices – Prior to beginning placement of micro-surfacing on this contract, the Proportioning Devices shall be calibrated to the satisfaction of the Engineer. The Engineer shall be notified 24 hours prior to calibration occurring. A copy of the results of the calibration must be given to the Engineer prior to any micro-surfacing operation.

.5 Re-Calibration of Proportioning Devices. Over the duration of the work, the Proportioning Devices shall be re-calibrated, to the satisfaction of the Engineer, should the following occur:

.1 After every 2000 tonne of aggregate placed throughout the duration of the contract.
.2 A change in the source of aggregate from that used in the previous calibration.
.3 Mechanical failure to the application system and/or Proportioning Devices in which repair is required.

.6 Spreading Equipment shall be used to apply the mixture. The mixture shall be spread uniformly by means of a conventional surfacing spreader box, including an auger, attached to the mixing machine and equipped with paddles to agitate and spread the material evenly throughout the box. A front seal shall be provided to ensure no loss of the mixture at the pavement contact point. The rear seal shall act as final strike-off and shall be adjustable. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved to produce a free flow of material to the rear strike-off. The spreader box shall have suitable means provided to manoeuvre the box to

compensate for variations in the pavement geometry. The rut filling spreader box shall be specifically designed for rut filling applications. Rear strike-off bar shall be one piece of rigid steel or metal (scratch course only). The spreading equipment shall be capable of being re-supplied with the micro-surfacing materials within the working lane to continuously place micro-surfacing for a minimum 2-lane-km distance. The machine shall be equipped to allow the operator to have full control of the forward and reverse speeds during application of the micro-surfacing.

.7 A 3 m straightedge shall be available that may be used to check for crossfall.

.8 A stringline or other device must be provided to ensure the longitudinal edges are straight and meet the existing pavement edge or as directed by the Engineer.

PART 3 - EXECUTION

3.1 General

.1 Location and dimensions as indicated on drawings or as directed by the Engineer.

3.2 Trial Area

.1 The Contractor shall place a trial area 100 m in length for the commencement of the micro-surfacing operation, one lane width, to demonstrate the ability to produce micro-surfacing in conformance with this specification. If the trial area meets the requirements of this specification, acceptance shall be provided by the Engineer within 1 hour of completion. The Contractor shall remove and replace any damaged or unsatisfactory micro-surfacing at no cost to HRM. The location of the trial area shall be approved by the Engineer.

3.3 Placement/ Weather Limitations

.1 Micro-surfacing shall not be applied, if either the pavement or air temperature is below 10ºC and falling but may be applied when both pavement and air temperature are above 7ºC and rising. No micro-surfacing shall be applied when it is foggy or when there is precipitation occurring. No micro-surfacing shall be applied when there is danger that the finished product will freeze before 24 hours. The mixture shall not be applied when weather conditions prolong opening to traffic beyond a reasonable time.

3.4 Surface Preparation

.1 Immediately prior to applying the micro-surfacing, the area to be surfaced shall be thoroughly cleaned of all vegetation, loose material, sand, dirt and other debris. Dried mud or other foreign matter, which cannot be removed with the

rotary power broom, shall be removed by hand blade or other approved method.

.2 Existing crack sealing material shall be removed.

.3 Existing pavement markings shall be removed.

.4 Water, if required, shall be applied to pre-wet the surface immediately ahead of the spreader at a rate to dampen the surface without allowing any freestanding or free flowing water. If water is used, cracks shall be allowed to dry thoroughly before applying micro-surfacing.

.5 Manholes, valve boxes, drop inlets and other service entrances shall be protected from the micro-surfacing by a suitable method, as approved by the Engineer.

.6 Tack coat shall be applied at a rate of 0.25 to 0.40 L/m^2. The tack coat should be allowed to cure prior to placement of micro-surfacing.

3.5 Application

.1 The mixture shall be spread to fill cracks and shallow potholes and leave a uniform surface. The application shall consist of a minimum of a scratch coat and a final coat with a rate of application for each layer meeting the requirements of Table 7. Additionally, the combined application rate for both layers shall be a minimum of 18 kg/m^2.

Table 7 – Micro-surfacing single layer application rates

Micro-surfacing Type	Application Rate (kg/m^2)
Type II	5 to 11
Type III M	8 to 16

.2 A sufficient amount of micro-surfacing mixture shall be carried in all parts of the spreader box at all times so that complete coverage is obtained. Spraying of additional water into the spreader box shall not be permitted.

.3 Overloading of the spreader box shall be avoided.

.4 No lumping, balling, or unmixed aggregate shall be permitted in the finished surface. No dry aggregate, either spilled from the lay-down machine or existing on the road, shall be permitted. Any oversized aggregate or foreign materials shall be screened from the aggregate prior to delivery to the mixing machine.

.5 Wheel track ruts of 13 mm or greater in depth shall be filled independently with micro-surfacing using a rut-filling spreader box prior to the application of the micro-surfacing scratch coat and final coat. Ruts greater than 25 mm shall be filled with micro-surfacing applied with two passes of the rut filling spreader box. All rut-filling material shall cure under traffic for at least a 24-hour period before additional material is applied. The minimum width of a rut filling micro-surfacing application shall be 1.5 m.

.6 Handwork – In restricted areas where hand spreading is necessary, slight adjustments to the mix formula may be used to delay the setting time. The mixture shall be poured into a small windrow along one edge of the surface to be covered. The mixture shall be spread uniformly with squeegees or other suitable hand tools. As much as possible, handwork shall exhibit the same finish as that applied by the spreader box. All handwork shall be completed prior to final surfacing.

.7 Appearance as follows:

.1 The finished micro-surfacing shall have a uniform texture free from excessive scratch marks, tears or other surface irregularities.

.8 Joints as follows:

.1 The longitudinal and transverse joints shall be neat and uniform in appearance. No excessive buildup, uncovered areas, non-homogeneous mixture or unsightly appearance shall be permitted on longitudinal or transverse joints.

.2 The longitudinal joints in the scratch course shall be constructed as a butt joint. The longitudinal joints in the surface course shall be placed on lane lines with less than 100 mm overlap on adjacent passes.

.3 Transverse joints shall be constructed with no more than 6 mm difference in elevation across the joint as measured with a 3 m straight edge.

.9 Rolling: The micro-surfacing shall be rolled unless otherwise directed by the Engineer.

.10 Mixture as follows:

.1 The micro-surfacing shall possess sufficient stability so that premature breaking of the material in the

spreader box does not occur. The mixture shall be homogeneous during and following mixing and spreading. It shall be free of excess liquids which create segregation of the aggregate. Spraying of additional water into the spreader box shall not be permitted.

.11 Defects as follows:

.1 Defects in the micro-surfacing will be classified as follows:

- Tear marks in any 12 m² per lane are considered excessive if there are: 1) four or more marks 12 mm wide or wider and 100 mm or more long; or 2) any marks 25 mm wide or wider and 25 mm or more long.
- Longitudinal ripples (raking) or wash-boarding (chatter), 5.0 mm deep, as measured with a 3 m straight edge or other irregularities that will affect the ride quality, with total area exceeding 2% in any 100 m^2 area.
- Total area exhibiting loss of surface (debonding, delamination, potholing) exceeding 2% in any 100 m^2 area.
- Total ruts > 6 mm deep, as measured with a 3-m straight edge, exceeding 2% base on 10 random samples per lane-km.
- Bleeding and flushing exceeding 2% in any 100 m² area.
- Bleeding and/or flushing at joints

.2 Generally, areas of delamination and flushing or bleeding surfaces shall be construed as failure; however, the Engineer shall be the sole judge as to the areas that must be re-treated.

.3 Any 400 m lane segment with repairs or defects exceeding 5% of the area shall require re-application of micro-surfacing over the entire segment.

.4 All deficient areas shall be repaired with additional application of micro-surfacing for the full lane width over the length of deficiency. If the distance between repair areas is less than 3 m, then the adjacent repairs shall be treated as one repair.

.5 Any part of completed micro-surfacing rejected for surface defects shall be repaired within 20 days from

the time the Contractor receives notification of rejection, but in no case later than the conclusion of the same construction year.

.6 If the 20 day period extends past the end of the construction year, the Contractor shall complete the repairs between June 1st and June 16th of the following construction year. All defects shall be repaired using micro-surfacing (this includes any repairs within the two-year warranty).

.7 The Contractor shall guarantee the Work against failure and defects, and shall hold the Owner blameless in all claims arising from the Work, any of which results from factors including, but not limited to poor workmanship, poor or incompatible materials, improper design of application rates, inadequate traffic control, and/or failing to practice proven micro-surfacing procedures.

.8 All work for reconstruction of unacceptable areas shall be at the Contractor's expense.

3.6 Temporary Pavement Markings

.1 Once the micro-surfacing application is capable of supporting traffic, temporary pavement markings shall be installed immediately.

3.7 Clean Up

.1 All areas, including shoulders and gutters, shall have the micro-surfacing mix removed as specified by the Engineer. The Contractor shall, on a daily basis, remove any debris associated with the performance of the work.

.2 Appurtenances shall be free of micro-surfacing and left in operable condition.

.3 After completion of the micro-surfacing, all areas such as gutters, sidewalks, and adjacent asphalt surfaces, shall be thoroughly cleaned of all loose material, sand, dirt and other debris.

.4 All hardware to be removed from site daily.

3.8 Protection of Work

.1 The Contractor shall be responsible for ensuring that the mixture is not damaged by traffic.

.2 Traffic, including construction traffic, shall be kept off the freshly placed mixture for whatever time is required to prevent damage to the surface and until premarking of traffic lines with paint is complete.

3.9 Testing .1 Straight Edges. A 3 m straight edge may be used to check for cross fall at the discretion of the Engineer.

.2 Stringline. A stringline or other device may be required to ensure the longitudinal edges are straight and meet the existing pavement edge or as directed by the Engineer.

3.10 Liability .1 During the period of construction and the two year maintenance period the Contractor shall be responsible for processing any and all claims for property damage and/or bodily injury caused by failure of the Micro-Surfacing including but not limited to motor vehicles or pedestrians. The contractor shall be responsible for the payment of all property damage and bodily injury claims and agrees to save and holds harmless Halifax Regional Municipality from all such claims.

PART 4 – MEASUREMENT FOR PAYMENT

4.1 General .1 Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 Measurement and Payment, of the Contract.

****** End S-5 ******

INDEX TO CLAUSES

PART 1 – GENERAL

1.1 Work Included
1.2 Reference Standards
1.3 Related Sections
1.4 Submittals

PART 2 – PRODUCTS

2.1 Materials
2.2 Concrete Mix
2.3 Advanced Concrete Testing

PART 3 – EXECUTION

3.1 General
3.2 Formwork and Falsework
3.3 Reinforcement and Embedded Items
3.4 Waterstops
3.5 Placing
3.6 Joints and Sealants
3.7 Finishing
3.8 Curing and Protection
3.9 Concrete Quality
3.10 Cold Weather Concrete
3.11 Defective Work
3.12 Emissions Reduction

PART 4 – MEASUREMENT & PAYMENT

4.1 General

LIST OF TABLES

Table 1: Permissible Concrete Temperatures at Placing (CSA A23.1:24 Table 14) 9
Table 2: Price Adjustments for Hardened Air Void Content (ASTM C457), w/cm > 0.36 10
Table 3: Price Adjustments for Hardened Air Void Content (ASTM C457), w/cm < 0.36 10
Table 4: Price Adjustments for Resistance to Chloride Ion Penetration (A23.2:24-23C), Class C-XL 11
Table 5: Price Adjustments for Resistance to Chloride Ion Penetration (A23.2:24-23C), Class C-1..... 11
Table 6: Criteria for Assessment of Defective Concrete 20

PART 1 - GENERAL

1.1 Work Included

.1 This section specifies requirements for constructing cast-in-place concrete. Work includes supply and installation of formwork, reinforcement, concrete, and accessories.

1.2 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 Joint Committee on Contract Documents Standard Specification for Municipal Services.

.2 AASHTO M182-05 (R2012), Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.

.3 ASTM C1610/C1610M, Standard Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique.

.4 ASTM A933-14, Standard Specification for Vinyl Coated Steel Wire and Welded Wire Reinforcement.

.5 ASTM C260-10A (R2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.6 ASTM C309-19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.7 ASTM C457/C457-16, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete.

.8 ASTM C494/C494M-19, Standard Specification for Chemical Admixtures for Concrete.

.9 ASTM C597-22, Standard Test Method for Ultrasonic Pulse Velocity Through Concrete.

.10 ASTM C805/C805M-2018, Standard Test Method for Rebound Number of Hardened Concrete.

.11 ASTM C1017-13E1, Standard Specification for Chemical Admixtures for Use in Producing Flooring Concrete.

.12 ASTM C1383-15, Standard Test Method for Measuring the P-Wave Speed and the Thickness of Concrete Plates Using the Impact-Echo Method

.13 CSA A3000-23, Cementitious materials compendium.

.14 CSA A23.1:24/A23.2:24, Concrete materials and methods of concrete construction/methods of test and standard practices for concrete.

.15 CSA A23.4-16, Precast concrete – materials and construction.

.16 CSA A283:124 Qualification code for concrete testing laboratories.

.17 CSA G30.18-09 (R2019), Billet-steel bars for concrete reinforcement.

.18 CSA S269.1-16, Falsework and formwork.

.19 ISO 10005:2018, Quality Management – Guidelines for quality plans.

1.3 Related Sections

.1	Precast Manholes, Catch Basins, and Structures	Section 33 39 00
.2	Walks, Curbs, and Gutters	Section S-11, Part B
.3	Interlocking Concrete Pavers	Section S-12

1.4 Submittals

Submittals pertain to Part A – Concrete and Part B – Walks, Curbs and Gutters, where applicable.

.1 A Quality Management Plan (QMP) shall include information regarding hot and cold weather concrete and applies to HRM flatwork projects including (but not limited to) Street Recapitalization projects, hereafter referred to as the project(s).

A QMP shall be submitted to the Engineer (TPW.TIM@halifax.ca) for review, a minimum of 15 working days prior to commencement of any concrete work as part of the project(s). The Engineer will provide written approval of the Contractor's QMP (Contractor QMP Approval Letter) in a timely manner, prior to commencement of this work.

The Contractor has the option to submit a comprehensive QMP to the Engineer (TPW.TIM@halifax.ca) for review, prior to the construction season and commencement of any concrete work as part of the project(s). This QMP shall be applicable for the entire construction season (ends December 30th of the calendar year) and pertains to all concrete work expected for that season, by the

Contractor. The Engineer will provide a Contractor QMP Approval Letter prior to the start of the construction season, which shall be submitted by the Contractor for each project as part of the preconstruction documents identified in HRM Construction's *Contractor Required Pre Construction Information* list.

If the Engineer deems the Contractor's QMP submission unacceptable, the Contractor shall provide iterations in a timely manner until the QMP is considered adequate by the Engineer. Construction of any concrete work as part of a project(s) shall not commence without submission of the Contractor QMP Approval Letter for the project. At the Engineer's discretion, a project specific QMP may be requested at any time to fit the criteria of a unique project. This request will be identified in contract specifications during the tendering process.

Note, if deemed necessary by the Contractor, an amended QMP can be submitted to the Engineer for review and approval at any point throughout the construction season (ends December 30th of the calendar year).

.2 The QMP shall include:

.1 All mix design summaries (properties) for mixes to be used on the project, including respective qualification testing as detailed in Section 2.1.

.2 Proposed frequency of testing for plastic and hardened concrete (slump, air content, mass density, temperature, and compressive strength) and method for reporting of results to HRM. Proposed frequency at a minimum to follow CSA A23.2:24-25C Clause 7.1.4.

.3 Complete procedures for proposed finishing, curing, and storage.

.4 Description of non-conformance processes for identifying and addressing non-conformant defects or issues in the concrete work.

.5 Description of communication methods when addressing non-conformant defects or issues in the concrete work, and escalation process for HRM to follow when an issue needs to be resolved.

An outline for a QMP, based on ISO 10005, is provided for reference in Attachment A.

.3 Submit shop drawings in accordance with Section 01 10 00 Clause

1.7.1 from latest edition of the Joint Committee on Contract Documents Standard Specification for Municipal Services. Shop drawings are required for structural elements only. At a minimum, shop drawings for each structural element shall include (but is not limited to) dimensions, tolerances, and concrete cover if applicable. Unless specified in project documentation, shop drawings are not required for non-structural elements such as sidewalks and curbs.

.4 Submit to the Engineer for acceptance all required documentation as outlined in CSA A23.1:24 – Table 5 Alternative 1 "Performance", along with CSA A23.2:24-24C Clause 7.2 demonstrating that each proposed concrete mix design will meet their respective performance requirements.

.5 For exposure classes C-XL, C-1, C-2, C-3, C-4, and F-1, submit test data for any proposed aggregate sources following CSA A23.2:24-27A Clause 5.3 from a testing laboratory certified by the Canadian Council of Independent Laboratories that shows measures taken to mitigate alkali silica reaction. The data shall be submitted with the QMP. Further submissions are required for any change in the quality, quantity, or proportion of materials used in any proposed concrete mixture, with a tolerance of +/- 5% or as defined in Project Documentation.

.6 For bridge structures and cold weather concrete work constructed for walks, curbs, and gutters, non-reactive coarse and fine aggregate, as defined in CSA A23.1:24 Clause 4.2.3, shall be used. Submit non-reactive alkali aggregate reaction (AAR) performance documentation for aggregates used in the mix design, consisting of at least five (5) consecutive tests performed in accordance with CSA A23.2:24-14A or CSA A23.2:24-25A over a period of at least five (5) years, while not exceeding ten (10) years.

.7 Unless noted otherwise, all test results used for qualification purposes shall be from tests completed within one (1) calendar year.

.8 Certification and Membership

.1 The Ready Mixed Concrete Supplier (hereafter concrete producer) shall provide current plant certification and membership certificates issued by the Atlantic Concrete Association (ACA) to comply with CSA A23.1:24 Clause 5.2.1.

.2 Upon written request from HRM, the Contractor shall

coordinate with the concrete producer(s) to allow for HRM (or its representative) to perform an inspection at the concrete producer's location (facility) for any concrete being produced for the project, *if requested* by HRM to perform forensic analysis. For clarity, it is the responsibility of the Contractor, and not HRM, to coordinate this inspection and such inspection is to occur during the period set forth in the written notification or during another period agreed to by HRM in writing. The inspection conducted by HRM (or its representative) may include any of the following:

- Production record review
- Batch tolerances
- Material storage
- Calibration records
- Quality control procedures
- Equipment condition
- Environmental and safety procedures

.9 Prior to use of any proposed self-consolidating concrete (SCC) mixture, a trial batch must be produced and tested to demonstrate mix design meets the performance requirements following CSA A23-1:24 Table 22 for Flow, T- 50 cm time and VSI value. If component has reinforcement, a J-ring test shall be performed. ASTM C1610/C1610M Column Segregation shall be used for pre-qualification of mix design.

.10 If requested by HRM, the concrete supplier, within 10 working days, shall provide documentation that the facility, materials, and products selected for use on a project address any of the following:

.1 Compliance with latest Nova Scotia Environment Act and regulations pertaining to Industrial facilities. All facilities shall comply with water taking permits, air and noise pollution, discharge of process water and waste generation regulations.

.2 For each mix design proposed, an Environmental Product Declaration (EPD) verified by a CSA-recognized verifier is required. Relevant EPDs published by the Atlantic Concrete Association are satisfactory. If a mix design lacks an approved EPD, a new EPD must be conducted and verified by a CSA-recognized verifier. Recognized verifiers can be found online at https://www.csaregistries.ca/GHG_VR_Listing/EPD_Verifier_Page

PART 2 - PRODUCTS

2.1 Materials

.1 Portland Cement: to CSA Standard A3001:23, Table 1 for Portland cement chemical requirements, Table 4 for physical requirements, and CSA A23.1:24 Table 6.

.2 Blended Hydraulic Cement: CSA Standard A3001:23 Table 2 for Portland cement chemical requirements, Table 5 for physical requirements, and CSA A23.1:24 Table 7.

.3 Where supplementary cementing materials are employed to mitigate potentially deleterious expansions due to AAR, the minimum level of supplementary material shall be in accordance with Table 7 of CSA Standard Practice A23.2:24-27A. Concrete curb and gutter, pavers, and sidewalks shall be classified as St3 and retaining walls as St4 according to Table 5 of the standard practice.

.4 Non-reactive coarse and fine aggregate, as defined in CSA A23.1:24 Clause 4.2.3, shall be used for bridge structures and for cold weather concrete work constructed for walks, curbs, and gutter. Frozen lumps of aggregate shall always be excluded from concrete mix. Prior to the start of any project using non-reactive aggregate, the ready-mix concrete supplier shall have at the place of production, enough aggregate to complete the entire concrete section scheduled for that day.

.5 Returned Hardened Concrete (RHC) further defined in CSA A23.1:24 Annex 0.1.3 Point C and Reclaimed Concrete Material (RCM) further defined in CSA A23.1:24 Annex 0.1.3 Point B shall follow CSA A23.1:23 Clause 4.2.3.4.1, along with the following requirements:

1. The concrete producer shall ensure the amount of RCM and/or RHC does not compromise the performance of the mix.

2. RCM and/or RHC aggregates, whether individually sourced or blended, shall follow CSA A23.1:24 Clause 4.2.3.2.2.

3. HRM shall be notified 10 working days prior to the use of RCM or RHC stockpiled material. HRM reserves the right to inspect the RCM or RHC stockpiles for contamination of materials other than concrete or natural aggregates. If contaminants are found, the stockpile will be rejected for use.

.6 Upon acceptance of the aggregates, the source and method of manufacture shall not be altered for the duration of the contract.

Aggregates shall be stored and maintained in such a manner to avoid the inclusion of foreign materials in the concrete and such that no equipment will be operated on the stockpiles. The stockpiles shall be constructed to prevent segregation or contamination.

.7 Fine aggregate shall be washed and classified to conform to the gradation limits specified in CSA Standard A23.1:24 Clause 4.2.3.3.2.1. Coarse aggregates shall consist of washed stone and conform to the gradation limits specified in CSA A23.1:24 Clause 4.2.3.4.2. The maximum combination of flat, elongated, and flat and elongated particles, as defined in CSA A23.2:24-13A, shall not exceed 10% of the mass.

.8 Water must be in accordance with CSA-A23.1:24, Table 9. Aggregates and water combined are not to exceed 35 ºC when in contact with cementitious materials.

.9 Admixtures:

.1 Air Entraining according to ASTM C260.

.2 Chemical according to ASTM C494/C494M or C1017 for flowing concrete.

.10 Adhere to CSA A3000:23 for the inclusion of supplementary cementing materials, considering potential ASR effects.

.11 Reinforcement:

.1 Bars according to CSA G30.18, billet steel, grade 400, deformed.

.2 Welded Steel Wire Fabric according to ASTM A933.

.3 Bar Supports and Spacers according to CSA A23.1:24 Clause 6.6.7.

.4 Tolerance for location of reinforcement according to CSA A23.1:24 Clause 6.6.8.

.12 Formwork:

.1 Form materials shall comply according to CSA S269-16 Clause 4.

.2 Form Ties according to CSA A23.1:24 Clause 6.6.4, removable or snap-off metal ties, fixed or adjustable length. Form ties, tie wire, other embedded fixtures susceptible to

corrosion shall not be positioned within the minimum cover distance. Form ties and tie wires shall be bent down to ensure minimum cover is maintained. For severe environments, dimension to be shown on the Project Drawings.

.3 Release Agent shall be non-staining natural organic chemicals of sprayable consistency which prevent adhesion of concrete to forms.

.4 Design according to CSA S269.3.

.13 Curing compound according to CSA A23.1:24 Clause 7.8, white pigmented. Refer to AASHTO M182 and ASTM A309.

.14 Waterstops:

.1 Ribbed or flexible strip, extruded PVC waterstops of type and size indicated.

.2 Bentonite shall be NSF certified, expandable strip composed of sodium bentonite, complete with adhesive if product is not self-adhering.

.15 Non-shrink grout pre-mixed, dry pack or pourable, containing non-metallic aggregate, plasticizing agents and cement, minimum compressive strength of 45 MPa at 28 days.

2.2 Concrete Mix

.1 Provide in accordance with CSA A23.1, Table 5, Alternate (1) "Performance."

.1 Performance requirements as outlined in Project Documentation or within respective Municipal Specifications.

.2 Mix proportions to provide workable concrete having required durability and strength.

.3 Air entraining admixtures: to obtain Air Content Category as defined in CSA A23.1, Tables 2, 3, and 4.

.4 Slump: to CAN/CSA A23.1:24, Clause 4.3.2.3.

.5 Compressive strength shall meet minimum strength requirements and specified age as per CSA A23.1:24 Table 2.

.6 Water to cementing materials ratio shall be according to CSA A23.1, Tables 2, 3, and 4 as required for exposure conditions.

.7 Cold weather concreting shall meet limits specified in CSA A23.2:24-Clause 7.2.2

.8 Hot weather concreting shall meet limits specified in CSA A23.2:24 Clause 7.2.1.

.9 Concrete temperature at placement shall meet limits of CSA A23.1:24 Table 14, within tolerance of specified minimum dimension of section.

Table 1: Permissible Concrete Temperatures at Placing (CSA A23.1:24 Table 14)

Temperatures, °C		
Thickness of section, m	Minimum	Maximum
< 0.3	10	32
≥ 0.3 - < 1	10	30
≥ 1 - < 2	5	25
≥ 2	5	20

.10 On site water addition for Portland cement concrete to comply with CSA A23.1:24 Clause 5.2.5.3.2 “Addition of Water on the job site”.

2.3 Advanced Concrete Testing

.1 Advanced concrete testing in this section shall refer to Air Void Analysis of Hardened Concrete (ASTM C457) and Resistance to Chloride Ion Penetration (A23.2:24-23C), tested in accordance with CSA A23.2:24.

.2 Price adjustment tables apply whenever advanced concrete testing is conducted, as defined by Clause 2.3.4 for Air Void Analysis of Hardened Concrete and Clause 2.3.5 for Resistance to Chloride Ion Penetration and shall apply to the concrete unit price.

.3 Advanced concrete testing to be conducted by Owner’s Consultant and any resultant payment adjustment shall apply solely to the Contractor. It is the responsibility of the Contractor and concrete producer to form their own agreement on price adjustment distribution.

.4 Concrete with an air content specified as Category 1, as described by CSA A23.1:24 Table 4, shall follow CSA A23.1:24 Clause 4.3.3.3.

.1 Total air content of hardened concrete shall be greater than or equal to 3.0 percent.

.2 Hardened concrete of the same mix shall have an average spacing factor less than 230 µm, with no single value greater than 260 µm.

.1 For mixes with a water to cementing material ratio equal or less than 0.36, the average spacing factor shall not exceed 250 µm, with no single value greater than 300 µm.

.3 Dependent upon the average spacing factor for the air-void system as well as the total air content measured within the hardened concrete, the following price adjustments shall apply to the unit price supplied for concrete with a water to cementing material ratio:

.1 w/cm greater than 0.36.

Table 2: Price Adjustments for Hardened Air Void Content (ASTM C457), w/cm > 0.36

Spacing Factor (mm)	Air Content, %																				
	≤1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	≥3.0
<0.200	Reject	0.52	0.55	0.57	0.60	0.62	0.65	0.69	0.71	0.74	0.76	0.79	0.81	0.83	0.86	0.88	0.90	0.93	0.95	0.95	1.00
0.200	Reject		0.52	0.54	0.56	0.58	0.60	0.62	0.65	0.69	0.71	0.74	0.76	0.79	0.81	0.83	0.86	0.88	0.90	0.93	1.00
0.210	Reject			0.52	0.54	0.56	0.58	0.60	0.62	0.65	0.69	0.71	0.74	0.76	0.79	0.81	0.83	0.86	0.88	0.91	1.00
0.220	Reject						0.56	0.58	0.60	0.62	0.65	0.69	0.71	0.74	0.76	0.79	0.81	0.83	0.86	0.89	1.00
0.230	Reject										0.50	0.53	0.57	0.60	0.62	0.65	0.70	0.75	0.77	0.80	1.00
0.240	Reject															0.50	0.52	0.54	0.56	0.58	0.60
≥0.250	Reject																				

.2 w/cm equal or less than 0.36.

Table 3: Price Adjustments for Hardened Air Void Content (ASTM C457), w/cm < 0.36

Spacing Factor (mm)	Air Content, %																				
	≤1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	≥3.0
<0.200	Reject	0.52	0.55	0.57	0.60	0.62	0.65	0.69	0.71	0.74	0.76	0.79	0.81	0.83	0.86	0.88	0.90	0.93	0.95	0.95	1.00
0.200	Reject		0.52	0.54	0.56	0.58	0.60	0.62	0.65	0.69	0.71	0.74	0.76	0.79	0.81	0.83	0.86	0.88	0.90	0.93	1.00
0.210	Reject			0.52	0.54	0.56	0.58	0.60	0.62	0.65	0.69	0.71	0.74	0.76	0.79	0.81	0.83	0.86	0.88	0.91	1.00
0.220	Reject						0.56	0.58	0.60	0.62	0.65	0.69	0.71	0.74	0.76	0.79	0.81	0.83	0.86	0.89	1.00
0.230	Reject										0.50	0.53	0.57	0.60	0.62	0.65	0.70	0.75	0.77	0.80	1.00
0.240	Reject													0.50	0.54	0.57	0.63	0.67	0.69	0.72	1.00
0.250	Reject																	0.50	0.52	0.65	1.00
≥0.250	Reject																				

.5 Concrete described as C-1 or C-XL according to CSA A23.1:24 Table 2, shall be tested via chloride ion penetrability in accordance with A23.2:24-23C.

.1 For C-XL, the chloride ion penetrability shall be measured as less than 1000 coulombs and tested within 91 days of placement. The following price adjustment shall apply for C-

XL concrete dependent upon the average chloride ion penetrability result and applied to the unit price for concrete.

Table 4: Price Adjustments for Resistance to Chloride Ion Penetration (A23.2:24-23C), Class C-XL

High Performance Concrete (Class C-XL)					
Resistance level to Chloride Ion Penetration	Great	Good	Below Standard	Poor	Extremely Poor
Coulombs*	0-500	500-1000	1000-1500	1500-2000	>2000
Unit Price Adjustment Factor	1.1	1.0	0.80	0.50	0.10 or full removal, as determined by the Engineer

* After corrosion inhibitor correction if applicable

.2 For C-1, the chloride ion penetrability shall be measured as less than 1500 coulombs and tested within 91 days of placement. The following price adjustment shall apply for C- 1 concrete dependent upon the average chloride ion penetrability result and applied to the unit price for concrete.

Table 5: Price Adjustments for Resistance to Chloride Ion Penetration (A23.2:24-23C), Class C-1

C-1 Exposure Concrete					
Resistance level to Chloride Ion Penetration	Great	Good	Adequate	Poor	Very Poor
Coulombs*	0-500	500-1000	1000-1500	1500-2000	>2000
Unit Price Adjustment Factor	1.1	1.0	1.0	0.80	0.10 or Full Removal, as Determined by the Engineer

* After corrosion inhibitor correction if applicable

PART 3 - EXECUTION

3.1 General

.1 Unless stated otherwise in Project Documentation or directed by the Engineer, plastic properties to be checked at a rate of one (1) test per load until satisfactory control is established. Typically, to demonstrate satisfactory control it is advised to test the first three to five loads to ensure consistency. If a test falls outside of any specified range from either quality control (QC) testing or via the Owner's Consultant, immediate notification shall be provided to the Engineer or HRM representative. Upon notification, the

Engineer or representative may request increased QC testing frequency until consistency is re-established. Once consistency is established, the plastic properties shall then be checked once every tenth load.

.2 Use ready-mixed concrete unless on-site mixings approved by the Engineer.

.1 Equipment for on-site mixing to be capable of accurately proportioning ingredients to produce required concrete.

.3 The Engineer (TPW.TIM@halifax.ca) shall be notified of concrete mix design changes. Changes in material supply will require submission of a new mix design as well as relevant qualification documentation for review by the Engineer, at least 1 working day prior to anticipated use.

3.2 Formwork and Falsework

.1 Formwork design and the proposed method of construction shall meet all necessary requirements in terms of strength and properties of material, rigidity, and erection tolerances as presented in Section 3.2 of this specification. Formwork shall also be compliant with the requirements of CSA S269.1 as well as other requirements described in CSA A23.1:25 Clause 6.5 “Formwork”.

.2 Formwork shall be built with sufficient strength and rigidity to carry the mass or fluid pressure of the Portland cement concrete (PCC) as well as all construction loads including wind, equipment, and runways which might be placed upon them. The fluid pressure on forms shall be correlated to the capacity and type of placing equipment, the rate of placing, slump, and temperature of the PCC.

.3 Formwork shall be supported by stiff members in two directions at right angles which are sufficiently rigid to hold the unit in line and in proper position and shape. Formwork shall be accurately located, rigidly tied, or braced to resist vertical or horizontal movements, and adequately supported. However, they shall be so arranged to allow for easy stripping to prevent damage of the PCC during removal.

.4 Formwork for SCC shall meet the requirements of CSA A23.1:24 Clause 6.5.3.1 and be designed to prevent paste loss. Design of the formwork shall assume that a full liquid head will be developed once placing is completed. Areas of focus include, but are not limited to, joints, holes for ties, and sill plates on foundation

footings or slab surfaces.

.5 Construct formwork to produce finished concrete to required shape, dimensions and levels indicated within tolerances required by CSA A23.1:24 Clause 6.5.3.1. Provide close fitting joints to prevent leakage of mortar and form ties and bracing sufficient to withstand pressure of plastic concrete without deflection.

.6 The Contractor shall construct the falsework and formwork in accordance with the approved drawings. Variations from the drawings shall not be permitted unless such variations are approved by the Engineer. Both the falsework and formwork shall be designed and constructed to provide the necessary rigidity and to support the loads without settlement or deflection.

.7 All falsework and formwork used to support fresh concrete during construction of the following components shall be designed by a Nova Scotia Registered Professional Engineer in accordance with CSA S269.1:16.

- Bridge decks and pier caps;
- Columns over 3 m in height;
- Retaining walls over 3 m in height;
- Roofs of structures under which persons are required to work; and,
- As required on the contract drawings.

.8 Use commercially available formwork release agent that will prevent the formwork absorption of moisture, prevent bond with concrete and not stain the concrete surface. Environmentally friendly form release materials shall be considered.

.9 Complete formwork removal in accordance with CSA A23.1:24 Clause 6.5.3.5.

.10 Fill form tie holes with non-shrink mortar and finish to texture of adjacent concrete.

.11 Under adverse weather conditions the Contractor shall be prepared to provide suitable protection to prevent damage to Portland cement concrete as per CSA A23.1:24 Clause 7.6 with methods subject to the approval of the Engineer.

3.3 Reinforcement and Embedded Items

.1 Surface condition of reinforcing to be in accordance with CSA A23.1:24 clause 6.1.6.

.2 Bend bars cold to measurements required.

.3 Confirm reinforcement and inserts are not disturbed during concrete placement.

.4 Place and support reinforcing using bar supports and side form spacers to obtain cover, spacing and location indicated.

.5 Reinforcing steel mesh to be positioned at appropriate height using non-reactive chairs.

3.4 Waterstops

.1 Install waterstops as specified in the Project Documents and in accordance with manufacturer's written instructions.

.2 Do not pierce or distort waterstops or displace reinforcement except near edges as required for securing.

3.5 Placing

.1 Place concrete to CSA A23.1:24 Clause 7.5.

.2 When cold weather concreting does not apply, place concrete on dampened base.

.3 Convey concrete from mixer to forms by methods that will maintain specified slump and prevent segregation.

.4 Do not drop concrete more than 1.5 metres vertically unless it can be shown that the concrete will not segregate. Deposit concrete in final position in forms to avoid lateral movement.

.5 Place concrete in continuous operation, starting from lowest point in form, in lifts not greater than 500mm.

.6 Internally consolidate each layer to obtain dense homogeneous structure free of cold joints, fill planes, voids, and honeycombing.

.7 For vertical installation vibrate at least 150mm into previously placed layers. Concrete to be well bonded to all reinforcing steel, anchors, waterstops and other embedded parts.

3.6 Joint Sealants

.1 Use of joint sealants to be directed by the Engineer.

3.7 Finishing

.1 Finish concrete in accordance with CSA A23.1:24 Clause 7.7 or

as specified in Project Documentation.

3.8 Curing and Protection

.1 Provide curing and protection to CSA A23.1:24 Clause 7.6. Keep the temperature of the concrete within the limits of Table 14 unless stated otherwise within Project Documentation.

.2 Protection during hot weather concreting according to CSA A23.1:24 Clause 7.2.1.

.3 Do not place concrete on frozen base. Remove all snow, ice, and frost from area prior to placing concrete. Do not place concrete on, or against, any surface that will lower the temperature of the concrete in place below the minimum value shown in CSA A23.1:24 Table 14.

.4 When air temperature may drop below 5 ºC or when there is a probability that it will drop below 5 ºC within 24 hours of placing, raise temperature of base, reinforcing steel, embedded parts, and forms above 5 ºC prior to placing concrete. In addition, before placement have available all materials and equipment needed for adequate protection and curing.

.5 Curing or sealing of concrete shall be carried out as per CSA A23.1:24 Clause 7.1.2.2, or as directed by the Engineer.

.6 After placing is completed, maintain minimum curing conditions for the concrete in accordance with CSA A23.1:24 Clause 7.8.

3.9 Concrete Quality

.1 Contractor shall bear full responsibility for ensuring the quality of the concrete product. Additionally, the Owner reserves the right for their independent Consultant to perform quality assurance (QA) testing for verification purposes. Contractor shall facilitate the Owner's Consultant's sampling and casting of test specimens as per CSA A23.1:24 Clause 4.4, as requested by the Owner.

.1 Unless otherwise noted in Project Documentation, the Owner's Consultant shall at a minimum, cast one set of three (3) compressive strength test specimens for testing at 7 days (1 sample) and 28 days (2 samples); as well as an appeal test (1 sample) at 56 days if required, for every 50 m^3 or fraction of thereafter for each mix during each site visit.

.2 For advanced concrete testing, the Owner's Consultant shall cast an additional test specimen for a minimum of once per concrete mix used for the project for Air Void Analysis of

Hardened Concrete. For Concrete described as C-1 or C-XL a second additional test specimen shall be cast and be tested via chloride ion penetrability in accordance with A23.2:24-23C. For larger projects, the Owner's Consultant shall cast their first additional specimens within the first 50 m^3 placed per mix, and another set for every 150 m^3 or fraction of thereafter.

.3 The Engineer reserves the right to reject concrete that is not in compliance with clause 5.2.5 of CSA A23.1:24. When both QC and QA tests are conducted, the contractor should consider all results prior to adjustment or placement of loads.

.2 Concrete shall be produced at a stationary or portable plant. Concrete shall not be supplied to any HRM project unless the concrete producer has completed all required submittals and are approved for use by the Engineer.

.3 Test concrete in accordance with CSA A23.1:24 Clause 4.4 and self-consolidating concrete in accordance with CSA A23.1:24 Table 22, using a testing laboratory certified to CSA A283:24 by Canadian Council of Independent Laboratories to the appropriate category for the tests performed.

3.10 Cold Weather Concrete

.1 Cold weather concreting shall apply whenever the air temperature is below 5 ºC or is expected to fall below 5 ºC within 24 hours of placing of concrete. When cold weather concrete applies, the concrete shall meet the requirements as specified herein.

.2 Contractor to follow CSA A23.1:24 Clause 7.2.2.1 regarding site preparation.

.3 Granular base for sidewalk shall be dry and free of ice or frost at the time of concrete placement. Base courses below 5 ºC shall be preheated prior to placement of concrete.

.4 Immediately after placing, consolidation, and strike off, the concrete shall be covered with either insulation blankets or 6 mil polyethylene plastic film to retain heat until final finishing. Plastic film may only be used if the ambient temperature is forecast to remain above 10 ºC. If plastic film is used, the Contractor shall monitor the temperature within the film, and the Contractor shall place insulation blankets prior to the temperature falling below 10 ºC. The Contractor shall always maintain at site sufficient insulation blankets to cover the entirety of the new concrete.

.5 Protective covers in accordance with CSA A23.1:24 Clause 7.2.2.4. The covers shall be temporarily removed for final finishing and replaced immediately after finishing is complete. Covers shall remain in place until the concrete reaches a compressive strength of 20 MPa. Compressive strength tests of field cured samples shall be used (cured in same environment as concrete structure) to determine removal time of concrete protective covers. Complete cover removal to follow requirements of CSA A23.1:24 Clause 7.2.2.5.

.1 Compressive strength test results of field cured samples shall be provided to the Engineer prior to removal of protective covers.

.6 MasterProtect H 400 or Engineer approved alternative to be applied when concrete achieves 80% design strength and only when ambient and expected 12-hour temperatures remain within 4 ºC to 43 ºC. Application shall not proceed during rain, or when rain is expected to occur within 12 hours of application. The Contractor shall notify the Engineer prior to application. Application shall be applied as per manufacturer's instructions.

.1 When temperatures are expected to remain below 4 ºC during application window, Sikagard SN-100 or Engineer approved alternative shall be applied instead. Application of Sikagard SN-100 can occur down to a minimum temperature of -10 ºC. Application shall be as per manufacturer's instructions.

.7 Verification that the concrete supplied meets the cold weather protection requirements, shall be provided to the Engineer or their direct representative (HRM Construction Inspector onsite or electronically) for each supplied load.

.8 HRM may conduct and record the results of random temperature readings under the insulation blankets during the curing period.

3.11 Defective Work

.1 Compressive strength evaluation shall follow CSA A23.1:24 Clause 4.4.2.2. Compressive strength of concrete shall be adequate if it meets the following two criteria:

.1 An acceptable test result (ATR) is defined as the specified strength minus 3.5 MPa, when the specified strength is 35 MPa or less. If specified strength is higher than 35 MPa then the ATR is determined to be 90% of the design strength. Each individual strength test shall meet or exceed the ATR where a strength test is defined as the average between two same

day (28-day) compressive strength tests.

.2 The moving average of three (3) consecutive test results of the same concrete mixture shall meet or exceed the specified strength. If less than three results are available, the average of available results shall meet or exceed the specified strength.

.3 A defect fee of $500 shall apply for each incident where concrete fails to meet the acceptance criteria. An incident shall be identified as one or more failures within a single day, for each project, and each mix. The defect fee shall compensate for the Engineer's time required to inspect the defects, manage the appeal process, and compile necessary documentation.

.2 When evaluation results are deemed to be inadequate, the following shall occur:

.1 The appeal test specimen cast by the Owner's Consultant will be assessed using the criteria of CSA A23.1:24 Clause 4.4.2.2.

.2 If the appeal test specimen fails to meet an ATR, the Contractor may elect to core the area which did not achieve an ATR for the purposes of appealing. CSA A23.1:24 Clause 4.4.2.3.2 shall be followed, as described below. If core samples meet these requirements, the Contractor shall fill all core holes with a material approved by the Engineer and make efforts to blend the filled areas seamlessly with the existing surface.

.1 The average of each set of three (3) cores from the portion of the structure in question is equal to at least 85% of the specified strength.

.2 No single core is less than 75% of the specified strength.

.3 Cores should be retrieved with a length to diameter ratio of 2.0. The minimum permitted length to diameter ratio is 1.0. Cores with length to diameter ratios greater than 1.0 and less than 2.0 shall have correction factors applied in accordance with CSA Test Method A23.2:24-14C:24.

.4 The Engineer may also request additional uniformity testing via Schmidt Hammer (ASTM C805), Impact-Echo (ASTM C1383), Ultrasonic (ASTM C597), or

acceptable alternative, in conjunction with testing core samples.

.3 If appeal processes yield inadequate strengths, then the infrastructure in question shall be replaced as directed by the Engineer.

.4 All additional costs for appeals, replacement, and/or other remediation processes due to inadequate strength results are to be absorbed by the Contractor. Any contractor concerns over Owner's Consultant's conformance to CSA methods must be immediately communicated to the Engineer upon occurrence. Otherwise, will be given no consideration as a means of waiving additional costs associated with inadequate testing results.

.5 Any additional costs incurred for appeals, replacements, and/or other remediation resulting from Consultant's findings shall be the responsibility of the Contractor. It is incumbent upon the Contractor to address any concerns regarding sample integrity or testing methodology at the time of placement. No concerns raised after the review of testing results shall be considered.

.3 Replace all structural defects in concrete such as spalling, moderate to severe honeycombing, high points, low points, cracking, and delamination as deemed necessary by the Engineer.

.1 High and low points denoted as points outside of the surface tolerances outlined in CSA A23.1:24 clause 6.4, with a specific tolerance limit of 8mm.

.4 Replace all aesthetic defects in exposed concrete as deemed necessary by the Engineer. Aesthetic defects include minor honeycombing, ravelling, joint chipping, blemishes, embedded debris from tie holes, surface cracks, discolouration, formwork impressions, segregation, laitance, scaling, and general surface voids.

.5 Submit method and obtain approval of the Engineer prior to proceeding with remediation of all structural and aesthetic defects.

.6 Defective concrete work shall be evaluated for spalling via depth gauges and calipers, or via visual assessment, as necessary during the 2-year warranty period. Overall assessment shall be based on the following criteria:

Table 6: Criteria for Assessment of Defective Concrete

Condition	Depth of Spalling	Area (%) of Panel
1R	≤ 3 mm (⅛")	> 15%
2R	> 3 mm (⅛") & ≤ 6 mm (¼")	> 10%
3R	> 6 mm (¼")	> 5%
Legend:	R: Removal and replacement of the slab/panel	

.7 If requested by HRM to perform forensic analysis, complete mix design information including precise weights of all substituents, shall be submitted to the Engineer (TPW.TIM@halifax.ca)

3.12 Emissions Reduction

.1 Concrete production and construction must take into consideration the Canadian Treasury Board's aim to reduce greenhouse gas emissions for ready-mix concrete by at least 10% below the Regional Industry Average EPD. An outcome-based approach will allow various methods of reaching these targets.

PART 4 - MEASUREMENT & PAYMENT

4.1 General

.1 Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 – Measurement and Payment, of the Contract.

****** END PART A ******

CONCRETE QUALITY MANAGEMENT PLAN - TABLE OF CONTENTS

1. **Scope of Quality Management Plan**
2. **Quality Plan Inputs**
3. **Quality Objectives**
4. **Quality Plan Responsibilities**
   - .1 Personnel Roles and Responsibilities
5. **Control of Documented Information**
   - .1 Identification
   - .2 Review / Approval Matrix
   - .3 Distribution of Documented Information
   - .4 Preservation of Documented Information
6. **Resources**
   - .1 Materials
   - .2 People / Training
7. **Communications**
   - .1 Communication Resources
   - .2 Methods of Communication
   - .3 Customer Feedback
8. **Externally Provided Processes, Products and Services**
   - .1 Subcontractor Training
   - .2 Subcontractor Evaluation
9. **Production and Service Provision**
   - .1 Production and Placement Process
   - .2 Concrete Mixtures and Materials
   - .3 Concrete Finishing, Curing and Storage
   - .4 Competence / Qualification Requirements
   - .5 Testing Frequency
   - .6 Criteria for Acceptance of Products
   - .7 Standards / Codes and Regulatory Requirements
   - .8 Cold/Hot Weather Concreting
10. **Identification and Traceability**
11. **Control of Non-Conforming Outputs**
    - .1 Identification of Non-Conformances
    - .2 Communication of Non-Conformances
    - .3 Resolution of Non-Conformances
12. **Monitoring and Measurement**
    - .1 Test Methods
    - .2 Subcontractor use
    - .3 Data Analysis
    - .4 Remediation / Improvements
13. **Audits**

INDEX TO CLAUSES

PART 1 – GENERAL

1.1 Work Included
1.2 Reference Standards
1.3 Related Sections
1.4 Protection

PART 2 – PRODUCTS

2.1 Materials
2.2 Concrete Mix
2.3 Asphalt Concrete Mix

PART 3 – EXECUTION

3.1 Fine Grading
3.2 Reinforcement
3.3 Asphalt Tops and Castings
3.4 Concrete Structures
3.5 Tactile Walking Indicator Surfaces Placement
3.6 Asphalt Concrete Surfaces
3.7 Extruding Portland Cement Concrete and Asphalt Concrete
3.8 Backfilling

PART 4 – MEASUREMENT & PAYMENT

4.1 General

PART 1 - GENERAL

1.1 Work Included

.1 This section specifies requirements for constructing walks, curbs, and gutters. Work includes fine grading; supply, placing, and finishing of Portland Cement concrete and asphalt concrete; and backfilling.

1.2 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 Joint Committee on Contract Documents Standard Specification for Municipal Services.

.2 ASTM C309-19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM D1751-18, Standard specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

.4 ASTM D5249-10 (R2021), Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland Cement Concrete and Asphalt Joints.

.5 CSA A23.1:24/A23.2:24, Concrete materials and methods of concrete construction/methods of test and standard practices for concrete.

.6 HRM Section S-1, Specification for Hot Mix Asphalt Concrete.

.7 Nova Scotia Department of Public Works - Highway Construction and Maintenance.

.8 CSA B651:23, Accessible design for the built environment.

1.3 Related Sections

.1 From Joint Committee on Contract Documents Standard Specification for Municipal Services:

.1	Earthwork	Section 31 20 00

.2 Concrete Section S-11, Part A

1.4 Protection

.1 Protection, including security, if necessary, to prevent damage to newly installed walks, curbs, and gutters shall be provided at Contractor's expense.

.2 Keep sufficient covering on site to protect fresh concrete from damage by weather.

PART 2 – PRODUCTS

2.1 Materials

.1 Isolation Joint Filler according to ASTM D 1751.

.2 Granular Base shall be Type 1 Gravel to Section 31 20 00.

.3 Asphalt Materials according to HRM Standard S-1 Specification for Hot Mix Asphalt Concrete (HMA).

.4 Curing Compound according to ASTM C309: 19 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete, white in colour.

.5 Tactile Walking Indicator Surfaces Plates:

.1 Cast iron plates in accordance with ASTM A48, minimum class 30B, free from damage or blemishes, sound, free from casting faults, cracks, blowholes, and other defects.

.2 Attention type (truncated domes), 12-25mm top surface diameter, 22-35mm base surface diameter, 42-70mm centre-to-centre between domes to CSA B651:23 Clause 4.4.5.3.1.

.3 Directional type (flat-top elongated bars), 17-30mm top surface width, 27-40mm base surface width, 57-85mm centre-to-centre between bars, in accordance with CSA B651:23 Clause 4.4.5.4.1.

.4 Both types of indicators must be slip resistant and colour contrasted with surrounding walking material in accordance with CSA B651:23.

2.2 Concrete Mix

.1 Concrete in accordance with Section S-11, Part A and as specified herein.

.1 Exposure class of C-2 as outlined in CSA A23.1:24 Tables 1

and 2.

.2 Slump shall be in accordance with CSA A23.1:24 Clause 4.3.2.3.1.

.3 Macro-synthetic fibres shall be in accordance with Project Documentation.

.4 Concrete placed during cold weather concreting shall have a minimum temperature of 16 ºC and maximum temperature of 28 ºC at the time of placement.

2.3 Asphalt Concrete Mix

.1 Asphalt Concrete Mix according to HRM Standard S-1 HMA

PART 3 - EXECUTION

3.1 Fine Grading

.1 Fine grade gravel surface prior to placing Portland cement concrete or asphalt concrete.

3.2 Reinforcement

.1 Reinforcing steel mesh to be positioned at appropriate height using non-reactive chairs.

3.3 Adjusting Tops of Castings

.1 Adjust castings to match finished surface prior to placing surface course of asphalt concrete or Portland cement concrete.

3.4 Concrete Structures

.1 Complete concrete work in accordance with Section S-11, Part A and as specified herein:

.1 Placing:

.1 Place concrete in continuous operation beginning at lowest point. Tamp or vibrate to prevent honeycombing.

.2 Jointing:

.1 Isolation joints shall follow CSA A23.1:24 Clause 7.3.4, to be of full depth and installed where concrete abuts an

existing structure (ex. curbs, buildings, lamp post, fire hydrants, water valves, etc.), or as indicated by the Engineer. Isolation material may be a polyethylene foam, cross link polyethylene foam, or polyurethane and confirm to the requirements of ASTM D 5249.

.2 Contraction (control) joints shall follow CSA A23.1:24 Clause 7.3.3, to be between one quarter to one third of section thickness. Space joints every 3 metres for curbs and every 1.5 metres for concrete walks unless otherwise indicated. Saw cutting with a wet cut saw typically occurs between 8 to 24 hours after placement. Prior to saw cutting, ensure concrete is sufficiently set to resist ravelling and before shrinkage cracks appear. If section contains non isolated walks and curbs, contraction joints shall be aligned where practical. Provide a contraction joint within 150 mm of change in cross section of curbs, gutters, and walks. Panels shall not contain wedges with angles less than 60 degrees. Reinforcement as required by the Engineer should be considered if lower angles are required.

.3 Construction joints shall follow CSA A23.1:24 Clause 7.3.2, to be of full depth and to be used at the end of days construction or when the placement of concrete is interrupted by more than 30 mins. 15 mm thick bitumen impregnated fibreboard to be used as joint material with three (3) 10 mm smooth steel bars evenly spaced where the free ends of the dowel bars are greased and have an expansion cap on one end. Concrete cover to be 50 mm. Joint shall be finished with an edging tool with a 12.7 mm radius.

.4 Expansion joints shall follow CSA A23.1:24 Clause 7.3.5, to be of full depth and spaced 30 m apart and at every cold joint. Joints also to be placed between curb and sidewalk which are perpendicular to each other. For expansion joints between walks and curbs and/or gutters, full depth will still apply however just the bitumen impregnated fibreboard shall be used. For expansion joints between walks, 15 mm thick bitumen impregnated fibreboard to be used as joint material with three (3) 10 mm smooth steel bars evenly spaced where the free ends of the dowel bars are greased and have an expansion cap on one end. Concrete cover to be 50 mm. Joint shall be finished with an edging tool with a 12.7 mm radius. Top surface of fiberboard to be fully exposed along its entire length.

.5 Concrete placed against utility poles shall have a suitable bond breaker installed and be treated as an isolation joint as described above.

.6 Finish perimeter of all slabs with an edging tool.

.3 Finishing:

.1 Do not apply water to newly placed concrete surfaces.

.2 Broom exposed concrete surfaces to provide evenly textured, non-skid surface.

.4 Curing:

.1 Apply curing compound in accordance with CSA A23.1:24 Clause 7.8. Curing compound to be applied to the entire surface and all faces. Concrete to have a uniform white colour after application of curing compound.

.5 Form Stripping:

.1 Strip forms only when concrete has developed sufficient strength to resist damage to corners and edges.

.2 Bump-out/Curb Extension reinforcement:

.1 Concrete mixture for curb and gutter on bump-out construction to contain macro-synthetic fibers with a minimum Fe,150 of 1.2 MPa or as specified in Project Documentation.

.3 Trip hazard mitigation:

.1 All finished surfaces shall be carefully inspected to identify potential trip hazards.

.2 The Contractor shall ensure that surfaces meet safety standards and adhere to local regulations and any applicable legal precedents.

.3 Regular assessments shall be carried out during and after construction to identify and rectify any surfaces deviating from the acceptable tolerance of 8 mm between adjacent surfaces, as measured with a 2 m straight edge. These surfaces shall be promptly corrected to ensure the safety of pedestrians. If such deviations can be reasonably rectified while the concrete is still in a workable state, the Contractor

can proceed with the necessary adjustments without Engineer approval. However, if the concrete has already set and significant alterations are required, the Contractor must inform the Engineer. Alternatively, if the Contractor feels that the hazard is due to subgrade conditions out of their control, such as a tree root, they will inform the engineer of these conditions. In such cases, the decision to proceed with grinding, removal, and replacement, or alternative repairs shall be at the Engineer's discretion.

3.5 Tactile Walking Indicator Surfaces Placement

.1 Tactile plate layout to be developed following HRM Standard Detail 131 and as specified in Project Documentation, or if not specified, to be conducted by the Contractor via field measurements.

.2 Tactile plates shall be placed with the top of the base plate (bottom of the truncated domes and/or flat-top elongated bars) flush with concrete surface.

.3 Attention type tactile plates to be positioned between 100mm to 200mm from the curb edge when utilized for hazard identification at intersections and shall be installed as per CSA B651:23 Clause 4.4.5.4.3, and HRM Standard Detail 131.

.4 Directional type tactile plates shall be installed as per CSA B651:23 Clause 4.4.5.4.3, and HRM Standard Details and/or as specified in the Project Documentation.

3.6 Asphalt Concrete Surfaces

.1 Place asphalt concrete mix in accordance with HRM Standard S-1, Specification for Hot Mix Asphalt Concrete.

3.7 Extruded Portland Cement Concrete and Asphalt Concrete

.1 Submit extruding equipment and mule configuration for review by the Engineer.

.2 The bottom of the granular base and sub-base for curb is to match that of street gravels or 150 mm thick minimum, whichever is greater.

.3 Curb bedding shall be 150 mm Type 1 gravel. The remainder shall match type and depth of street gravels.

.4 Outside edge of curb bedding to be 150 mm behind curb at surface and increase 100 mm for each 200 mm below curb.

3.8 Backfilling

.1 Backfill when Portland cement concrete or asphalt concrete have strength sufficient to resist damage from backfilling operations. Backfill to Section 31 20 00.

.1 The Contractor shall backfill the area behind the curb to a distance not less than 0.6 m from the back of the curb. The material used shall be free from large rock, organic and/or deleterious material.

PART 4 - MEASUREMENT & PAYMENT

4.1 General

.1 Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 – Measurement and Payment, of the Contract.

****** END PART B ******

INDEX TO CLAUSES

PART 1 – GENERAL

1.1 Work Included
1.2 Reference Standards
1.3 Related Sections
1.4 Submittals

PART 2 – PRODUCTS

2.1 Materials
2.2 Concrete Mix

PART 3 – EXECUTION

3.1 Concrete Quality
3.2 Defective Work

PART 4 – MEASUREMENT & PAYMENT

4.1 General

PART 1 - GENERAL

1.1 Work Included

.1 This section specifies requirements for constructing precast concrete. Work includes supply, placing, and finishing of Portland Cement concrete.

1.2 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 Joint Committee on Contract Documents Standard Specification for Municipal Services.

.2 ASTM C1610/C1610M, Standard Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique.

.3 ASTM A933-14, Standard Specification for vinyl Coated Steel Wire and Welded Wire Reinforcement.

.4 ASTM C260-10A (R2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.5 ASTM C309-19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.6 ASTM C494/C494M-19, Standard Specification for Chemical Admixtures for Concrete.

.7 ASTM C1017-13E1, Standard Specification for Chemical Admixtures for Use in Producing Flooring Concrete.

.8 CSA A3000-23, Cementitious materials compendium.

.9 CSA A23.1:24/A23.2:24, Concrete materials and methods of concrete construction/methods of test and standard practices for concrete.

.10 CSA A23.4-16(R2021), Precast concrete – materials and construction.

.11 CSA A283:24, Qualification code for concrete testing laboratories.

.12 CSA G30.18-09 (R2019), Billet-steel bars for concrete reinforcement.

.13 CSA S269.1-16, Falsework and formwork.

1.3 Related Sections

.1	Concrete	Section S-11, Part A
.2	Precast Manholes, Catch Basins, and Structures	Section 33 39 00
.3	Walks, Curbs, and Gutters	Section S-11, Part B
.4	Interlocking Concrete Pavers	Section S-12

1.4 Submittals

.1 Contractor to submit production schedule to the Engineer.

.2 Contractor to provide the Engineer with copies of QC records prior to approval of delivery of products to site. QC records shall contain at minimum all pertinent and CSA-mandated supplementary information related to the plastic and hardened properties such as air content, temperature, slump/slump flow, and compressive strength as outlined in CSA A23.2:24-24C and test specific specifications.

.3 If not included in the Contractor's Comprehensive QMP submission, the Contractor shall submit a supplementary QMP to the Engineer (TPW.TIM@halifax.ca) for review, a minimum of 15 working days prior to commencement of any precast concrete work as part of the project(s). The supplementary QMP shall be prepared to fit the criteria of the unique project. The Engineer will provide a Contractor QMP Approval Letter in a timely manner, prior to commencement of this work.

If the Engineer deems the supplementary QMP unacceptable, the Contractor shall provide iterations in a timely manner until the QMP is considered adequate by the Engineer. Construction related to precast concrete work as part of a project(s) shall not commence without the Contractor's QMP Approval Letter for the project.

Note, if deemed necessary by the Contractor, an amended QMP can be submitted to the Engineer for review and approval at any point throughout the construction season (ends December 30th of the calendar year).

An outline for a QMP, based on ISO 10005, is provided for reference in Attachment A.

.4 Contractor to submit shop drawings for each precast culvert containing the following information:

- Station of culvert, name of watercourse, with HRM project number and description;
- General layout showing all culvert sections and appurtenances;
- Length and weight (mass) of individual sections;
- Joint details (including gap, gasket, connection plates, and waterproofing);
- Proposed construction joints (if sections not cast monolithically);
- Location and type of inserts and list devices (including location where rebar and/or mesh will be cut for life anchors);
- Location of reinforcing steel (including additional reinforcement around large openings);
- Bar schedules for all reinforcing steel;
- Itemized supply list;
- Detail showing year of fabrication embedded in headwalls;
- Concrete design strength, age of test, form removal strength, and shipping strength;
- One set of design calculations; and
- Location of manufacturing plant;

.5 Contractor to submit documentation for each precast catch basin as/if outlined in latest edition of Halifax Water specification.

.6 Certification and Membership

.1 Precast concrete manufacturer shall be certified by the Canadian Precast Concrete Quality Assurance Certification Program in accordance with CSA A23.4, latest edition prior to tender. Proof of certification shall be provided prior to award of the contract. The certification shall also indicate for what category the plant is certified for as described in CSA A23.4:16 Clause 4.1.

.2 Quality control technicians must possess at least the basic certification recognized by CSA for concrete testing procedures performed such as CCIL Type Q or an equivalent certification. Technicians may require additional certifications, such as CSA A23.2:24-19C for specialized testing.

.3 The concrete testing laboratory must hold certification for concrete testing from a recognized authority, such as CCIL Type Q or an equivalent certification following CSA A23.2:24 standards. The laboratory must maintain current certification and demonstrate compliance with testing standards for accuracy and reliability as specified in CSA A283:24.

.4 Upon written request from HRM, the Contractor shall

coordinate with the precast concrete manufacturer(s) to allow for HRM (or its representative) to perform an inspection at the precast concrete manufacturer's location (facility) for any precast concrete being manufactured for the project, *if requested* by HRM. For clarity, it is the responsibility of the Contractor, and not HRM, to coordinate this inspection and such inspection is to occur during the period set forth in the written notification or during another period agreed to by HRM in writing. The inspection conducted by HRM (or its representative) will verify compliance with certification requirements, testing standards, and quality control procedures.

.7 Prior to use of any proposed self-consolidating concrete (SCC) mixture, a trial batch must be produced and tested to demonstrate mix design meets the performance requirements following CSA A23-1:24 Table 22 for Flow, T- 50 cm time and VSI value. If component has reinforcement a J-ring test shall be performed. ASTM C1610/C1610M Column Segregation shall be used for pre-qualification of mix design.

.8 If requested by HRM, the precast concrete manufacturer shall provide documentation that the facility, materials, and products selected for use on a project address any of the following:

.1 Compliance with latest Nova Scotia Environmental Act and regulations pertaining to Industrial facilities. All facilities shall comply with water taking permits, air and noise pollution, discharge of process water and waste generation regulations.

PART 2 – PRODUCTS

2.1 Materials

.1 Materials in accordance with Concrete Section S-11, Part A.

2.2 Concrete Mix

.1 Concrete in accordance with Section S-11, Part A and as specified herein.

.1 Concrete for culverts and related structures to be of minimum class C-1 as outlined in CSA A23.1:24 Table 1 and to follow latest Halifax Water Specifications.

.2 Concrete for Halifax Water manholes or catch basins to follow latest Halifax Water specifications.

.3 Structural elements shall have calcium nitrate corrosion inhibitor added, at a rate of 15 L per cubic metre containing between 30 % and 36 % calcium nitrate by weight of solution. Batch water in concrete mix design shall be reduced to account for water in corrosion inhibitor.

PART 3 – EXECUTION

3.1 Concrete Quality

.1 Precast concrete manufacturer responsible for QC of their product.

.2 Precast concrete manufacturers shall perform sampling and testing in accordance with CSA A23.2:24, including casting test specimens, air content, temperature, and slump testing.

.1 For both dry-cast and wet-cast manufacturing, at least two (2) strength test specimens shall be cast for every production run per day.

.2 Strength test specimens shall be tested at the specified age for the exposure class according to CSA A23.1:24 Table 2, typically 28 days unless otherwise noted.

.3 All testing, including air content, temperature, slump, and strength, shall be conducted after the addition and incorporation of all materials, including admixtures.

.3 QA testing to be conducted by HRM or its representative. QA testing shall include verification of the quality management plan and records submitted by the Manufacturer as well as access to all phases of product manufacture including:

- Pre-stressing operations, where applicable;
- Installation of reinforcing steel and support, inserts;
- Aggregate testing;
- Concrete production, placement, and curing;
- De-tensioning operations, where applicable;
- Finishing of members;
- Dimensions and tolerances;
- Handling and storage; and,
- Transportation and delivery.

.4 QA testing may be waived at the Engineer’s discretion so long as required QC report submittals are maintained.

3.2 Defective Work

.1 Defective work shall be in accordance with Concrete Section S-11 Part A. In addition, precast concrete infrastructure may be inspected and accepted by HRM's representative prior to installation, and repair work, if required, to the satisfaction of HRM.

PART 3 - MEASUREMENT & PAYMENT

3.1 General

.1 Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 – Measurement and Payment, of the Contract.

****** END PART C, END S-11 ******

INDEX TO CLAUSES

PART 1 – GENERAL

1.1 Work Included
1.2 Reference Standards
1.3 Related Sections
1.4 Submittals
1.5 Delivery, Storage, and Handling
1.6 Environmental Conditions

PART 2 – PRODUCTS

2.1 Pavers, Bedding, and Edging
2.2 Concrete Under Pavers

PART 3 – EXECUTION

3.1 Standard Concrete Paver Installation
3.2 Edge Restraints
3.3 Bedding Sand
3.4 Surface Course
3.5 Paver Joint Sand
3.6 Polymeric Sand Placement
3.7 Finish Paver Grade
3.8 Emissions Reduction

PART 4 – MEASUREMENT & PAYMENT

4.1 General

PART 1 - GENERAL

1.1 Work Included

.1 This section specifies requirements for interlocking concrete paving, including excavation, bedding sand, preparation of bedding, compacting, and installation of concrete paver units, geotextile, joint sand, and edge restraints.

1.2 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 Joint Committee on Contract Documents Standard Specification for Municipal Services.

.2 ASTM C136-19, Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM C140-22, Sampling and Testing Masonry Units and Related Units.

.4 ASTM C936-21b, Specification for Solid Interlocking Concrete Paving Units.

.5 ASTM C979-16, Specification for Pigments for Integrally Colored Concrete.

.6 ASTM D698-12(2021), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m^3).

.7 ASTM D1557-12E1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m^3).

.8 CSA A23.1:24/A23.2:24, Concrete materials and methods of concrete construction / test methods and standard practices for concrete.

.9 CSA A179-14 (R2019), Mortar and grout for unit masonry.

.10 CSA A231.1:19/A231.2:19, precast concrete paving slabs/precast concrete.

.11 Interlocking Concrete Paving Institute (ICPI).

.1 Tech Spec Technical Bulletins, Vol. 1- latest edition.

.2 ICPI Fact sheet for Permeable Interlocking Concrete Pavement (PICP).

.12 AASHTO 1993 Guide for low-speed roads and parking lots.

1.3 Related Sections

.1 From Joint Committee on Contract Documents Standard Specification for Municipal Services, latest edition:

.1	Earthwork	Section 31 20 00
.2	Concrete	Section S-11

1.4 Submittals

.1 If not included in the Contractor's Comprehensive QMP submission, the Contractor shall submit a supplementary QMP to the Engineer (TPW.TIM@halifax.ca) for review, a minimum of 15 working days prior to commencement of any interlocking concrete paver work as part of the project(s). The supplementary QMP shall be prepared to fit the criteria of the unique project. The Engineer will provide a Contractor QMP Approval Letter in a timely manner, prior to commencement of this work.

If the Engineer deems the supplementary QMP unacceptable, the Contractor shall provide iterations in a timely manner until the QMP is considered adequate by the Engineer. Construction related to interlocking concrete paver work as part of a project(s) shall not commence without the Contractor's QMP Approval Letter for the project.

Note, if deemed necessary by the Contractor, an amended QMP can be submitted to the Engineer for review and approval at any point throughout the construction season (ends December 30th of the calendar year).

An outline for a QMP, based on ISO 10005, is provided for reference in Attachment A.

.2 If specified in Project Documentation, submit shop drawings indicating layout, pattern, and relationship of paving joints to fixtures and project formed details. Note, Project Documentation may request additional details than referenced above.

.3 Submit full size samples of concrete paving units to indicate color and shape selection.

.4 Submit sieve analysis of bedding and joint sand.

.5 Submit test results from an independent testing laboratory for compliance of paving unit requirements to ASTM C936 or other

applicable requirements as determined by the Engineer.

.6 Certification and Membership

.1 Submit manufacturer's certification of concrete pavers as having passed applicable ASTM or CSA standards.

.2 Upon written request from HRM, the Contractor shall coordinate with the interlocking concrete paver manufacturer(s) to allow for HRM (or its representative) to perform an inspection at the interlocking concrete paver manufacturer's location (facility) for any interlocking concrete pavers being manufactured for the project, *if requested* by HRM. For clarity, it is the responsibility of the Contractor, and not HRM, to coordinate this inspection and such inspection is to occur during the period set forth in the written notification or during another period agreed to by HRM in writing. The inspection conducted by HRM (or its representative) will verify compliance with certification requirements, testing standards, and quality control procedures.

1.5 Delivery, Storage, and Handling

.1 Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped cubes capable of transfer lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.

.2 Cover sand with waterproof covering to prevent exposure. Secure the covering in place.

1.6 Environmental Conditions

.1 Do not install sand and pavers over frozen base materials or saturated sand.

PART 2 - PRODUCTS

2.1 Pavers, Bedding, and Edging

.1 The Interlocking Concrete Pavement Institute (ICPI) shall approve manufacturers.

.2 Concrete paver requirements:

.1 Paver dimensions in accordance with CSA A321.2:1-19 Clause 6.1.1.

.2 Compressive strength testing conducted according to CSA A231.2 Clause 7.3, where an average compressive strength of the test samples shall be not less than 55 MPa with no individual unit less than 50 MPa.

.3 Absorption testing conducted to ASTM C140 where an average absorption of the test samples shall not be greater than 5% with no individual unit greater than 7%.

.4 Freeze thaw durability testing conducted according to CSA A231.2 Clause 7.4 where no greater mass loss than 200 g/m^2 when subjected to 25 freeze-thaw cycles or no greater than 500 g/m^2 when subjected to 50 freeze-thaw cycles in 3% saline solution test.

.3 Pigment shall conform to ASTM C979.

.4 Granular base materials:

.1 Sub-base shall be Type 2 as specified in Section 31 20 00 or as specified in the Project Documentation.

.2 Base shall be Type 1 as specified in Section 31 20 00 or as specified in the Project Documentation.

.5 Manufactured sand for bedding shall follow CSA A23.1:24 Clause 4.2.3.3 to be hard, durable, crushed stone particles, to the gradation specified in CAN/CSA A23.1:24 Table 10 (FA1) with no more than 1 % passing the 80 µm sieve and tested according to CSA Test Method A23.2:24-5A:24. Sand to be free from clay lumps, cementation, organic material, frozen material, and other deleterious materials. Do not use limestone screenings or sand that does not meet gradation requirements. Do not use mason's sand for sand bedding.

.6 Joint sand shall be according to CSA A23.1:24 Clause 4.2.3.3.2, with Gradation to CSA A23.1:24 Table 10 (FA1) with no more than 1 percent passing the 80 µm or CSA A179. Joint sand shall be comprised of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material, and other deleterious materials.

.7 Polymeric binder shall be non-chemical, non-toxic, colourless, odourless additive for joints of interlocking concrete and clay brick paving.

.8 Edge restraints shall be metal, plastic, or concrete as per ICPI Tech Spec 3 or as specified in Project Documentation.

.9 Geotextile filter: as specified in the HRM Municipal Design Guidelines or Project Documentation.

2.2 Concrete Under Pavers

.1 May be constructed using one of the following types of Portland cement concrete pavement:

- Jointed concrete;
- Jointed reinforced concrete;
- Continuously reinforced concrete; or,
- Roller-compacted concrete.

.2 Concrete construction shall follow the requirements of the AASHTO 1993 Guide for low-speed roads and parking lots, Section S-11, and as specified in the Project Documentation.

PART 3 - EXECUTION

3.1 Standard Concrete Paver Installation

.1 Prepare sub-grade to ASTM D698 or ASTM D1557 as applicable to allow for installation of granular base.

.1 For furnishing zone pavers, prepare concrete base per the HRM Standard Details or Project Documentation.

.2 Install geotextile filter as specified in the HRM Municipal Design Guidelines or Project Documents.

.3 Construct base to minimum thickness as specified in the HRM Municipal Design Guidelines or Project Documents.

.4 Spread and compact crushed stone or gravel base in uniform layers not exceeding 150 mm compacted thickness.

.5 Compact base to a density of not less than 98 % Standard Proctor Density in accordance with ASTM D698.

.6 Shape and compact alternately to obtain a smooth, even, and uniformly compacted granular base in conformity with finish surface grades.

.7 Apply water as necessary during compaction to obtain water content within 2 % of optimum. If granular base is excessively moist, remove it and install more granular material to rid it of sponginess.

.8 Top of granular base not to exceed plus or minus 8 mm deviation

over a 2 m straightedge.

3.2 Edge Restraints

.1 Install edging true to grade, in location, layout, and pattern as indicated.

.2 Abut pavers tightly against edge restraints to prevent rotation under load and any subsequent spreading of joints.

.3 Install edge restraints so that they can withstand temperature changes, vehicular traffic, and snow removal equipment.

.4 Use edge restraints along all unrestrained paver edges and support on a minimum of 150 mm of aggregate base.

3.3 Bedding Sand

.1 Place and spread bedding sand to an uncompacted nominal thickness of 1 in. (25mm).

.2 Maximum uncompacted thickness not to exceed 40 mm.

.3 Use granular base material to compensate for depressions that exceed specified tolerances in surface of base.

.4 Bedding sand shall be compacted during the compaction of the pavers.

.5 Do not use polymeric jointing sand for bedding sand.

3.4 Surface Course

.1 Keep bedding sand and granular base free of foreign material prior to placement of concrete pavers. Do not allow water saturation to occur.

.2 Install unit paving true to grade on the bedding sand, in location, layout and pattern as indicated.

.3 Joint between pavers is to be between 2 mm and 5 mm wide or as indicated in the Project Documents.

.4 Precast concrete paving slabs:

.1 Install paving slabs with the joints of the prescribed width as indicated on the drawings.

.2 Compact and level units with a minimum 22 kN force mechanical plate vibrator.

.3 Do not compact unit paving within 2 m of unrestrained edges.

3.5 Paver Joint Sand

.1 Fill spaces between pavers by sweeping in sand. Sweep off excess sand.

.2 Utilize a mechanical plate vibrator specifically designed for interlocking concrete pavers to achieve compaction of sand in joints. Prior to completion of compaction, ensure that all joints are adequately filled.

3.6 Polymeric Sand Placement

.1 After paving has been compacted, sweep polymeric sand into joints, remove excess material remaining on the surface and remove any remaining sand/binder on paver surface prior to activation.

.2 Activate polymeric sand in accordance with manufacturer's instructions.

3.7 Finish Paver Grade

.1 At the completion of each workday, confirm all work within 2 m of laying face is to be left fully compacted and all joints are filled. Cover laying face with plastic sheets overnight.

.2 Surface of finished pavement: Free from depressions exceeding 8 mm as measured with 2 m straight edge.

.3 Surface elevations of pavers to be 3 mm to 6 mm above adjacent drainage inlets, concrete collars, or channels.

.4 Sweep surface clean and check final elevations.

3.8 Emissions Reduction

.1 Concrete production and construction must take into consideration the Canadian Treasury Board's aim to reduce greenhouse gas emissions for ready-mix concrete by at least 10% below the Regional Industry Average EPD. An outcome-based approach will allow various methods of reaching these targets

PART 4 - MEASUREMENT & PAYMENT

4.1 General

.1 Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 – Measurement and Payment, of the Contract.

****** END S-12 ******

Traffic Control Manual Supplement

Halifax Regional Municipality

January 2025

HALIFAX

NEW FOR 2025

The following is a list of significant changes in this document compared to the version published in January 2024. Minor changes will not be specifically called out:

Removals:

Former sections 2 PRE-CONSTRUCTION MEETINGS, 3 PERMITS, 7 ROUNDABOUTS, 12 IDENTIFICATION OF TRAFFIC CONTROL SIGNAGE, and 18 SIGNALIZED INTERSECTIONS have been removed. These requirements have already been addressed by the MANUAL and other existing legislation.

Additions: new concepts are identified within this document using the year graphic in the left margin.

2025

3 TRAFFIC CONTROL PLANS

- Changed terminology from "Construction Management Plan" back to "Traffic Control Plan" to distinguish the requirements in this document from those described within the *Administrative Order on Construction Site Management* (which is specific to development-related construction).

3.2 IMPACTS TO CYCLISTS

- Clarified MANUAL requirement that temporary construction signs installed over bicycle lanes or multi-use pathways must provide a minimum vertical clearance of 2.5m.

3.3 IMPACTS TO TRANSIT

- Added requirement to provide 5m of curb space in front of a transit stop for the bus to maneuver.

9.1 SIDEWALK CLOSURES

- Added criteria for when a sidewalk closure with a pedestrian detour is required (when minimum clear width of 1.6m and clear height of 2.1m cannot be maintained due to Long Duration Work).
- Added expectations for providing a temporary sidewalk when the sidewalk is closed.

9.4 STREET CLOSURES

- Added expectation that detour routes should utilize streets that are a similar classification to the street that is being closed.

10 CLOSURE NOTIFICATION

- Added requirement for a closure to be approved by HRM prior to notification being delivered.
- Changed the description of street closure to include one-way and directional closures.

10.1 LONG DURATION CLOSURES FOR HRM PROJECTS

- Added requirement for notification at least 60 days in advance of a full street closure for an HRM Capital Project on a Schedule A Restricted Street that will be in place for more than 3 weeks with a detour route over 1km in length.
- Added requirement for notification at least 30 days in advance of a full street closure for an HRM Capital Project that will be in place for more than 3 weeks with a detour route over 1km in length.

TABLE OF CONTENTS

PART I – GENERAL PROVISIONS

1 INTRODUCTION

2 DEFINITIONS

3 TRAFFIC CONTROL PLANS

3.1 IMPACTS TO PEDESTRIANS

3.2 IMPACTS TO CYCLISTS

3.3 IMPACTS TO TRANSIT

3.4 IMPACTS TO PARKING

3.5 ADVANCE WARNING SIGNS

4 TRAFFIC AUTHORITY CONSULTATION & APPROVAL

PART II - DISRUPTION MANAGEMENT

5 MINIMUM LANE WIDTHS

6 MINIMUM NUMBER OF LANES

7 HOURS OF WORK

8 EXEMPTIONS

8.1 VERY SHORT DURATION WORK

PART III - CLOSURES

9 CLOSURES

9.1 SIDEWALK CLOSURES

9.2 BICYCLE LANE CLOSURES

9.3 TRANSIT LANE CLOSURES

9.4 STREET CLOSURES

10 CLOSURE NOTIFICATION

10.1 LONG DURATION CLOSURES FOR HRM PROJECTS

SCHEDULE A – List of Restricted Streets

SCHEDULE B – List of Holiday Exemptions to Restricted Streets

SCHEDULE C – Document Version Control

1 INTRODUCTION

The following requirements apply to all contractors, organizations, and others doing work on streets that are owned and maintained by Halifax Regional Municipality. These requirements are in addition to the *Nova Scotia Temporary Workplace Traffic Control Manual*, latest edition (referred to in this document as the MANUAL), published by Nova Scotia Department of Public Works.

It is the responsibility of every contractor, owner, or organization doing work in Halifax Regional Municipality to be familiar with applicable provincial laws as well as municipal by-laws, administrative orders, regulations, and ordinances. This includes but is not limited to:

- Streets By-law (S-300)
- Noise By-law (N-200)
- Truck Routes By-law (T-400)

Traffic control signage that is placed within HRM's street right of way must not create a hazard for road users (pedestrians, cyclists, and vehicles) and the signage must include the owner's name or logo, as per the MANUAL, so that the owner of the sign can be immediately identified.

Failure to comply with the requirements in this document may result in penalties in accordance with HRM's Streets By-law (S-300).

2 DEFINITIONS

For the purposes of this document:

- "Engineer" means the Engineer of the Halifax Regional Municipality and includes a person acting under the supervision and direction of the Engineer.
- "Traffic Authority" means the Traffic Authority or Deputy Traffic Authority of the Halifax Regional Municipality (per HRM's *Administrative Order 12*, as amended from time to time).

All other definitions shall be consistent with those provided in the *Nova Scotia Temporary Workplace Traffic Control Manual*, latest edition (the MANUAL).

3 TRAFFIC CONTROL PLANS

2025

Traffic Control Plans (TCPs) must be submitted to HRM for review prior to every project impacting road users on HRM-owned streets. Plans must include information about how each type of road user (pedestrians, cyclists, and vehicles) will be safely guided past the work area. The TCP must include contact information for the qualified Temporary Workplace Signer (TWS) who created it.

When Traffic Authority approval is required, the TCP must include a detailed diagram and signature block; otherwise, the format of the TCP will depend on the complexity of the traffic control setups and information may be conveyed through an appropriate combination of text and/or diagrams.

HRM reserves the right to request additional detail or information prior to issuing a ROW Permit.

3.1 IMPACTS TO PEDESTRIANS

Pedestrian Management Plans (PMPs) are a type of TCP that considers pedestrians of all abilities, including those using mobility aids such as canes, walkers, and wheelchairs. Particular attention to detail is necessary for pedestrian impacts along a transit route where the work area includes a bus stop that will remain open, and the plans must include comments on how access will be maintained to the transit stop.

3.2 IMPACTS TO CYCLISTS

2025

Further to what is described in the MANUAL, temporary construction signs that are installed over bicycle lanes or multi-use pathways must provide a minimum vertical clearance of 2.5 metres.

3.3 IMPACTS TO TRANSIT

Every effort should be made to maintain access to bus stops along designated transit routes. Halifax Transit bus stops may remain open near work areas if the following criteria are met:

2025

- The curbside lane remains open and accessible for buses. A minimum of 40 metres of curb space before the bus stop sign and 5 metres after it is required for a bus to pull in and out of the stop; and,
- The sidewalk or shoulder adjacent to the street remains open and accessible for pedestrians. Transit considers a gravel walking surface to be open but not accessible for pedestrians, and they must be notified if the accessibility status of a bus stop is changed due to construction.

TCPs must clearly indicate the location of and impact to any bus stops within a work area. Halifax Transit will determine if a bus stop needs to be closed.

If work will impact Halifax Transit routes or stops, a minimum of 5 business days notice prior to the start of construction is required to close stops and re-route buses.

3.4 IMPACTS TO PARKING

The contractor shall make every attempt to prevent parking in the work area by using cones or other delineators to reserve the curb space required for construction activities.

Contractors may install their own non-regulatory signs to restrict parking, subject to the following requirements:

- Signs must be text only and resemble a construction sign (with black letters on an orange background).
- Signs installed by the contractor must not cover any existing signs (including parking controls).
- Signs installed by the contractor are not enforceable through HRM Parking Enforcement, but they may prove helpful in protecting space ahead of planned works.
- Parking restriction signs should be installed at least 24 hours in advance of construction for maximum effectiveness.

Having HRM install regulatory signage for the purposes of restricting parking for construction activities will only be considered in exceptional circumstances. **Requests for temporary regulatory signage must be submitted a minimum of 10 business days in advance of construction.**

3.5 ADVANCE WARNING SIGNS

HRM may require advance warning signs for any construction project which is expected to cause major delays or affect a large number of road users. The use of these signs must be identified on the TCP including the location of the advance warning, the proposed type of advance warning (electronic variable message signs, static text signs, etc.) and the proposed message. HRM may require the message to be modified at any time.

Portable Electronic Variable Message Sign usage must be consistent with Nova Scotia Department of Public Works *Policy PO1028 – Use of Portable Variable Message Signs*.

4 TRAFFIC AUTHORITY CONSULTATION & APPROVAL

As per the requirements of the MANUAL, and notwithstanding emergency situations, HRM must be consulted before disabling, covering, altering, or removing any permanent signs, traffic signals or beacons, and pavement markings. HRM must also be consulted before any detour routes are established. These elements must be clearly described within the TCP.

Per the MANUAL, the following traffic control conditions are not permitted without written authorization from the Traffic Authority:

Description	MANUAL Section
Partial lane closures on multi-lane roads	7.0
Altered centerline on a highway (road with speed limit > 50 km/h)	7.0
Altered centrelines on multi-lane roads when lane widths are being reduced	7.0
Speed limit reductions	8.3 + 13.3
Installation of permanent stop signs (for the duration of the project)	8.4
Extending work areas where pilot vehicles are used beyond 2km	9.4
Use of temporary traffic control signals	9.6
As noted in various Application Guides within the MANUAL	

If the Traffic Authority is to authorize the above noted conditions, the TCP must have a space for the Traffic Authority's signature and date as well as identify why the Traffic Authority is signing the document. Below is an example signature block:

Approved by: _____

HRM Traffic Authority / Deputy Traffic Authority Date

For the approval of **(*insert reason here – example: use of temporary traffic signals*)** only. All other aspects of this Traffic Control Plan must follow the Nova Scotia Temporary Workplace Traffic Control Manual, latest edition.

5 MINIMUM LANE WIDTHS

Notwithstanding the requirements of the MANUAL, minimum lane width requirements for HRM-owned streets are outlined below. The Engineer may require lane widths wider than these minimums to ensure the safe flow of traffic:

- The minimum width of any narrowed lane shall be 3.0 metres.
- A minimum lane width of 3.5 metres is required where lanes are separated by painted lines (rather than being separated by physical delineators).

6 MINIMUM NUMBER OF LANES

Reducing the road down to one single traffic lane must be avoided on certain streets due to the significant delays it would cause. A list of streets where two-way traffic must be maintained can be found in *Schedule A*, and below is an explanation of these requirements:

- **Maintain Two Lanes at All Times**: at least two lanes of traffic (one in each direction) must be maintained and stop-and-go traffic control is not permitted.
- **Maintain Two Lanes During Peak Hours**: at least two lanes of traffic (one in each direction) must be maintained during peak hours (7-9AM & 4-6PM, Monday to Friday, holidays excluded). If this condition cannot be met, then normal Peak Hour Restriction will apply.

7 HOURS OF WORK

Hours of work shall be restricted in accordance with HRM's Noise By-law (N-200). Further to this, a specific list of streets with restricted hours of work can be found in *Schedule A*, and below is an explanation of these requirements. Note that when a temporary workplace encompasses multiple streets the most stringent restrictions will apply.

- **Peak Hour Restriction**: No on-street work[*] may occur during peak hours, which are defined as 7-9AM & 4-6PM from Monday to Friday, excluding holidays (which are defined in *Scheule B*).

  On the day before the Canada Day long weekend (if applicable), as well as the Fridays before Natal Day and Labour Day, peak hours are defined as 7-9AM & 2-6PM.
- **PM Peak Hour Restriction Only**: No on-street work may occur during afternoon peak hours, which are defined as 4-6PM from Monday to Friday, excluding holidays.
- **Peak Hour Restriction in Peak Direction:** No on-street work which interferes with the primary direction of travel may occur during peak hours. This requirement would typically apply to a multi-lane street where, for example, two inbound lanes would be maintained during the AM peak hours and work could take place in one of the two outbound lanes.
- **Evening & Weekend Only:** No on-street work may occur from 7AM to 6PM, Monday to Friday, holidays excluded. Work must either take place during weekday evenings and overnight or on a Saturday or Sunday.

[*] References to "on-street work" include the full width of the street right of way, not just traffic lanes.

8 EXEMPTIONS

Notwithstanding the requirements relating to minimum number of lanes and hours of work described within this document, the Engineer may impose additional restrictions or allow specific exemptions for any work within HRM's street right of way.

Exceptions to these restrictions will be considered on a case-by-case basis only when specifically requested by the permit applicant or contractor. The criteria for evaluating the exception request includes the impact that the on-street work will have on road users and whether the scope of work and size of the excavation (if applicable) prevent the work area from being reopened in accordance with the restricted hours of work listed in *Schedule A*.

Permission to work through restricted times may be granted by the Engineer or the HRM Inspector. **All requests to continue work through restricted hours must be requested in writing at least one hour before the restriction is to take effect.** Permission is only considered granted upon receipt of a response in writing from the Engineer or the HRM Inspector indicating the request is approved.

8.1 VERY SHORT DURATION WORK

Very Short Duration Work (as defined in the MANUAL) will generally be exempt from Evening & Weekend Only restrictions, provided that Peak Hour Restrictions are respected.

9 CLOSURES

9.1 SIDEWALK CLOSURES

Sidewalk closures should be avoided wherever possible, and the Engineer must grant approval before a sidewalk* can be closed.

2025

A sidewalk closure with a pedestrian detour is required when Long Duration Work (as defined in the MANUAL) impacts a sidewalk such that a minimum clear width of 1.6 metres and clear height of 2.1 metres cannot be maintained.

A request for a sidewalk closure must be accompanied by a Pedestrian Management Plan (PMP). The MANUAL specifies the elements required for a cane-detectable sidewalk closure barricade. Pedestrians should be directed to the other side of the street using marked crosswalks, where possible.

If there is no other sidewalk available to use for a pedestrian detour route, then the contractor must establish a temporary sidewalk around the work area which includes the following:

- Minimum 1.6 metre clear width and 2.1 metre clear height.
- Suitable protection from vehicular traffic.
- Continuous channelization to physically guide pedestrians around the work area.
- A stable, firm, slip-resistant surface that produces minimal glare, with appropriate grades and ramps.

9.2 BICYCLE LANE CLOSURES

Within HRM, the processes described in the MANUAL are only appropriate for closing painted bicycle lanes (unprotected bicycle lanes).

Unless otherwise approved by the Engineer, protected bicycle lanes and other components of an "All Ages and Abilities" (AAA) bicycle network that are closed or impacted by construction should be provided a facility which provides reasonably similar protection, and this must be addressed within the TCP. Short Duration Work (as defined in the MANUAL) and works done under an Annual Permit are exempt from the requirement to provide reasonably similar protection, and instead must comply with the requirements of the MANUAL.

9.3 TRANSIT LANE CLOSURES

Unless otherwise approved by the Engineer, work affecting Transit Lanes shall be restricted to non-operational hours (as defined by Halifax Transit).

* For the purposes of this document, only an improved asphalt or concrete area between the road and the adjacent property line shall be considered a sidewalk. This is not consistent with the definition of a sidewalk within the *Nova Scotia Motor Vehicle Act*.

9.4 STREET CLOSURES

The Engineer must grant approval before a street can be closed, including a one-way or directional closure. **Requests for street closures must be submitted to HRM for review and approval a minimum of 10 business days in advance of closure start date.** This provides 5 business days for review, revisions, and approval and a further 5 business days for notification.

A request for a construction-related street closure must include the following:

- Reason for the request to close the street.
- Location of the work area and limits of the closure.
- Date(s) of the closure, alternate or rain date(s), and intended working hours.
- Indication of whether the street will be reopened at the end of the workday and over the weekend.
- Detour plan(s).
- Plan(s) for maintaining service continuity (solid waste collection, Canada Post community mailbox delivery, snow clearing activities, etc.).
- Copy of the closure notification letter that will be delivered to affected property owners and/or tenants.

2025

Detour routes should be designed to utilize streets that are a similar classification to the street that is being closed. For example, traffic on an "arterial" roadway should not be detoured onto a "local" roadway. Separate detour plans may be required for each impacted road user (pedestrians, cyclists, buses and trucks, and other vehicles).

10 CLOSURE NOTIFICATION

2025

A street closure must be approved by the Engineer prior to notification being distributed.

For all planned construction-related street closures, including one-way or directional street closures, the contractor is responsible to distribute notification regarding the planned disruption to all affected property owners and/or tenants within the closed area. These notices must contain the following information:

- Name and 24-hour contact information for the person responsible for the closure.
- Location of the work area, limits of the closure, and an explanation of the plan for access and egress.
- Date(s) of the closure, alternate or rain date(s), intended working hours, and an indication of whether the street will be reopened at the end of the workday and over the weekend.

The contractor must provide confirmation to HRM that the closure notices were delivered, including a list of all the civic addresses included in the distribution. **Notices must be delivered at least 5 business days in advance of any street closure.**

When multiple or repeated street closures are required on the same project, the notification must also include a schedule with the expected number of closures. **Notification for each subsequent street closure on the same project is still required, and it must be provided to affected property owners and/or tenants a minimum of 48 hours in advance of the closure.**

2025

10.1 LONG DURATION CLOSURES FOR HRM PROJECTS

Notwithstanding emergency situations, where an HRM Capital Project requires a full street closure to be in place for more than 3 weeks at a time and the detour route is more than 1km in length:

- Notification is required **a minimum of 60 days** in advance of a closure on any street found in *Schedule A – List of Restricted Streets*; or,
- Notification is required **a minimum of 30 days** in advance of a closure on any other street.

This advance notice about a long duration closure does not require exact dates as that is dependent on many factors.

HALIFAX REGIONAL MUNICIPALITY
Traffic Control Manual Supplement (January 2025)
SCHEDULE A – List of Restricted Streets

STREET NAME	FROM	TO	Minimum Number of Lanes		Hours of Work			
			Maintain Two Lanes During Peak Hours	Maintain Two Lanes At All Times	PM PHR Only	PHR In Peak Direction	Peak Hour Restricted	Evening & Weekend Only
Agricola Street	Cunard Street	Duffus Street					X	
Ahern Avenue	Cogswell Street	Bell Road					X	
Akerley Boulevard	Windmill Road	John Savage Avenue		X			X	
Albemarle Street	Cogswell Street	Duke Street					X	
Albro Lake Road	Victoria Road	Windmill Road					X	
Alderney Drive	Windmill Road	Prince Albert Road		X			X	
Alma Crescent	Titus Street	Supreme Court		X			X	
Almon Street	Connaught Avenue	Gottingen Street					X	
Armdale Roundabout	All circulating lanes, including all approach and exit lanes - see Section 6 of this document							X
Atlantic Street (Dartmouth)	Pleasant Street	Transit Terminal – civic 9					X	
Baker Drive	Portland Street	Norm Newman Drive		X			X	
	Norm Newman Drive	Mount Hope Avenue					X	
Barrington Street	MacKay Bridge Ramp	Duffus Street						X
	Duffus Street	Nora Bernard Street					X	
	Duke Street	Spring Garden Road						X
	Spring Garden Road	Inglis Street					X	
Basinview Drive (Bedford)	Hammonds Plains Road	Meadowbrook Drive					X	
Bayers Road	Connaught Avenue	Windsor Street		X			X	
	Highway 102	Connaught Avenue		X				X
	Joseph Howe Drive	Highway 102		X		X		
Bayview Road	Bedford Highway	Lacewood Drive					X	
Beaver Bank Road	Earl Gordon Drive	Sackville Drive					X	
Bedford Highway	Hwy 102	Moirs Mills Road		X			X	
	Moirs Mills Road	Kearney Lake Road						X
	Kearney Lake Road	Flamingo Drive		X			X	
	Flamingo Drive	Sherbrooke Drive		X				X
	Sherbrooke Drive	Traffic Signals at Civic #50		X			X	
	Traffic Signals at Civic #50	Windsor Street						X
Bell Road	Robie Street	Sackville Street					X	
Bissett Road	Cole Harbour Road	Cow Bay Road					X	
Bluewater Road	Hammonds Plains Road	Larry Uteck Boulevard	X					
Boland Road	Victoria Road	Wyse Road					X	
Braemar Drive	Waverley Road	Grahams Grove					X	
Brunswick Street	Cogswell Street	Spring Garden Road					X	
Burnside Drive	Akerley Drive	Hwy 111		X			X	
Caldwell Road	Cole Harbour Road	Shore Road					X	
Caledonia Road	Main Street	Montebello Drive		X				
Chain Lake Drive	Lacewood Drive	Otter Lake Court		X	X			
	Otter Lake Court	Horseshoe Lake Drive		X				
Chebucto Road	Armdale Rotary	Mumford Road		X				X
	Mumford Road	North Street		X			X	
	North Street	Windsor Street					X	
Cobequid Road	Sackville Drive	Nelson Drive		X			X	
	Nelson Drive	Rocky Lake Drive					X	
Coburg Road	Oxford Street	Robie Street					X	
Cogswell Street	Robie Street	North Park Street		X				
	North Park Street	Brunswick Street					X	
Cole Harbour Road	Portland Street	Bissett Road		X		X		
	Bissett Road	Ross Road					X	
Commodore Drive	Burnside Drive	Eileen Stubbs Drive		X				X
	Eileen Stubbs Drive	Highway 118 Ramp		X			X	
Connaught Avenue	Windsor Street	Jubilee Road		X		X		
Nora Bernard Street	North Park Street	Barrington Street					X	
Countryview Drive	Wright Avenue	Commodore Drive		X	X			
Cow Bay Road	Main Road	Dyke Road (west)					X	
Cowie Hill Road	Herring Cove Road	Cowie Hill Connector					X	
Crichton Avenue	Glen Manor Drive	Ochterloney Street					X	
Cumberland Drive	Cole Harbour Road	Colby Drive		X				
Cunard Street	Windsor Street	Gottingen Street					X	
Dartmouth Road	Bedford Highway	Magazine Hill (Highway 7)		X			X	
Dentith Road	Old Sambro Road	Herring Cove Road		X				
Devonshire Avenue	Novalea Drive	Barrington Street					X	
Duffus Street	Robie Street	Novalea Drive					X	
Duke Street (Bedford)	Glendale Avenue	Rocky Lake Drive		X				
Duke Street (Halifax)	Brunswick Street	Hollis Street		X			X	
	Hollis Street	Upper Water Street						X
Dunbrack Street	Kearney Lake Road	Main Street		X			X	
Dutch Village Road	Joseph Howe Drive	Joseph Howe Drive					X	
Dyke Road	Cow Bay Road	Cow Bay Road					X	
Eisener Boulevard	Portland Street	Norm Newman Drive		X			X	
	Norm Newman Drive	Portland Hills Drive		X				
Fall River Road	Windsor Junction Road	Highway 2					X	
Farnham Gate Road	Parkland Drive	Dunbrack Street		X				
Finlay Drive	Commodore Drive	Wright Avenue		X				
First Lake Drive	Metropolitan Avenue	Cobequid Road					X	
Flamingo Drive	Knightsridge Drive	Bedford Highway					X	

HALIFAX REGIONAL MUNICIPALITY
Traffic Control Manual Supplement (January 2025)
SCHEDULE A – List of Restricted Streets

STREET NAME	FROM	TO	Minimum Number of Lanes		Hours of Work			
			Maintain Two Lanes During Peak Hours	Maintain Two Lanes At All Times	PM PHR Only	PHR In Peak Direction	Peak Hour Restricted	Evening & Weekend Only
Forest Hills Parkway	Main Street	Circassion Drive					X	
	Circassion Drive	Cole Harbour Road		X			X	
Gary Martin Drive	Hammonds Plains Road	Broad Street					X	
George Street	Barrington Street	Lower Water Street					X	
Glen Manor Drive	Crichton Avenue	Mic Mac Boulevard		X			X	
Glendale Avenue	Cobequid Road	Duke Street (Bedford)		X			X	
Glendale Drive	Beaverbank Road	Cobequid Road					X	
Gordon Avenue	Main Street	Hwy 111					X	
Gottingen Street	Young Street	Black Street					X	
	Black Street	Cogswell Street						X
	Cogswell Street	Brunswick Street		X				
Grahams Grove	Highway 111	Prince Albert Road					X	
Hammonds Plains Road	St. Margarets Bay Road	Gary Martin Drive					X	
	Gary Martin Drive	Hwy 102		X			X	
	Hwy 102	Bedford Highway						X
Hartlen Street	Main Street	Tacoma Drive					X	
Herring Cove Road	Armdale Rotary	Purcells Cove Road		X				X
	Purcells Cove Road	Highfield Street					X	
	Highfield Street	Old Sambro					X	
	Old Sambro Road	Auburn Avenue		X				
	Auburn Avenue	Hebridean Drive					X	
Highfield Park Drive	Hwy 111	Victoria Road		X				
Highway 2	Sunnylea Road	Rocky Lake Drive					X	
Highway 7	Forest Hills Parkway	Little Salmon River	X			X		
	Highway 107	Bluerock Road					X	
Hines Road	Main Road	Caldwell Road					X	
Hollis Street	Upper Water Street	Terminal Road					X	
Horseshoe Lake Drive	Susie Lake Crescent	End		X	X			
Ilsley Avenue	Wright Avenue	End					X	
Inglis Street	Robie Street	Barrington Street					X	
Innovation Drive	Gary Martin Drive	Hammonds Plains Road						X
John Brackett Drive	Purcells Cove Road	Hebridean Drive					X	
Joseph Howe Drive	Fairview Overpass	Mumford Road		X				X
	Mumford Road	Craigmore Drive		X			X	
	Craigmore Drive	Armdale Rotary		X				X
Joseph Zatzman Drive	Akerley Avenue	Wright Avenue		X				
Jubilee Road	Connaught Avenue	Robie Street					X	
Kearney Lake Road	Larry Uteck Boulevard	Hwy 102					X	
	Hwy 102	Dunbrack Street	X					
	Dunbrack Street	Bedford Highway					X	
Kempt Road	Lady Hammond Road	Young Street					X	
Knightsridge Drive	Dunbrack Street	Flamingo Drive		X				
Lacewood Drive	Chain Lake Drive	Titus Street		X			X	
Lady Hammond Road	Bedford Highway	MacKintosh Street						X
	MacKintosh Street	Robie Street	X					
Lake Major Road	Reddy Drive	Main Street					X	
Lakelands Boulevard	Chain Lake Drive	St. Margarets Bay Road		X	X			
Larry Uteck Boulevard	Hammonds Plains Road	Kearney Lake Road					X	
	Kearney Lake Road	Southgate Drive						X
	Southgate Drive	Bedros Lane					X	
	Bedros Lane	Bedford Highway		X				
Lawrencetown Road	Ross Road	Mineville Road					X	
Lower Water Street	Terminal Road	George Street			X			
Lucasville Road	Sackville Drive	Hammonds Plains Road					X	
Main Avenue (Halifax)	Washmill Lake Drive	Willet Street		X				
	Willet Street	Titus Street					X	
	Titus Street	Bedford Hwy					X	
Main Road (Eastern Passage)	Pleasant Street	Hines Road		X			X	
	Hines Road	Cow Bay Road					X	
Main Street (Dartmouth)	Hwy 111	Caledonia Road		X			X	
	Caledonia Road	Forest Hills Parkway		X		X		
Maple Street (Dartmouth)	Thistle Street	Ocheterloney Street					X	
Massachusetts Avenue	Lady Hammond Road	Robie Street		X			X	
Meadowbrook Drive	Basinview Drive	Bedford Highway					X	
Metropolitan Avenue	Nictaux Crescent	Glendale Drive					X	
Micmac Boulevard	Woodland Avenue	Horizon Court					X	
	Horizon Court	Hwy 111		X			X	
Millwood Drive	Sackville Drive	Beaverbank Road					X	
Moirs Mills Road	Amin Street	Bedford Highway					X	
Montebello Drive	Waverley Road	Caledonia Road		X				
Morris Street	South Park Street	Lower Water Street					X	
Mount Edward Road	Woodlawn Road	Ridgecrest Drive					X	
Mount Hope Avenue	Pleasant Street	Baker Drive		X				
Mumford Road	Joseph Howe Drive	Romans Avenue					X	
	Romans Avenue	Chebucto Road		X			X	
Nantucket Avenue	Victoria Road	Wyse Road						X
Norm Newman Drive	Baker Drive	Eisener Boulevard					X	

HALIFAX REGIONAL MUNICIPALITY
Traffic Control Manual Supplement (January 2025)
SCHEDULE A – List of Restricted Streets

STREET NAME	FROM	TO	Minimum Number of Lanes		Hours of Work			
			Maintain Two Lanes During Peak Hours	Maintain Two Lanes At All Times	PM PHR Only	PHR In Peak Direction	Peak Hour Restricted	Evening & Weekend Only
North Street	Chebucto Road	Barrington Street						X
North Park Street	Cunard Street	Cogswell Street					X	
North Preston Road	Johnson Road	Reddy Drive					X	
Novalea Drive	Young Street	Duffus Street		X				
Ochterloney Street	Prince Albert Road	Alderney Drive					X	
Old Sambro Road	Herring Cove Road	Dunbrack Street					X	
	Dunbrack Street	Dentith Road		X			X	
	Dentith Road	Leiblin Drive					X	
Old Sackville Road	Beaver Bank Connector	Walker Avenue					X	
Osborne Street	Dunbrack Street	Herring Cove Road					X	
Oxford Street	Bayers Road	South Street					X	
Parkland Drive	Kearney Lake Road	Lacewood Drive		X				
Peter Saulnier Drive	Dunbrack Street	Cowie Hill Road					X	
Pinehill Drive	Glendale Drive	Sackville Drive					X	
Pleasant Street	Prince Albert Road	Acadia Street					X	
	Acadia Street	Main Road		X			X	
Portland Street	Alderney Drive	Gaston Road					X	
	Gaston Road	Caldwell Road		X			X	
Portland Estates Boulevard	Portland Street	Josephine Court	X					
Portland Hills Drive	Portland Street	Berry Hill Drive	X					
Prince Albert Road	Grahams Gove	Sinclair Street		X			X	
	Sinclair Street	Alderney Drive					X	
Prince Street (Halifax)	Brunswick Street	Lower Water Street					X	
Princess Margaret Boulevard	Halifax-bound Ramp	Windmill Road					X	
Purcells Cove Road	Herring Cove Road	John Brackett Drive					X	
Queen Street (Halifax)	Sackville Street	South Street					X	
Quinpool Road	Armdale Rotary	Marked Crosswalk @ civic 7121		X				X
	Marked Crosswalk @ civic 7121	Robie Street		X			X	
Ridgecrest Drive	Main Street	Mount Edward Road					X	
Riverside Drive	Glendale Drive	Sackville Drive					X	
Robie Street	Stairs Street	Almon Street		X			X	
	Almon Street	Cunard Street		X				X
	Cunard Street	Inglis Street		X			X	
Rocky Lake Drive	Waverley Road	Fraser Drive					X	
	Duke Street	Central Street					X	
	Central Street	Bedford Highway						X
Ronald Smith Avenue	Ilsley Avenue	Burnside Drive						X
Sackville Drive (Sackville)	Patton Road (North intersection)	Millwood Drive					X	
	Millwood Drive	Bedford Highway		X			X	
Sackville Street (Halifax)	Summer Street	Lower Water Street					X	
Shore Road (Eastern Passage)	Cow Bay Road	Caldwell Road					X	
St. Margarets Bay Road	Ingram River Lane	Albert Walker Drive					X	
	Albert Walker Drive	Armdale Rotary		X				X
South Street	Oxford Street	Hollis Street					X	
South Park Street	Sackville Street	Inglis Street					X	
Spring Avenue	Mount Edward Road	Portland Street					X	
Spring Garden Road	Robie Street	South Park Street		X			X	
	South Park Street	Barrington Street						X
Springvale Avenue	Arlington Avenue	Joseph Howe Drive					X	
Starboard Drive	Larry Uteck Boulevard	Larry Uteck Boulevard					X	
Summer Street	Bell Road	University Avenue		X			X	
Susie Lake Crescent	Horseshoe Lake Drive	Chain Lake Drive		X	X			
Sussex Street	Old Sambro Road	Herring Cove Road					X	
Tacoma Drive	Gordon Avenue	Valleyfield Road		X			X	
	Valleyfield Road	Main Street			X			
Terminal Road	Hollis Street	Lower Water Street					X	
Thistle Street	Wyse Road	Victoria Road		X			X	
	Victoria Road	Crichton Park Road					X	
Timberlea Village Parkway	Hwy 103	St. Margarets Bay Road					X	
Titus Street	Lacewood Drive	Alma Crescent		X			X	
Tower Road	Inglis Street	Point Pleasant Drive					X	
Trollope Street	Cogswell Street	Bell Road					X	
University Avenue	LeMarchant Street	South Park Street		X			X	
Upper Water Street	Barrington Street	George Street						X
Valleyfield Road	Tacoma Drive	Woodlawn Road		X			X	
Veterans Memorial Drive	Robie Street	Summer Street					X	
Victoria Road	Windmill Road	Albro Lake Road		X			X	
	Albro Lake Road	Woodland Avenue					X	
	Woodland Avenue	Nantucket Avenue						X
	Nantucket Avenue	Portland Street					X	
Walker Avenue	Transit Terminal-civic 7	Old Sackville Road (N)					X	
Washmill Lake Drive (excl. Under Highway 102 Overpass)	Chain Lake Drive	Dunbrack Street		X				
Waverley Road	Rocky Lake Drive	Breamar Drive					X	
Willett Street	Dunbrack Street	Rosedale Avenue					X	
	Lacewood Drive	Dunbrack Street		X				

HALIFAX REGIONAL MUNICIPALITY
Traffic Control Manual Supplement (January 2025)
SCHEDULE A – List of Restricted Streets

STREET NAME	FROM	TO	Minimum Number of Lanes		Hours of Work			
			Maintain Two Lanes During Peak Hours	Maintain Two Lanes At All Times	PM PHR Only	PHR In Peak Direction	Peak Hour Restricted	Evening & Weekend Only
Wilkinson Avenue	Wright Avenue	Cutler Avenue		X				
Windgate Drive	Beaverbank Road	Windsor Junction Road					X	
Windmill Road	Bedford Bypass	Victoria Road		X				X
	Victoria Road	Wyse Road					X	
	Wyse Road	Alderney Drive		X			X	
Windsor Junction Road	Fall River Road	Cobequid Road					X	
Windsor Street	Bedford Highway	Connaught Avenue		X			X	
	Connaught Avenue	Quinpool Road					X	
Woodland Avenue	Victoria Road	Ryland Street		X			X	
Woodlawn Road	Main Street	Portland Street		X			X	
Wright Avenue	Windmill Road	Hwy 118		X			X	
Wyse Road	Albro Lake Road	Windmill Road		X			X	
Young Street	Windsor Street	Robie Street					X	
	Robie Street	Gottingen Street					X	

SCHEDULE B – List of Holiday Exemptions to Restricted Streets

Holiday	Date	Peak Hour Restrictions waived on…
New Year's Day	January 1	… January 1st. If the holiday is on a Saturday or a Sunday, restrictions are also waived on the first weekday following.
Heritage Day	Third Monday in February	… the holiday only.
Good Friday	Floating	… the holiday only.
Victoria Day	Last Monday preceding May 25	… the holiday only.
Canada Day	July 1	… July 1st. If the holiday is on a Saturday or a Sunday, restrictions are also waived on the first weekday following.
Natal Day	First Monday in August	… the holiday only.
Labour Day	First Monday in September	… the holiday only.
National Day for Truth and Reconciliation	September 30	… September 30th. If the holiday is on a Saturday or a Sunday, restrictions are also waived on the first weekday following.
Thanksgiving Day	Second Monday in October	… the holiday only.
Remembrance Day	November 11	**If work must be carried out on November 11 in accordance with the *Provincial Remembrance Day Act* restrictions will be waived**. If Remembrance Day is on a Saturday or a Sunday, restrictions are waived on the first weekday following.
Christmas Day	December 25	… December 25th. If the holiday is on a Saturday or a Sunday, restrictions are also waived on the first weekday following.
Boxing Day	December 26	... December 26th. If the holiday is on a Saturday or a Sunday, restrictions are also waived on the first weekday following that date. If both Christmas Day and Boxing Day are on Saturday and Sunday, then restrictions are also waived on the first two weekdays following.

SCHEDULE C – Document Version Control

Version 2017v01 (Published December 2016)
Includes changes to sections 2, 4, 5, 7, 10, 11, and 12, as well as amendments to Schedule A. Schedules C and D repealed.

Version 2018 (Published November 2017)
Minor amendments to Schedule A.

Version 2019 (Published January 2019)
Includes changes to sections 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, and 16 as well as amendments to Schedule A. Note that additional sections have been added and sections have been renumbered from previous additions.

Version 2020 (Published January 2020)
Includes changes to sections 10, 12, and amendments to Schedule A

Version 2021 (Published January 2021)
Includes changes to sections 6, 10, 11, 13 (formerly 12), add new section 12, and amendments to Schedule A. Note that additional sections have been added and sections have been renumbered from previous additions.

Version 2022 (Published January 2022)
Includes minor edits to sections 13, amendment to Schedule A and a new holiday added to section C.

Version 2023 (Published January 2023)
Includes minor edits to sections 10, 11 & 12 of the Traffic Control Manual Supplement and amendments to Schedule A.

Version 2024 (Published January 2024)
Includes minor edits to sections 6, 13.4 & 14 of the Traffic Control Manual Supplement. Section 7 (Roundabouts) removed and part of Section 12 was removed. This is also accompanied by some changes to the Schedule A – List of Restricted Streets.

Version 2025 (Published January 2025)
Includes minor edits to organization and formatting; removal of redundant sections 2 Pre-Construction Meetings, 3 Permits, 7 Roundabouts, 12 Identification of Traffic Control Signage, and 18 Signalized Intersections; minor changes to sections 3 Traffic Control Plans, 3.2 Impacts to Cyclists, 3.3 Impacts to Transit, and 9.4 Street Closures; added new requirements to sections 10 Closure Notification, and 10.1 Long Duration Closures for HRM Projects.

PART 1 - GENERAL

1.1 Work Included
1.2 Related Work
1.3 References
1.4 Shop Drawing and Product Data
1.5 Closeout Submittals

PART 2 – PRODUCTS

2.1 General
2.2 Ornamental Street Lighting
2.3 Concrete Bases (Metal Poles)
2.4 Poles
2.5 Lighting Control Nodes
2.6 Street Lighting Luminaires
2.7 Conduit
2.8 Mounting Equipment

PART 3 – EXECUTION

3.1 General
3.2 Grounding
3.3 Pole and Base Installation
3.4 Bracket Installation
3.5 Wiring Installation
3.6 Luminaries Installation
3.7 Luminaire Cleaning
3.8 Commissioning and Take Over

PART 1 - GENERAL

1.1	Work Included	.1	This section specifies the requirements to supply and install lighting equipment including poles, bases, conduit, luminaries, and mounting accessories.
1.2	Related Work	.1	General Requirements: Section 01 10 00
		.2	Metal Fabrications: Section 05 50 00
		.3	Concrete: Section 03 30 00
		.4	Ornamental Street Lighting Map: Attachment A
1.3	References	.1	ANSI/IES RP-8 – 18, Roadway Lighting.
		.2	IEEE C62.41.1-2002, Guide on the Surge Environment in Low-Voltage (1000 V and Less) A/C Power Circuits.
		.3	ANSI/NEMA C136.41-2013, Standard for Roadway and Area Lighting – Dimming Control.
		.4	ASTM B117-18, Standard Practice for Operating Salt Spray (Fog) Apparatus.
		.5	ASTM C1804-14e1, Standard Specification for Spun Cast Prestressed Concrete Bases for Tapered Steel Lighting Poles.
		.6	ASTM C1824-16e1, Standard Test Method for Full Scale Bending Test of Spun, Prestressed Concrete Bases for Tapered Steel Lighting Poles.
		.7	ANSI C136.15-2015 Standard for Roadway Lighting Equipment - Luminaire Field Identification.
		.8	CSA C22.2 No. 41-13(R2017), Grounding and Bonding Equipment.
		.9	CSA C22.2 No. 45.1-07(R2017), Electrical Rigid Metal Conduit.
		.10	CSA C22.2 No. 206-17, Lighting Poles.
		.11	CSA 22.2 No. 211.2-06(R2016), Rigid PVC Conduit.
		.12	CSA A23.4-16, Precast Concrete - Materials and Construction.
1.4	Shop Drawings And Product Data	.1	Submit shop drawings and product data in accordance with Section 01 10 00.
		.2	Submit shop drawings for the following: .1 Luminaire. .2 Lamp for each luminaire type.

.3 Driver for each luminaire type.
.4 Poles and brackets.
.5 Lighting control nodes.

.3 Shop Drawings:
.1 Shop drawings to clearly indicate the following:
.1 Unique Luminaire ID number.
.2 Fixture specification as identified in Part 2.
.3 Driver specification as identified in Part 2.
.4 Controller specification as identified in Part 2.
.5 Photometric data for each luminaire type.
.6 Pole and base detail including anchor belt sizing.

.4 Catalogue cuts lacking sufficient detail to indicate compliance with Contract documents will not be acceptable.

.5 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by the Engineer. Photometric data to include:
.1 VCP Table, spacing criterion;
.2 Total input watts;
.3 Candlepower summary, candela distribution, zonal lumen summary;
.4 Luminaire efficiency, C.I.E. type, coefficient of utilization;
.5 Lamp type;
.6 Lumen ratings; and
.7 Summary in accordance with IES procedures.

1.5 Closeout Submittals

.1 Provide operation and maintenance data as well as any special tools, cleaners or spares for all materials supplied herein in accordance with Section 01 10 00.

.2 Provide the following additional spare material for each type of item specified in the Work:
.1 10% spare poles, minimum of one (1).
.2 10% metal poles, minimum of one (1).
.3 10% of brackets, minimum of one (1).

PART 2 - PRODUCTS

2.1 General

.1 All lighting equipment and connectors must be compatible with HRM's existing lighting systems and must be approved by HRM prior to ordering.

.2 Provide equipment designed to meet or exceed wind loading requirements as set forth in the National Building Code for the HRM region.

2.2 Ornamental Street Lighting

.1 Provide the ornamental fixtures as shown on Attachment A – Ornamental Street Lighting Map, appended at the end of this Section.

2.3 Concrete Bases (Metal Poles)

.1 Precast:
- .1 Concrete: to CSA A23.4.
- .2 Prestressed concrete bases: to ASTM C1804, tested to ASTM C1824.

.2 Cast-in-Place to Section 03 30 00.

2.4 Poles

.1 To CSA C22.2 No. 206.

.2 Pole wiring to be #12/2 NMWU.

.3 Handhole: to HRM Detail 103

.4 Acceptable Products:
- .1 Wood Poles - 9.3 m – to CSA C22.2 No. 206
- .2 Metal Poles:
  - .1 4.7 m Aluminum – Valmont 11-2506C0860
  - .2 7.3 m Aluminum – Valmont 11-3504C0860-1
  - .3 9.1 m Aluminum – Valmont 12-40010E1060

2.5 Lighting Control Nodes

.1 ANSI 7-Pin design.

.2 Integrated GPS connectivity to report Latitude/Longitude coordinates.

.3 Battery – backed real-time clock.

.4 Universal AC input 85V-264V or 347V as required for street lighting fixture, 50/60Hz.

.5 Revenue grade energy measurement and reporting via web based software.

.6 Wireless mesh-network communication.

.7 Capable of dimming, on/off, and scheduling control of connect light fixture.

.8 Minimum IP65 rating.

.9 Suitable for operation in -40°C to 70°C ambient environments.

.10 Minimum 1000W, 1800VA load rating with minimum 15A switching.

.11 Integrated photocell.

2.6 Street Lighting Luminaires

.1 Surface mounted incandescent luminaire suitable for mounting in a wet location.

.2 Rating: 120V or 347V as required, based on local utility secondary voltage.

.3 Light Output: As required to comply with Halifax Street Lighting Standards and ANSI/IES RP-8.

.4 Housing: low copper alloy die cast aluminum, complete with minimum 2 mil thick polyester powder coat.

.5 Luminaire and finishes must pass the 1000 hour salt test per ASTM B117.

.6 Minimum 88,000 hour rated life at 20 degrees Celsius to 80% of rated initial output (IES LM-80).

.7 Fixture to be adjustable +/- 5 degrees relative to mounting arm.

.8 Provide fixture complete with permanent internal labelling which must be entirely legible for the lifetime of the luminaire, indicating:

.1 Manufacturer's Name
.2 Catalogue Number
.3 Date of Manufacture
.4 Rated luminaire voltage
.5 Rated Luminaire wattage

.9 Waterproof permanent label on exterior of fixture indicating fixture wattage, clearly visible from street level.

.10 IP66 fixture rating.

.11 0-10V DC Dimmable driver.

.12 7-pin receptacle for twist lock photo controller per ANSI C136.41 and Lighting Control Node (see 2.4).

.13 Complete with internal or external surge suppression achieving Category C High (10kV, 10kA) per IEEE C62.41.1.

.14 Color Rendering Index (CRI) greater than or equal to 80.

.15 IES type II distribution for roadway applications, IES type IV distribution for all cul-de-sac turning circles.

.16 Up-light component of fixture BUG rating to be not greater than U0.

.17 Acceptable Products:

.1 AEL ATB0/ATB2 series
.2 LRL – NXT series.

2.7 Conduit

.1 Minimum conduit size to be 38 mm, except 16 mm for connections to fixture brackets.

.2 Metal Conduit: to CSA C22.2 No. 45.1.

.3 PVC Conduit: to CSA C22.2 No. 211.2.

2.8 Mounting Equipment

.1 Brackets to be nominally 1800 mm, or 3050 mm in length, single member arm, galvanized steel, elliptical in shape and adjustable as required for application to achieve the Halifax Design Standards and IES RP-8.

PART 3 - EXECUTION

3.1 General

.1 When connecting any fixture to Nova Scotia Power (NSP) infrastructure, follow all NSP installation specifications and details as shown on the Project Drawings.

.2 Confirm, through survey review, the locates of underground infrastructure and review overhead wire routing prior to excavation to avoid conflicts or obstructions and achieve required offsets.

.3 Ground transformer base with a grounding lug.

.4 Ground u-guard to main service ground.

.5 Before beginning the Work, review the overhead wire routing for conflicts or obstructions. Report any conflicts or obstructions to the Engineer who will provide a resolution.

.6 Obtain a Fixture (FX) and Support (SS) number from the Owner prior to commencing installation.

.7 Provide a list of MAC addresses and associated serial number prior to commencing installation.

3.2 Grounding

.1 Ground equipment and wiring in accordance with CSA C22.2 No. 41.

3.3 Pole and Base Installation

.1 Where cast-in-place bases are used, do concrete work in accordance with Section 03 30 00 – Concrete.

.2 Support poles in cast-in-place bases as required during construction.

.3 Grease all screws and bolts using never seize paste.

.4 Do not weld nuts.

.5 Use lock washers on all anchor bolts.

.6 Split bolts are not acceptable.

.7 Every pole must have a separate ground plate installed and bonded to pole through ground lug.

.8 Set all poles on concrete bases. Do not set on nuts, Orientate poles such that they are parallel to the roadway.

.9 Install a fuse kit for every individual head.

3.4 Bracket Installation

.1 Install bracket prior to installing street lighting fixture.

.2 Use through bolt with square washer in addition to 16 mm lag bolt to secure arm to pole.

.3 Connect ground to bracket via ground bolt.

.4 Connect 16 mm NM LTF to bracket.

3.5 Wiring Installation

.1 Identify electrical circuits using numbered wire tags, not duct tape or masking tape. Clearly identify the neutral.

.2 Minimum wire size #8AWG R90 XLPE Simpull.

.3 Tape wire connectors with super 88 electrical tape.

.4 Make overhead connections using piercing connectors.

.5 Run underground electrical joints to the nearest pole. Avoid the usage of underground junction boxes where possible.

.6 All wire runs to contain an extra conductor as a spare.

.7 For overhead connections, use a piercing type connector.

.8 Cut off conduits 100mm high above concrete base and not level with concrete base.

.9 Where possible, minimize bends to two (2) 90° bends in each run from pole to pole.

3.6 Luminaries Installation

.1 Install luminaires in accordance with the manufacturer's written instructions and in accordance with the Engineer's written approval.

3.7	Luminaire Cleaning	.1	Clean luminaires one (1) week prior to Substantial Performance.
		.2	Replace blemished, damaged or unsatisfactory luminaries as directed by the Engineer.
3.8	Commissioning and Take Over	.1	Prior to take over of any new lighting installations by the Owner, arrange for commission by the Owner or their designated representative.
		.2	Make arrangements for commissioning a minimum of one (1) week prior to completing Work.
		.3	Assist the process of commissioning as required.
		.4	Once commissioning is complete, the Owner will take over the system.

**** End 26 50 00 ****

PART 1 - GENERAL

1.1 Work Included

.1 This section specifies requirements for supply and installation of granite curbstone.

1.2 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 CSA B651-18, Accessible Design for the Built Environment.

.2 Nova Scotia Department of Transportation and Active Transit – Highway Construction and Maintenance Standard Specification.

1.1 Related Sections

.1 From Joint Committee on Contract Documents Standard Specification for Municipal Services, latest edition:

1. Earthwork	Section 31 20 00
2. Asphalt Concrete Paving	Section 32 12 16
3. Reinstatement	Section 32 98 00
4. Standard Details	Section 39 00 00

.2	Concrete	Section S-11/A
.3	Walks, Curbs and Gutters	Section S-11/B
.4	Interlocking Concrete Pavers	Section S-12

1.2 Submittals

.1 If not included in the Contractor's QMP submission, the Contractor shall submit a supplementary QMP to the Engineer for review and approval for projects including granite curbstone. The supplementary QMP shall be prepared to fit the criteria of the unique project.

This supplementary QMP shall be submitted to the Engineer succeeding project award and prior to construction, as part of the required preconstruction documents identified in HRM Construction's Contractor Required Pre Construction Information

list. HRM will provide written approval (QMP Approval Letter) of the supplementary QMP in a timely manner.

If the Engineer deems the supplementary QMP unacceptable, the Contractor shall provide iterations in a timely manner until the QMP is considered adequate by the Engineer. Construction shall not commence without submission of the Contractor's QMP Approval Letter for the project.

Note, if deemed necessary by the Contractor, an amended QMP can be submitted to the Engineer for review and approval throughout the construction season.

An outline for a QMP, based on ISO 10005, is provided for reference in Attachment A.

.2 If specified in Project Documentation, submit shop drawings indicating layout and relationship of granite curbstone to sidewalk paving joints, fixtures and project formed details. Note, Project Documentation may request additional details than referenced above.

.3 Submit full size samples of granite curbstone units to indicate color, and surface texture selection to the Engineer for review and approval at pre-construction meeting.

.4 Submit the manufacturer's product data relating to granite curbstones.

1.3 Mock-up

.1 A job site mock-up should always be performed to ensure that the product or system conforms to the aesthetic, that material coverage rates are know, and method of workmanship are understood.

1.4 Quality Assurance

.1 The contractor shall be qualified in the field of hardscape or stone masonry with a successful track record. The contractor should have qualified personnel that are trained in installation of granite curbstone or direct oversight of binder suppliers' representative.

.2 Install materials in accordance with all environmental conditions by the manufacturer and safety conditions set forth or as modified by the applicable rules and regulations of the local, provincial, and federal authorities having jurisdiction. Consult safety data sheets for handling recommendations.

1.5 Delivery, Storage, and Handling

.3 Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped cubes capable of transfer lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.

.1 Deliver granite curbstones to site in steel banded, plastic banded or plastic wrapped cubes cable of transfer lift or clamp lift with the manufacturers' name, labels, product identification and batch numbers. Unload curbstones at job site in such a manner that no damage occurs to the product. Damaged material must be documented, reported to the Engineer and removed from site.

.2 Any piece of granite showing flaws, damage or imperfections upon receipt at the storage yard or jobsite, shall be referred to the Engineer for decision as to whether it shall be rejected, patched, or redressed for use. If rejected, the Contractor shall replace curbstones at no additional charge to the Owner.

.3 Store all materials off the ground and avoid excessive heat, or freezing temperatures until ready to use.

1.6 Environmental Conditions

.1 The base needs to be prepared according to the expected traffic loads. Base must be water permeable. Future loads must not cause the surface to settle or loosen stone.

.2 Do not install curbstones over frozen base materials.

.3 Protection, including security, if necessary, to prevent damage to newly installed curbstones shall be provided at Contractor's expense.

PART 2 - PRODUCTS

2.1 Materials

.1 **Granite:** 'Stansted Grey' granite from the Polycor quarry in Rivière-à-Pierre, Quebec, Canada (1-800-463-2229) or approved equivalent. The granite must be sound, homogeneous, free of visible defects and cracks, and compliant with the following requirements:

.1 Compressive strength: 168.4 MPa, dry and perpendicular to the grain.

.2 Modulus of rupture: 11.7 MPa, dry and perpendicular to the

grain.

.3 Water absorption: 0.18%.

.4 Bulk mass: 2,705 kg/cubic meter.

.2 **Crushed stone:** Type 1 gravel as per the Standard Specification for Municipal Services, Earthwork, Section 31 20 00 and approved by the Engineer.

.3 **Concrete:** Compliant with the Section S-11/A

2.2 Curbstone Fabrication:

.1 Curbstones to form sections with straight and chip-free angles, compliant with the following requirements:

.2 Thickness: 150 mm

.3 Height: 450mm

.4 Length: Min 1000mm

.5 C/W Radius Chamfer: 13mm

.2 Fabrication Tolerances

.1 Height: : ± 15mm

.2 Width: ± 10mm

.3 Projection of visible rock faces: +12%, -6% of the height.

.4 Joint squareness: 90°, ±1.5°.

.3 Finishes

.1 Top & bottom: Sawn

.2 Front & Rear: Splitface

.3 Extremities: Sawn with clearance at the bottom

.4 Curves

.1 Furnish and shape curved curbstones according to radius and arcs on the drawings

.5 Other curb elements:

.1 Furnish all special sections required to complete the project (transitions, low profile curbs, nosings), with quality and finishes similar to standard curbs.

PART 3- EXECUTION

3.1 Subgrade

.1 The subgrade must comply with the layouts, profiles and levels indicated on the drawings and be approved by the Engineer.

.2 The subgrade must be well drained and compacted at 100% Standard Proctor maximum dry density before beginning installation.

3.2 Crushed Stone Bed

.1 Lay on foundation a 300 mm thick bed of Type 1 gravel and compact it to a density of 95%.

3.3 Granite Curb

.1 Mark location of curb and place in field for review by Engineer prior to setting granite

.2 Each curbstone is to be laid to rest on two concrete brick or two granite spacers. The spacers will facilitate the levelling of the curbstone and leave the empty space under the curbstone that must be filled with concrete later.

.3 Granite elevations shall not deviate by more than 6 mm from the finished layout, profiles and elevations shown on the drawings.

.4 Curbstones shall be maneuvered with enough care to prevent damage to ends.

.5 Install curb sections with extremities as close together as possible. Do not use mortar to fill between each curbstone section.

3.4 Concrete Bed

.1 Place 10M rebar longitudinally for concrete bed and asphalt impregnated fiberboard shown on the drawings.

.2 Install proper formwork to hold concrete to dimensions shown on the drawings.

.3 After placing the curbstones and rebar and installing formwork, pour a bed of concrete at a minim rate of 1 cubic meter per 10

lineal meters. The concrete must be poured under and on both sides of the curbstones as shown on the drawings.

.4 Reinstate the roadway gravels, asphalt and sidewalk as shown elsewhere on the drawings.

3.5 Protection

.1 Let the concrete harden at least 48 hours before proceeding with any adjacent landscaping work.

****** END 32 16 13.43 ******

INDEX TO CLAUSES

PART 1 - GENERAL

1.1 Work Included
1.2 Work Not Included
1.3 Related Work
1.4 References
1.5 Submittals
1.6 Protection
1.7 Delivery and Storage
1.8 Allowable Tolerances
1.9 Warranty

PART 2 – PRODUCTS

2.1 Materials

PART 3 – EXECUTION

3.1 Dewatering
3.2 Soil Preparation
3.3 Installation and Review
3.4 Protection
3.5 Adjustment and Cleaning
3.6 Reinstatement

PART 1 - GENERAL

1.1 Work Included

.1 This Section contains performance specifications for the provision of design and construction of prefabricated wet cast or dry cast segmental concrete unit gravity retaining walls and associated appurtenances to the lines and levels indicated on the Project drawings.

1.2 Work Not Included

.1 This section does not cover:
.1 Walls greater than 3.0m in height.
.2 Mechanically Stabilized Earth Walls requiring a designed tie back system.

1.3 Related Work

.1 Metal Fabrications: Section 05 50 00

.2 Earthwork: Section 31 20 00

.3 Reinstatement: Section 32 98 00

1.4 References

.1 ASTM D1557 (latest edition), Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (45,000 ft-lbf/ft³ - 2,700 KN-m/m³.

.2 ASTM C1372 (latest edition), Standard Specification for Dry-Cast Segmental Retaining Wall Units.

.3 ASTM C1262/C1262M (latest edition), Standard Test Method for Evaluating the Freeze-Thaw Durability of Dry-Cast Segmental Retaining Wall Units and Related Concrete Units.

.4 ASTM C1776/C1776M (latest edition), Standard Specification for Wet-Cast Precast Modular Retaining Wall Units.

.5 ASTM C94/C94M (latest edition), Standard Specification for Ready-Mixed Concrete.

.6 ASTM C143/C143M (latest edition), Standard Test Method for Slump of Hydraulic-Cement Concrete.

.7 CSA B1800 (latest edition), Thermoplastic Nonpressure Piping Compendium.

.8 CSA G164 (latest edition), Hot Dip Galvanizing of Irregularly Shaped Articles.

.9 CSA S6-19 (latest edition), Canadian Highway Bridge Design Code.

.10 National Concrete Masonry Association (NCMA) Design Manual for Segmental Retaining Walls, Third Edition.

1.5 Submittals

.1 Submit designs and details of prefabricated segmental concrete retaining wall systems for review by the Engineer in accordance with Section 01 10 00.

.2 For walls over 1.0m in height, as measured from the finished grade to the top of the wall, design and shop drawings must be stamped by a professional engineer licensed to practice in the Province of Nova Scotia.

.3 Design wall system in accordance with the recommendations set forth in NCMA Design Manual for Segmental Retaining Walls and the requirements of CSA S6.

.4 Designs to provide for level installation of precast unit courses and be of sufficient design to retain areas indicated, accommodate live load surcharge in retained area, support handrail where indicated, support snow windrow loading, and sustain minor impacts without prefabricated concrete unit failure. Submissions to include all necessary items to provide for installation of the required retaining wall systems including but not necessarily limited to:

.1 Plans and elevations.
.2 Cross-sectional details.
.3 Slope above and below the wall
.4 Miscellaneous details including anchoring, railings and drainage.
.5 Soil strength design parameters for backfill, levelling pad, infill, and drainage layer.
.6 Code references.

.5 Where additional fill is needed, submit sample and specifications to the Engineer for review.

1.6 Protection

.1 Prevent damage to landscaping, fences, adjacent property and all other items designated to remain.

1.7 Delivery And Storage

.1 Check materials upon delivery to assure proper material has been received.

.2 Prevent excessive mud, wet cement, and like material from coming in contact with the materials.

.3 Protect materials from damage. Do not incorporate damaged materials into the project. Promptly remove damaged units from the site.

.4 Do not stack units more than two high.

1.8 Allowable Tolerances

.1 Finished top of wall surface to within 25mm of specified elevations and locations, and within a tolerance of 12mm for both top and face surfaces when measured under a 3.0m long straightedge.

1.9 Warranty

.1 Provide a warranty that expressly states the retaining wall is covered for a period of two (2) years from the date of Substantial Completion against workmanship, heaving, or settlement and cracking, spalling or other product failure.

PART 2 - PRODUCTS

2.1 Materials

.1 Provide a precast segmental retaining wall system complete with, but not necessarily limited to, the following:

.1 Block units:

.1 Wet cast segmental units:

.1 To ASTM C1776.

.2 Minimum compressive strength: 28 MPa.

.3 Free of water soluble chlorides and chloride based accelerator admixtures.

.4 6% +/- 1½% air-entrainment in conformance ASTM C94.

.5 Maximum slump of 125 mm +/- 40 mm per ASTM C143 for conventional concrete mix designs.

.2 Dry cast segmental units:

.1 To ASTM C1372.

.2 Passing freeze thaw tests as set forth in ASTM C1262/C1262M with an average absorption rate of 120kg/m3.

.3 Compressive strength range: 28-40 MPa in accordance with ASTM C1372.

.4 Infill rock/soil: as approved by the Engineer.

.3 Block units may be mass concrete or designed to incorporate granular infill.

.2 Gravel levelling pad and/or concrete footing as required by design.

.3 Prefabricated concrete units including bottom, intermediate, end, top and cap units as required.

.4 Drainage tile: perforated pipe, polyvinyl chloride (or approved equivalent), diameter as indicated, to CSA B1800, capable of being tied into new storm system construction. Provide connection to existing storm system in accordance with Section 33 39 00.

.5 Geotextile: to Section 31 15 53.

.6 Metal fabrications: posts, handrails, anchors, and fasteners to Section 05 50 00, galvanized to CSA G164. Provide design details to accommodate anchorage of railing, including infill materials, infill concrete or grout, holes drilled in block units, fasteners, all in accordance with the railing design.

.7 Backfill Material:

.1 Free Draining Backfill material to be granular, well-draining stone placed to a minimum of 300 mm depth behind the back of the wall and shall extend vertically from the leveling pad or concrete footing to an elevation 100 mm below the top of wall.

.2 Backfill material must be approved by a geotechnical engineer licensed to practice in the Province of Nova Scotia. Site excavated soils may be used if approved, unless otherwise specified in the drawings. Do not use unsuitable soils as defined in Section 31 20 00, organic soils and frost susceptible soils within a 1 to 1 influence area.

.8 Anchored wall cap or top unit.

.9 Face texture: Cobblestone texture, gray in color, or as shown in the Tender Drawings.

.2 Granular Fill: where required, use Type 1 gravel as specified in Section 31 20 00.

PART 3 - EXECUTION

3.1 Dewatering

.1 Perform dewatering in accordance with accepted method and in accordance with Section 31 20 00.

3.2 Soil Preparation

.1 Complete excavations in accordance with approved submissions, Section 31 20 00 and as indicated on Drawings. Notify the Engineer of unsatisfactory conditions.

.2 Confirm site foundation soil strength meets or exceeds assumed design strength. Submit results to the Engineer for review.

.3 Remove and replace soil not meeting the required strength with acceptable material. Compact to a minimum 95% to ASTM D1557 Density.

.4 Place geotextile between the Free Draining Backfill and retained soil as required.

3.3 Installation and Review

.1 Install retaining wall system in accordance with approved submission and manufacturer's recommendations including preparation of levelling pad, block unit, infill (where applicable), backfill and drainage layer, compaction, geotextile, railing, and associated work in accordance with the Engineer and the design requirements of the wall designer.

.2 Have contractor provide sealed drawings and certification of finished retaining wall construction, by a Professional Engineer (P.Eng.) licensed to practice in Nova Scotia.

3.4 Protection

.1 Protect and maintain work of this Section including accessories, until acceptance of project work.

3.5 Adjustment and Cleaning

.1 Replace entire units that are defective. Immediately remove from site defective and damaged materials. Replace, repair, re-finish, or otherwise make good to the Engineer’s review.

3.6 Reinstatement

.1 Reinstate any damaged surface adjacent to the Work area in accordance with Section 32 98 00.

****** END SECTION 32 32 23 ******

PART 1 – GENERAL

1.1 Related Sections
1.2 Reference Standards
1.3 Submittals
1.4 Delivery, Storage, and Handling
1.5 Warranty

PART 2 – PRODUCTS

2.1 Description
2.2 Materials

PART 3 – EXECUTION

3.1 General Conditions
3.2 Excavation Below Grade
3.3 Sub-Grade Preparation & Grading
3.4 Subdrain Piping
3.5 Sub-Base
3.6 Soil Cell System
3.7 Utilities Within Soil Cell Modules
3.8 Soil Filling
3.9 Aeration/Irrigation and Inspection Piping
3.10 Root Barriers and Root and Moisture Barriers
3.11 Backfilling
3.12 Installation of Geogrid
3.13 Aggregate Base Course
3.14 Tree Pit Openings
3.15 Tree Grates
3.16 Cleaning
3.17 Protection

PART 1 - GENERAL

1.1	Related Sections	.1	Concrete	Section 03 30 00
		.2	Precast Concrete	Section 03 45 00
		.3	Topsoil Placement and Grading	Section 32 91 19
		.4	Trees, Shrubs and Groundcover Planting	Section 32 90 00
		.5	Concrete	Section S11 Part A
		.6	Walks, Curbs & Gutters	Section S11 Part B
		.7	Interlocking Concrete Pavers	Section S12

1.2 Reference Standards .1 CSA S6:19, Canadian Highway Bridge Design Code.

1.3 Submittals .1 Soil Cell Systems and surrounding pavement design must be complete by a professional engineer licensed to practice in the Province of Nova Scotia in accordance with the Supplementary specifications. The design of the sidewalk, soil cell system, the underlying material, and soils, are able to withstand vehicular loading pursuant to the current version of the Canadian Highway Bridge Design Code CSA S6:19.

.2 Manufacturers Certification:
- .1 Design Stage: Soil cell manufacturer's letter of review and approval of the project, plans, details and specifications for compliance with product installation requirements.
- .2 Post Installation: Manufactures approved inspection checklist in accordance with submittal procedures and certification the installation qualifies for warranty.

.3 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for all composite elements of soil cell system and include product characteristics, performance criteria, physical size, finish, and limitations.

.4 Shop Drawings:
- .1 Submit shop drawings to CSA A23.4 and CAN/CSA-A23.3 including:
- .2 Manufacturer’s site-specific soil cell layout in plan and section. Indicate on drawings:

.1 All composite elements of soil cell system.
.2 Construction details, material descriptions, finishes, installation details
.3 Methods of handling and erection.
.4 Grades and dimensions (indicate stepping or sloping conditions to achieve finished grades), and soil volumes as required.
.5 All details and drawings to be stamped by a Professional Engineer licensed in Nova Scotia
.6 Warranty the product satisfies all reasonably expected loading requirements in this location.

.3 Samples:
.1 Produce, deliver and erect where directed by the Engineer on project site, [1] full size sample of each type of support module and related products finish and quality for approval of the Engineer.

.3 Compaction Tests: A certified testing agency shall perform compaction testing on sub-grade and on each layer of fill to determine compliance with specified compaction. Determine method and frequency of testing in consultation with Engineer.

.4 Documentation: dated and georeferenced photos to be submitted to manufacturer and Engineer during each phase of installation. Work may not proceed until approval of previous phase has been provided by the Engineer.

1.4 Delivery, Storage, and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

1.5 Warranty

.1 Provide manufacturer warranty, 20 year minimum against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 Description .1 The Soil cell system shall have the flexibly to be assembled around existing structures, utilities and in tight constraints, specific to the site requirements and achieve the required soil and/or stormwater volume. The system shall be easily disassembled and reassembled to allow for utility repair within and below the system.

2.2 Materials .1 Soil cell system

Either of the following systems:

a. StrataVault 30 series as manufactured by City Green Urban Landscape Solutions
Telephone:778-533-7764
Website: www.citygreen.com

b. Silvacell as manufactured by Deeproot Canada Corp.
Telephone: 1 604-687-0899
Website: www.deeproot.com

c. Arborsystem – Urban Tree Planting System as manufactured by GreenBlue Urban
Telephone: 1-866-282-2743
Website: https://greenblue.com/ce

d. or equivalent systems as approved by the Engineer or their representative

The Structural Soil cells system shall meet all applicable manufacturer's specifications and recommendations including, but not limited to, the following components:

a. non-woven filter cloth;
b. tensile geogrid;
c. root deflector, structural cells, and decking;
d. air and watering system;
e. Infill Panel: Injection molded, polypropylene or polyethylene with nominal dimensions as per manufacturer;
f. Interlocking uprights and decks are assembled on-site to create modules which can be uniformly stacked in height, not to exceed 2m in height (per project design); and
g. The soil module system shall have the ability to be assembled as a complete, interlocked unit or as independent modules.

.2 Tree Grates (as required)

a. Thames Tree Grate 1200 with inlet manufactured by Green Blue Urban Ltd

Grate Size:1200mm x 1200mm (min)
Vehicle Rating: Class B (min)
Material: Corten / Weathered Steel
Accessibility: Meets requirements of CSA B651 Accessible Design for the Built Environment and Heel Proof (<6.25 mm)

b. or equivalent as approved by the Engineer or their representative.

.3 Inlet Port Covers

a. RootRain Hyrdogrille Irrigation / Aeration / Inspection inlet manufactured by Green Blue Urban Ltd
Cover Size:120mm ⌀
Vehicle Rating: Class B (min)
Material: Weathering Steel
Accessibility: Meets requirements of CSA B651 Accessible Design for the Built Environment and Heel Proof (<6.25 mm)

b. or equivalent as approved by the Engineer or their representative"

PART 3 – Execution

3.1 General Conditions .1 Soil cells and related products shall be installed by a qualified Contractor with experience successfully installing structural soil cells on at least two (2) prior projects with contact information for references on those prior projects.

- Contractor will be required to complete a training session provided by the manufacture. Training session to be completed by all field supervisors and key personnel involved in the installation.
- Contractor shall utilize the same field supervisor through the project unless a substitution is submitted and approved by the Engineer.
- Otherwise, coordinate the installation with the product manufacturer, to have the manufacturer on-site during product installation.

.2 Locate underground utilities before proceeding with excavation.

- Clearance and cover measurements for underground utilities to be observed by Contractor and noted on as-built drawings.

.3 Review manufacturer's installation procedures and coordinate installation with other work affected, such as grading, excavation, utilities, construction access, erosion control and other associated works.

.4 Each soil cell or stack of soil cells shall be structurally independent such that a single stack, or group of stacks, may be removed to facilitate future utility connections or repairs. If connections are required, the connections must have ability to break during access for maintenance or repair activities.

.5 Cold weather installation or assembly of modules should not be undertaken when temperatures are below 4° C.

.6 Tree Pit Depths: Confirm excavation depths with reference to finished surface elevations. Allow for granular base course layer and, where applicable, drainage layer.

.7 Assembled modules may be walked on, but vehicular traffic is prohibited until properly backfilled and covered per Manufacturer's recommendations. Protect personnel and the installation against damage with highly visible construction tape, fencing, or other means until construction is complete.

3.2 Excavation Below Grade

.1 Excavation required for the installation of all pipes and structures shall be made to the depths and widths indicated on the Drawings (a minimum of 300 mm beyond all sides of the structural soil cell components for proper backfill). The Contractor shall ensure that the bottom of the excavation is firm and dry and, in all respects, acceptable to the Engineer.

.2 All objectionable material identified by the Engineer encountered within the limits indicated shall be removed and disposed of by the Contractor.

.3 In excavation faces, all loose or protruding rocks shall be secured or otherwise removed to finished grade. All cut slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings or as directed by the Engineer.

.4 Furnish, install, monitor, and maintain excavation supports (e.g., shoring, sheeting, bracing, trench boxes, etc.) as required by to meet applicable safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and protect the

installed soil cell system and adjacent structures from undermining, settlement, or other damage.

3.3 Sub-Grade Preparation and Grading

.1 Sub-grade shall be unfrozen, level, and free of lumps or debris with no standing water, mud, or muck. Do not use frozen materials or materials mixed or coated with ice or frost. A minimum 9,764.86 kilograms per square meter (2,000 pounds per square foot) bearing capacity is required unless otherwise specified in project documents.

.2 If Contractor fails to maintain the sub-grade properly, the Contractor shall remove the unsuitable material. If the bottom of any portion of the excavation is removed below the limits shown on the Drawings, it shall be restored per the Engineer to the elevation shown in the Drawings. Compacted native earthen fill is not acceptable.

.3 If in the opinion of Engineer or authorized representative, the sub-grade, at or below the normal grade of the excavation as indicated on the Drawings, is unsuitable for construction; it shall be removed to such depth and width as the Engineer may direct and be replaced with suitable material as directed by the Engineer.

3.4 Subdrain Piping

.1 Place subdrain piping as indicated on the Drawings.

.2 Subdrain is required unless native soils infiltration rate is shown to be greater than 15 mm/hr by Guelph Permeameter test or other testing method approved by the Engineer.

.3 Install subdrain piping and cleanouts as indicated on the Drawings. Cleanout caps should be flushed with surface and labelled clearly and durably.

.4 Subdrain piping to be 150mm (min. diam.) perforated PVC pipe with filter sock

.5 Subdrain piping shall be sloped toward the outlet at a minimum 1% slope.

.6 Cleanout spacing shall not exceed 30m.

.7 Angled pipe connections must exceed 90 degrees. No 90-degree joints are permitted.

.8 Where the soil cell system subdrain is to connect to the Halifax Water storm drainage system, the connection design shall be submitted to and approved by Halifax Water.

.9 Prior to backfilling subdrain system must be inspected and approved by Halifax Water & the Engineer.

3.5 Sub-Base

.1 Install leveling bed to depths shown on drawings across the footprint of the structure. Granulars shall be compacted to provide a flat surface; free from lumps, debris or any other sharp materials. Base may have up to a 5% slope.

.2 Base shall be compacted to 95% Proctor Density minimum, or as specified by the Engineer.

.3 If recommended in the geotechnical report or by the Engineer, reinforcement geogrid fabric shall be placed within the base.

- If required, the reinforcement geogrid fabric shall be placed on top of 50 mm of aggregate and covered with 50 mm of aggregate. Reinforcement geogrid fabric panels shall be overlapped a minimum 300 mm, or as recommended by manufacturer.

3.6 Soil Cell System

.1 The installation procedure outlined in this section shall be followed by the Contractor. In the event of any discrepancy between the following installation procedure and the Manufacturer's Installation Guidelines, the Engineer reserves the right to contact the Manufacturer's Representative for guidance prior to the continuation of the installation. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

.2 Layout tree pit locations and dimensions using a soluble paint, chalk, or string to outline the footprint of the soil cell system. Prior to the installation of soil module panels, confirm tree pit dimensions and mark location of trees. Rectify discrepancies and errors. Ensure squareness prior to module placement. Obtain engineers approval of layout before proceeding with excavation.

.3 Install structural soil cell modules in strict accordance with manufacturer's written instructions and installation diagrams. Prior to placement, check each module for damage. Reject cracked, chipped and otherwise damaged modules. Ensure that panels in contact with granular base course are firmly seated, with no rocking. Ensure that panels are mechanically interconnected both horizontally and, if applicable, vertically.

.4 Upon completion of the placement, wrap the sides of the system with root and moisture barrier, or geogrid/fabric to prevent material migration into the soil module system.

Avoid damage to moisture barrier or geogrid/fabric during placement. If damage occurs, repair that portion per manufacturer specifications. Locations of all such repairs shall be noted on as-built drawings.

3.7 Utilities Within Soil Cell Modules

.1 The Contractor shall coordinate interface or spanning of utilities with the Engineer. This may require special treatments, barriers, and details.

3.8 Soil Filling

.1 Obtain Engineer's approval prior to filling the soil cell modules with soil. Install soil after soil modules are fully assembled and piping systems and barriers are in place.

.2 Except as shown otherwise on the Drawings, all void spaces shall be completely filled with soil. Place soil using an excavator bucket and spread by hand with rakes or shovels.

.3 Keep outer trench free of soil.

.4 Soil shall be compacted in lifts of 200 mm to 300mm during placement and compacted by walking over layers or utilizing a hand-held roller designed specifically for this use and approved by the Manufacturer. Note: the top panel is also an aeration deck allowing soil to be filled to top of upright panels.

3.9 Aeration/Irrigation and Inspection Piping

.1 Where required, place aeration/irrigation piping in accordance with the Drawings and soil cell manufacturer's specifications.

.2 Pipe to be placed level and reach entire tree pit.

.3 Perforations to face bottom of tree pit.

.4 Connect pipe to irrigation port at surface. Port cover shall be grated to allow aeration.

.5 There should be a minimum of one inlet per tree to a maximum spacing of 30m.

.6 Angled pipe connections must exceed 90 degrees. No 90-degree pipe connections are permitted.

3.10 Root Barriers and Root and Moisture Barriers

.1 Install ribbed root barriers and root & moisture barriers per manufacturer specifications. Overlap barrier joints 200mm and tape both sides of joint. Locations of barrier joints to be marked on as-built drawings. Top edge of barriers shall be level with adjacent construction. Ensure

that earth surfaces in contact with barriers are flat and free of sharp edges, debris and stones to avoid puncturing barriers. Install ribbed root barriers with ribs facing inward.

3.11 Backfilling

.1 Place backfill materials around the perimeter of the soil cell system in maximum 300mm lifts. Each lift shall be placed around the entire perimeter such that each lift is no more than 600 mm higher than the side backfill along any other location on the perimeter of the soil cell system. No fill shall be placed over top of modules until the side backfill has been completed and approved by the Engineer.

.2 Each lift shall be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density or? until no further densification is observed (for self-compacting stone materials). The side lifts must be compacted with walk-behind compaction equipment. Even when “self-compacting” backfill materials are selected; a walk behind vibratory compactor must be used.

.3 Take care to ensure that the compaction process does not allow the machinery to contact the installed soil cell system due to the potential for damage to the root and moisture barrier or geogrid/fabric and structural soil cells.

.4 Continue backfilling the perimeter until it is backfilled to within 300 mm of the top of the structural soil cells.

3.12 Installation of Geogrid

.1 Where required, install the geogrid with integrated non-woven geotextile on top of the soil cell system per soil cell system manufacturer’s specifications allowing it to extend 300 mm vertical down the sides of the modules, and 300 mm horizontal away from the decking. Overlap geogrid with integrated non-woven geotextile a minimum 200 mm or according to geogrid manufacturer specifications.

3.13 Aggregate Base Course

.1 Continue backfilling the perimeter and top of the assembled modules in 150 mm lifts, until specified depth is reached. Each lift shall be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density.

.2 Ensure that all unrelated construction traffic is kept away from the limits of excavation until the project is complete and final surface materials are in place. No non-installation related loading should be allowed over the soil cell system until the surface treatment is constructed.

3.14 Tree Pit Openings

.1 Confirm exact location of tree pit openings. Cut geogrid layer and fold back to expose opening. Position perimeter formwork for tree grate (as required).

.2 Line tree pit opening with root barrier where required with ribs facing inward. Extend root barrier down to top of soil modules and up to level of finished surface. Lap root barrier joints 200mm and tape both sides of joint or according to root barrier manufacturer specifications.

3.15 Tree Grates

.1 Where specified, install tree grates according to the manufacturer's instructions.

.2 Tree pit openings shall have a minimum dimension of 1200 mm x 1200 mm and be constructed with a concrete shelf to accommodate tree grate. Tree grates and supporting structures shall be sized to cover the tree opening without encroachment into the minimum tree opening.

.3 Tree grate opening shall be a minimum of 600 mm^2 (square or round).

4. Trees must be centered within the tree grate openings.

5. Tree grates shall be installed to be flush with surrounding pavement.

3.16 Cleaning

.1 Obtain approval of cleaning methods from the Engineer before cleaning any soiled surfaces.

.2 Final Cleaning: upon completion of installation of soil cell system remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

3.17 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by surface treatment, sidewalk, and precast or cast-in-place concrete curb installation.

****** END OF SECTION 32 94 50 ******

INDEX TO CLAUSES

PART 1 - GENERAL

1.1 Work Included
1.2 Related Sections
1.3 Reference Standards
1.4 Shop Drawings
1.5 Codes, Bylaws, Ordinances and Regulations
1.6 Certificates
1.7 Handling and Storage
1.8 Quality Assurance
1.9 Spare Parts

PART 2 - PRODUCTS

2.1 General
2.2 Concrete Bases
2.3 Conduits
2.4 Pull Pits and Junction Boxes
2.5 Transformer Bases
2.6 Traffic Signal Cables
2.7 Detection System
2.8 Poles, Mast Arms - Aluminum
2.9 Poles, Mast Arms - Steel
2.10 Signal Mounting Brackets
2.11 Traffic Signal Heads
2.12 Traffic Signal Backplates
2.13 Pedestrian Signal Heads
2.14 Pedestrian Push Buttons
2.15 Pre-Emption Devices
2.16 Pedestrian (RA-5) Signals
2.17 Rectangular Rapid Flashing Beacon (RRFB)
2.18 Uninterruptible Power Supply

PART 3 - EXECUTION

3.1 Excavation and Backfilling
3.2 Concrete Bases
3.3 Conduit Installation
3.4 Installation of Detector Loops
3.5 Installation of Transformer Bases, Poles and Mast Arms
3.6 Installation of Push Button Assemblies
3.7 Installation of Traffic Signals and Pedestrian Signals
3.8 Installation of Pedestrian (RA-5) Signals
3.9 Installation of Pre-emption Equipment
3.10 Wiring of Poles and Mast Arms
3.11 Mounting of Traffic Signal Controller Cabinet
3.12 Installation of Pedestrian (RA-5) Signal Controller
3.13 Removal and Disposal of Damaged and Obsolete Equipment
3.14 Grounding

PART 1 - GENERAL

1.1 Work Included

.1 This section specifies the requirements for the installation of traffic and pedestrian crossing signal systems. The Work consists of furnishing all labour, tools, and equipment, and performing all operations necessary to complete the installation of the traffic signal, pedestrian crossing items, UPS - Battery Backup, and any other supplementary systems as shown on the drawings.

1.2 Related Sections

.1	Concrete	Section 03 30 00
.2	Metal Fabrications	Section 05 50 00
.3	Earthwork	Section 31 20 00
.4	Walks, Curbs, and Gutters	Section 32 16 00
.5	Topsoiling and Finish Grading	Section 32 91 19
.6	Reinstatement	Section 32 98 00
.7	Hot Mix Asphalt Concrete	Section S-1
.8	Performance Graded Asphalt Binder	Section S-2

1.3 Reference Standards

.1 CSA C22.1 (latest edition), Canadian Electrical Code Part 1

.2 International Municipal Signal Association (IMSA) Official Wire and Specifications Manual (latest edition)

.3 CSA C22.2 No. 211.2 (latest edition), Rigid PVC (Unplasticized) Conduit.

.4 CSA C22.2 No. 41 (latest edition), Grounding and Bonding.

.5 CSA C22.2 No. 85 (latest edition), Rigid PVC Boxes and Fittings.

.6 CSA S6 (latest edition), Canadian Highway Bridge Design Code.

.7 AASHTO LRFDLTS-1 (latest edition), LRFD Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

.8 ASTM C857 (latest edition), Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.

.9 ASTM D412 (latest edition), Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers – Tension.

.10 ASTM D2240 (latest edition), Standard Test Method for Rubber Property – Durometer Hardness.

.11 NEMA TS-2 (latest edition), Traffic Controller Assemblies with NTCIP Requirements.

.12 NEMA 250- (latest edition), Enclosures for Electrical Equipment (1000 Volts Maximum)

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 10 00.

.2 Submit shop drawings to HRM for review within 14 calendar days of tender award and order the materials within two (2) working days of receiving HRM's shop drawing review.

1.5 Codes, Bylaws, Ordinances and Regulations

.1 Perform all work covered by this section according to:
- .1 Applicable Halifax Regional Municipality and Nova Scotia Power Incorporated (NSPI) Codes, Bylaws, Ordinances, and Regulations.
- .2 Nova Scotia Department of Transportation and Infrastructure Renewal "Temporary Work Place Traffic Control Manual" (latest revision).
- .3 HRM's Traffic Control Manual Supplement.
- .4 The Canadian Electrical Code.

1.6 Certificates

.1 Submit manufacturer's specification and test data that confirms proposed products and materials meet requirements of this Section in accordance with Section 01 10 00.

.2 Provide additional test data for any component specified herein as requested by the Engineer.

.3 Obtain final certificate of approval from NSPI.

1.7 Handling and Storage .1 Ship poles, mast arms, tenons, signal heads, and other equipment complete with all required hardware.

.2 Handle and store traffic signal system equipment in accordance with the manufacturer's written instructions and in a manner that avoids damage to the equipment. Should any item be damaged as a result of neglect or improper storage or handling, replace at no additional cost to the Contract to the satisfaction of the Engineer.

1.8 Quality Assurance .1 Have field work on traffic signal systems performed by or directly supervised by a journeyman electrician with a minimum International Municipal Signal Association (IMSA) Traffic Signals Level 1 Certification.

.2 In addition, have Traffic Signals work within the Control Cabinet and involving the Control Cabinet wiring and equipment performed by or directly supervised by a Licensed Journeyman Electrician with IMSA, Traffic Signals Level 2 Certification or an Electrical or Electronics Technician / Technologist with IMSA, Traffic Signals Level 2 Certification.

1.9 Spare Parts .1 Provide all unused portions of cable spools to the Owner at the conclusion of the Work.

PART 2 - PRODUCTS

2.1 General .1 All material and equipment supplied must be new unless otherwise stated.

.2 All traffic signal equipment must be compatible with HRM's existing traffic signal systems and must be approved by HRM prior to ordering.

.3 Provide equipment designed to meet or exceed wind loading requirements as set forth in the National Building Code for the HRM region.

.4 Supply all accessories and appurtenances for a fully functional traffic control system.

2.2 Concrete Bases .1 Cast in place base mix design to Section 03 30 00.

2.3 Conduits

.1 Detector home runs: 38mm diameter rigid PVC: to CSA C22.2 No. 211.2.

.2 Preformed Home-run detector loops: 19mm diameter rigid PVC, to CSA C22.2 No. 211.2.

.3 Signal Cable: Rigid PVC to CSA C22.2 No. 211.2. Sizes shown on drawing.

.4 Pole Risers: to Section 03 30 00, 20mm maximum aggregate size, minimum 35 MPA at 28 days, to sizes and dimensions shown on drawings.

2.4 Pull Pits and Junction Boxes

.1 Pull pit: as per HRM standard drawing HRM 79.

.2 Junction Box: (Above Ground): to CSA C22.2 No. 85, flanged, PVC junction box complete with fibre reinforced cover.

.3 Junction Box: (In Concrete or in Ground): to ASTM C857.

2.5 Transformer Bases

.1 Aluminum transformer base to AASHTO LRFDLTS-1, complete with hinged access door fastened with stainless steel hinges and screws. Bolt circles to match poles and bases.

2.6 Traffic Signal Cables

.1 26-conductor traffic cable complete with PVC jacket. PE insulated and cabled symmetrical in layers with lay as per IMSA 19-1-1984. Tracers to be permanently marked or embedded into insulation not printed. Filler to be PVC or PE. Apply (1) one layer of tape under outside of jacket to lap at least 12.5% of tape width. Cable outside diameter not to exceed (1) one inch. 600 volt ac rating.

- .1 #10 stranded plain copper A.W.G. white.
- .2 #14 stranded plain copper A.W.G as follows:
  - .1 Red: with (1) white tracer, Red with (2) white tracers, Red with (3) white tracers.
  - .2 Orange: with (1) white tracer, orange with (2) white tracers, orange with (3) white tracers.
  - .3 Blue: with (1) white tracer, blue with (2) white tracers, blue with (3) white tracers.
  - .4 Black: with (1) white tracer, black with (2) white tracers, black with (3) white tracers.

.5 Yellow: with (1) white tracer, yellow with (2) white tracers, yellow with (3) white tracers.

.6 Brown: with (1) white tracer, brown with (2) White tracers, brown with (3) white tracers.

.2 Five (5) conductor traffic cable complete with PVC jacket. PE insulated and cabled symmetrical in layers with lay as per I.M.S.A. 19-1-1984. Filler to be PVC or PE. Apply (1) one layer of tape under outside of jacket to lap at least 12.5% of tape width. Cable outside diameter not to exceed (1) one inch, 600 volt ac rating. Wire size and color coding is as follows:

.1 #14 stranded plain copper A.W.G as follows: “Red”. “Orange”, “Blue”, “White”, “Green”.

.3 (4) Four conductor traffic cable, PVC jacket. PE insulated and cabled symmetrical in layers with lay as per IMSA 19-1-84.

Filler to be PVC. or PE. Apply one (1) layer of tape under the outside of jacket to lap at least 12.5% of tape width. Cable outside diameter not to exceed ½ inch. 600 volt ac rating. Wire size and color coding is as follows:

.1 #14 stranded plain copper A.W.G as follows: “Green”, “White”, “Black”, “Yellow”.

2.7 Detection System

.1 Inductive Detector Loops:

.1 Loop Cable: RWU 90, #14 AWG stranded bare copper conductor complete with cross-linked polyethylene insulation.

.2 Sealant: one-part, moisture curable, polyurethane sealant, self-levelling with the following minimum physical property ranges:

.1 Tensile Strength: 620 psi ± 43 psi to ASTM D412.

.2 Elongation: 290% ± 32% to ASTM D412.

.3 Minimum Hardness (Shore A): greater than 10 to ASTM D2240.

.3 In-ground Lead-in-Cable: 2-conductor, 14 AWG tinned copper, polyethylene insulation outer jacket and aluminum/polyester outer shield.

.4 Overhead Lead-in-Cable: 2 × 2 core with ground and foil shield complete with 5mm support wire.

.2 Preformed Detector Loops:

.1 Four (4) conductor, double-jacketed cable suitable for asphalt or concrete overlay.

.2 Conductors: #18 AWG with 0.5mm thick layer of crosslinked polyethylene (XLPE).

.3 Void between conductors and inner jacket to be spiral wrapped in moisture resistant binder tape and filled with an amorphous water blocking gel.
.4 Inner jacket: 1.0mm crosslinked polyethylene (XLPE).
.5 Outer jacket: 0.9mm thick crosslinked polyethylene (XLPE). For direct buried applications employ an additional 5.0mm thick TPE insulated outer jacket.
.6 Lead-in cable: two (2) conductor, double jacketed cable, #16 AWG with a 0.5mm thick layer of crosslinked polyethylene (XLPE). Inner jacket and outer jacket to match specification above.
.7 Splices to be soldered, sealed and waterproofed.

.3 Microwave radar detection:
.1 Microwave based radar motion sensor to interface with traffic control cabinet (NEMA 170, 179 and 2070 cabinets). Capable of monitoring up to eight detection zones; motion detection range between 60-600 feet for cars, 160 feet for pedestrians and bicycles; complete with surge protection; powered from TCIB over Ethernet cables; mountable on corner pole or mast arm and capable of tracking up to 64 objects simultaneously.

.4 Radar Detector:
.1 Radar sensor matrix system capable of monitoring real time presence data complete with pre-assembled cabinet backplate and mounting hardware.
.2 Remotely accessible for traffic monitoring and sensor management.
.3 Integral surge protection.
.4 Watertight to NEMA 250.
.5 Accessories:
.1 Rack cards.
.2 Junction box.
.3 6-conductor cable.

.5 Video monitoring equipment:
.1 Camera:
.1 Single bell camera vehicle detection and counting, for highway counting and monitoring application.
.2 5MP CMOS, powered over Ethernet IP68, internally pressurized and leak tested, water tight to NEMA 250 and with an operable temperature range of -34°C to +74°C.

.3 Resolution: 2560 x 1920 pixels
.4 Lens: 180° Fisheye.
.5 Power consumption: 5W nominal, 50W with heaters activated.

.2 Processor:
.1 Vehicle tracking and counting, intersection actuation application, to NEMA TS2.
.2 TCP/IP communication.
.3 Wide Area Network (WAN) port for remote connectivity.
.4 Power: 120/240 VAC 50/60 H
.5 Power consumption: 35Wnominal, 85W with active camera heaters.
.6 Detector I/O: Twenty-four (24) optically isolated I/O, SDLC interface, or ITS interface.
.7 Outputs: 24 optically isolated outputs, SDLC interface conforming to TS2 specs, programmable up to 64 detectors.
.8 Operable temperature range of -34°C to +74°C.

.3 Software: data interface, remotely operable with equipment, storage and retrieval of data. Proprietary software to matches the equipment system, Cloud backup enabled, capable of real time automatic alerts.

2.8 Poles, Mast Arms - Aluminum

.1 Round seamless tubes of aluminum alloy 6063-T6, free from longitudinal welds with No. 120 grit belt surface finish.

.2 Height, diameter, wall thickness, and taper: as indicated.

.3 Poles and arms to meet minimum loading requirements.

.4 Mast arms: aluminum alloy truss style complete with aluminum alloy 6063-T6 brackets, stainless steel nuts, bolts, and washers.

.5 Use anti-seize compound on all threaded hardware.

2.9 Poles, Mast Arms - Steel

.1 Steel poles and mast arms to be round in cross-section and have a constant linear taper of 1.17 cm/m. Shaft to be one piece with no circumferential welded splices.

.2 Tube seam welds for poles and mast arms must be free of cracks and excessive undercut, performed with an

automatic process with a smooth finish and have a minimum penetration of 60%. Seams within 100mm of a flange or base plate shall be 100% penetration. Poles to be fabricated to ASTM A572 or ASTMA595 Grade A with a minimum yield strength of 55 ksi.

.3 Pole to include a 100mm x 250mm hand hole with the cover located 26mm to 153mm from pole base and arm base.

.4 All mast arms up to 15.2m in length are to be manufactured and shipped in one piece. Provide each arm with a cast end cap secured in place with set screws.

.5 Poles and arms to be designed in accordance with CSA S6 and must meet minimum loading requirements.

.6 Include anchor bolts with each pole, sized as determined by the fabricator. Use anti-seize compound on all threaded hardware.

.7 Fabricator to be certified to an AISC Fabricator Certified Quality Program.

.8 Treat field cuts and/or drill holes with cold galvanizing compound.

.9 Nuts to be double nutted and tightened to manufacturer's recommended torque.

2.10 Signal Mounting Brackets

.1 Pole Mounted: 38mm diameter aluminum tubing and cast fittings unpainted unless specified on drawings.

.2 Mast Arms: 2-way variable tenon mount, with stainless steel hardware.

.3 Tenons: aluminum alloy complete with 201 stainless steel 19mm banding, buckles, pole plates, one way top bracket assembly, and one way bottom bracket assembly.

.4 Pole Plate: Double Band-it type MH/AL/100 by Pelco or approved equal.

.5 Color: as specified by Engineer.

2.11 Traffic Signal Heads

.1 Housing: Polycarbonate with polycarbonate lenses and black visors unless otherwise specified on the drawings.

.2 Color: Yellow housing unless otherwise specified on the drawings.

.3 Lamps: All signals to have 300mm LED modules built to the latest ITE specifications

.4 Complete with snow shield.
.1 Acceptable product: Snow Sentry.

2.12 Traffic Signal Backplate

.1 Primary Signal Heads to come complete with yellow Polycarbonate reflectorized backplate non-louvered, with 76mm 3M diamond grade reflective white tape border.

2.13 Pedestrian Signal Heads

.1 Housing: Bi-modal polycarbonate housing.

.2 Color: Yellow housing and black visors unless otherwise specified on the drawings.

.3 Lamps: All pedestrian signals to have Square LED modules built to the latest ITE specifications.

.4 Countdown Pedestrian Signal Heads as shown on the drawings.

.5 Symbols: to the International Municipal Signal Association (IMSA) Official Wire and Specifications Manual (latest edition).

2.14 Pedestrian Push Buttons

.1 Pedestrian push buttons:
.1 Audible signal with accompanying visual one. Wireless Bluetooth communication, 360 degree dual-side speaker output, over-mold board protection, APS connectivity accessibility, and tested to NEMA TS2 for temperature, humidity, mechanical shock vibration and transient surge.
.1 Acceptable Product: Polara i-Navigator APS, Model iN-2 for existing systems, Model iN3 for new systems; or approved equivalent.

.2 Sounds: As per latest recommendation by the Canadian National Institute for the Blind as confirmed by the Engineer.

.3 Colour: Yellow or as specified.

2.15 Pre-Emption Devices

.1 Plug-in, four (4) channel, dual priority, multimode encoded signal device for use with GPS radio/GPS intersection equipment.

.2 Capable of reading three (3) distinct emitter frequencies, high priority, low priority and probe priority.

2.16 Pedestrian (RA-5) Signals

.1 Type: Double-sided illuminated 600mm × 750mm RA-5 Crosswalk sign with walking man symbol inside white border, complete with 300mm flashing amber beacons attached to each side of sign if specified.

.2 Body:

.1 Aluminum, treated to prevent premature peeling and blistering using interprime 5519 etch primer and 519 converter prior to painting. Sign to be painted 514 crosswalk yellow.

.2 All seams to be welded in main body construction.

.3 Bottom of sign to have an opening protected by wire mesh.

.4 No exposed wiring inside sign except for terminal ends in bottom.

.5 Stainless steel hinges with removable pins to hold both door faces of sign to main sign, and stainless latch to close door faces to main sign. Doors to swing upwards freely with no obstructions.

.6 CSA labeled.

.7 Wiring diagram with completed parts list.

.8 RA-5 housing to be a maximum of 660mm W x 790mm L x 320mm D.

.3 Lens:

.1 Lexan 5mm thick, slide in-slide out, replacement.

.2 Facelight source to be LED 120/130 volt 40w lamp, mogul base (lamp to be included). Ballast to be mounted in plate with quick detachable socket for wiring.

.3 Down light source to be LED 120/130 volt 54w lamp, mogul base (lamp to be included). Mount ballast in plate with quick detachable socket for wiring. Down light source to provide illumination of 43 lux on the roadway surface.

.4 Switch inside to provide disconnect to lamp socket.

.4 Mounting:
.1 Mast Arm: top of fixture to be reinforced with minimum 7mm aluminum plate to absorb strain of the hanger. Supply cushion hanger with sign. Supply safety chains and eye bolts on top to prevent signs from rotating in high winds. Doors to swing upwards freely with no obstructions.
.2 Span Wire: top of fixture to be reinforced with minimum 7mm aluminum plate. Provide double span wire suspension hangers with wire entrance port complete with wire clamp and protector. Bottom suspension wire to be clamped with suitable clamping device capable of supporting total weight of signs in the event of primary messenger failure.

.5 Beacons: Each sign to be complete with two (2) 300mm flashing amber LED beacons in yellow polycarbonate housing, one attached to each side of the sign (right side: facing the viewer; left side: facing away from the viewer). Black visors unless otherwise specified on the drawings.

.6 Complete sign assembly to be CSA certified.

.7 Pedestrian controller:
.1 Controller to be capable of activating the pedestrian signals for a programmable length of time.
.2 Any press of the push buttons must be capable of starting the crossing countdown over.

2.17 Rectangular Rapid Flashing Beacon (RRFB)

.1 Overview: The RRFB shall conform to all provisions of the MUTCD, Interim Approval IA-21 including flash pattern.

.2 An AC-powered version and solar powered version shall be available. (see drawings for type required)

.3 Mechanical Specifications:
.1 For top of pole mounting, the solar panel shall be supplied with a fixed tilt angle of 45 degrees and shall be able to be oriented toward the equator with no additional mounting hardware.
.2 For side of pole mounting, the solar panel shall be supplied with an adjustable tilt angle and shall be able to be oriented toward the equator with no additional mounting hardware. Solar simulations for side-of-pole solar panel mounting shall assume 45-degree angle.

.4 Fasteners shall be stainless steel.

.5 Light bar - Each RRFB shall include from one to four light bars as required.

.1 The light bars shall be current-driven LEDs

.2 The light bar housing shall be constructed from aluminum and shall have the approximate dimensions: 24” L x 1.5” D x 4.5” H (61.0 cm L x 3.8 cm D x 11.4 cm H).

.3 Each light bar shall conform to all provisions of the MUTCD and FHWA requirements.

.4 Each of the two modules in a light bar shall have 8 LEDs and shall be purpose-built by the manufacturer of the RRFB including the optics. The optics shall be premium, UV-resistant polycarbonate.

.5 Each end of a light bar shall include a side-emitting pedestrian confirmation light composed of a single LED. Users shall have the option of using both confirmation lights for median applications, or covering one confirmation light with an included sticker for side-of-road applications.

.6 The light bar shall be mounted to the post or pole using a separate bracket assembly to facilitate mounting two light bars back-to-back (bi-directional) and to allow the light bar(s) to rotate horizontally for aiming.

.6 Mounting adapter hardware for the RRFB cabinet shall be available for 4” – 4.5” round poles or square posts. Manufacturer shall provide a 5-Year Limited Warranty.

.7 The User Interface shall provide viewing and/or programming access for the following:

- Activation Duration (5 to 60, 60 to 1200, or 3600 seconds)
- Digital output that is active during the flashing cycle that allows the control of external devices such as crosswalk illumination. Digital output shall be configurable for night operation only or operation day or night
- Radio Channel (Choice of 1 to 14)
- Radio Status
- Night Intensity Setting
- Adjustment for Ambient Daytime Brightness
- Self-Test / BIST (Built-In Self-Test) including the detection of shorts or open circuits in the fixture outputs
- Battery Status – General description and actual battery voltage

- Day or Night Status (as determined by dedicated photosensor not solar panel output)
- Solar Panel Voltage
- Automatic Light Control. If this safety feature is enabled, it allows the RRFB to temporarily reduce the intensity of the light bars to maintain energy equilibrium. The user interface shall report the amount of dimming being applied in the range of 10% to 100%
- Daily activations averaged over 90 days
- Pushbutton detection
- Firmware Version number

.8 A detailed solar simulations shall be provided as evidence that the RRFB is capable of the claimed performance at a specific location. Solar Simulations shall be composed of three calculations: Energy Balance, Array-to-Load Ratio (ALR), and Autonomy. The manufacturer or bidder shall provide a detailed analysis of these three calculations in an "Energy Balance Report".

.9 The Manufacturer shall be ISO 9001 certified.

.10 Acceptable product: Carmanah Technologies Inc.

2.18 Uninterruptible Power Supply

.1 UPS - Battery Backup Systems (BBS) for Traffic Signals.

.2 Compatibility: BBS to be compatible with the traffic controller cabinet, controller and cabinet components, including the safety monitor, for full time operation. BBS to include all necessary cables to connect Inverter/Controller and battery panel(s).

.3 Run-time: BBS to provide a 2-amp cabinet load a minimum run-time of four (4) hours of full color operation.

.4 Output Capacity: BBS to provide a minimum of 1000W @ +74°C, continuous active output capacity, with a 90% minimum inverter efficiency while running in battery backup mode.

.5 Output Voltage: When under battery power, BBS output voltage to be 120 VAC, pure sine wave output, ±3%, 60 Hz ±0.1%.

.6 Transfer Time: The maximum transfer time allowed, from disruption of utility line voltage to stabilized inverter line

voltage from batteries shall be eight (8) milliseconds. The maximum transfer time when switching from inverter line voltage to utility line voltage after the line-qualifying period shall be ten (10) milliseconds. The BBS must be capable of allowing the user to change the transfer time in eight (8) millisecond increments up to 200 milliseconds if needed by the cabinet equipment.

.7 Operating Environment: The operating temperature for the Inverter/Controller, Battery Hub and Power Interface Module (PIM) shall be -35°F to +165°F (-37°C to +74°C).

.8 Surge Protection: BBS transient protection to be able to handle a minimum of 480 joules of energy and 39kA peak current. In addition, input circuit to contain an RF filter, which provides attenuation of line noise of 25 dB at 10 KHz, 65 dB at 100 KHz and 100 dB at 1 MHz.

.9 Power & Control Connections: BBS to have the capability to be replaced with ease utilizing single connectors for AC input, AC output and the battery panel(s).

.1 AC Connection: AC input and output to be separate panel mounted plug/receptacles that allow no possibility of accidental exposure to dangerous voltages. Plug/receptacles to utilize some form of locking mechanism to prevent accidental disconnect.

.2 Battery Connection: battery panel to utilize a single circular barrel type connector for connecting to the Inverter/Controller with ease.

.10 Battery: sealed Nickel-Zinc (NiZn) battery technology. Lead-Acid battery technologies will not be accepted.

.1 Charging/battery monitoring circuitry to be incorporated within the battery panel.

.2 BBS to allow the user to ‘Hot Swap’ the battery panel(s) while on utility power or battery backup power.

.3 The Inverter/Controller must allow the connection of four (4) battery panels directly to the Inverter/Controller.

.4 The Inverter/Controller must be capable of accepting battery panel(s) of different capacities at once, giving the user the ability to utilize different battery sizes to achieve required run-times.

.5 Inverter/Controller to accept up to sixteen (16) battery panels when utilizing a battery HUB(s).

.11 Charge Time: The BBS must recharge to full charge capacity within four (4) hours of complete discharge when AC utility line voltage is available. The number of battery panels connected to the Inverter/Controller shall have NO effect on the four (4) hour recharge time. Temperatures below 149°F (65°C) shall not have any effect on the ability to recharge or the recharge time. The BBS must not require trickle/float charging.

.12 Unit Failure: The BBS must have a fail-safe utility tie feature that automatically cuts back to the utility line in the event of an Inverter/Controller failure, battery panel(s) failure or complete battery panel(s) discharge.

.13 LCD Display: BBS Inverter/Controller to have a 4 line by 20-character LCD display with an LED back light. From the main screen, LCD display to provide the following information:

.1 Utility line voltage
.2 BBS status
.3 Cabinet current consumption
.4 Battery charge percentage
.5 Available backup time in hours and minutes

.14 Keypad: BBS Inverter/Controller to include a 4-way navigational keypad to allow users the ability to navigate the menu and program user set parameters.

.15 Programmable Relays: BBS Inverter/Controller to include eight (8) programmable relays, which are controlled by power line conditions, and user selected settings of the BBS. These relay contacts shall be rated for 2 amps @ 120 VAC. Each relay shall have the ability to be triggered by multiple conditions simultaneously. The programming options are as follows:

.1 Loss of utility line voltage
.2 Low battery
.3 Time of day
.4 Temperature
.5 Time delay (for red flash)

.16 Event Log: BBS to provide an event log, which will allow the user to view the date, time, and duration of a given event. The event log shall provide the user with an image of the waveform from the given event. Data to be recorded in a FIFO format so the oldest event is purged as the newest is entered.

.17 Manual Bypass Switch: BBS Inverter/Controller to include a manual bypass switch to allow the user to manually bypass the inverter while allowing the utility line voltage through to the cabinet.

.18 Circuit Breakers: Equip the BBS Inverter/Controller with two (2) 20A circuit breakers, one (1) each for the AC input and output.

.19 Force On: Equip the BBS with “Force On” capabilities, which provides the user the ability to turn the BBS on and supply backup power when no utility line voltage is available. This allows the user the ability to install a BBS and provide backup AC power at an intersection that has no utility line voltage available.

.20 Communication:
- .1 The BBS must have the capability to provide Ethernet and IP addressing communications with the capability for remote monitoring and programming. This capability must be provided through a desktop application.
- .2 Equip BBS with an Ethernet port. Ethernet port to be an RJ45, EIA 568B pin out type connector. Data rate to be 100mbps.

.21 Warranty: provide a warranty for the complete system including battery panel(s) that expressly states the system will be free from defects in material and workmanship for a minimum of five (5) years from the date of original receipt.

.22 Enclosure:
- .1 Contain all Batteries, UPS unit and additional equipment in a weather proof aluminum enclosure.
- .2 Engineered to accommodate outdoor powering equipment in pole or wall mount configurations. Durable, outdoor design kiosk, CSA approved, NEMA 3R weather resistant UPS enclosure.
- .3 All aluminum welded construction and durable powder coat finish provides superior corrosion resistance.
- .4 Sliding battery trays with lock-in/lock-out features standard. A variety of configurations available to support specific powering needs. Portable generator cabling access panel.
- .5 Single or multiple power supply enclosure to support distributed powering architectures. The power

supply is located on the equipment shelf above the batteries for maximum convection cooling.

.6 Includes a removable lockable door and easy opening lid, high magnetic circuit breaker and a duplex AC receptacle.

.7 Dimensions: 762mm W x 1219mm H x 457mm D unless otherwise specified.

PART 3 - EXECUTION

3.1 Excavation and Backfilling

.1 Do excavation and backfilling in accordance with Section 31 20 00 – Earthwork.

3.2 Concrete Bases

.1 Do cast in place concrete in accordance with Section 03 30 00 – Concrete.

.2 Confirm, through survey review, the locates of underground infrastructure and review overhead wire routing prior to excavation to avoid conflicts or obstructions and achieve required offsets.

.3 Protect concrete bases and poles until project completion.

.4 Install a vertical post or pole (metal or wooden) to a height of at least 2 m, within 3 business days of base installation and keep in place until final pole installation.

3.3 Conduit Installation

.1 Location, number, and size of conduit as indicated on drawings or as directed by Engineer.

.2 Do cast in place concrete in accordance with Section 03 30 00 – Concrete.

.3 Obtain permits from NSPI.

.4 Install non-concrete encased conduit in accordance with standard drawing number HRM 78.

.5 Install concrete encased conduit in accordance with detail indicated on the drawings.

.6 Use wood forms for concrete encased conduit rather than place concrete in direct contact with the sides of excavation.

.7 Join conduit in accordance with manufacturer's instructions. Ream the ends of all conduit to ensure smooth interior finish that will not damage the insulation of the wires.

.8 Protect conduit stubs from construction related damage with caps to prevent entrance of foreign materials.

.9 Confirm conduit stubs are located correctly and terminations are suitable for installation of equipment.

.10 Provide complete connections between conduit ends and terminal boxes of electrically operated equipment.

.11 Remove all water and foreign material from conduit and raceways by swabbing out the conduit or by using compressed air.

.12 Draw conductors and/or wire, and pull string through conduit. Use approved lubricants for drawing conductors through conduit. Leave at least one metre of slack in each conductor at panel boards, outlet boxes, and other devices to facilitate the making of joints.

.13 Cover all non-concrete encased conduit along entire length with 38mm × 140mm treated wood plank. Plank to be pressure treated with pentachlorophenol to retention of at least 3.6 kg as per CSA S6 and CSA 080.

.14 Place electrical underground warning tape above the conduit 150mm to 250mm below finished grade. Warning tape shall be 0.9mm thick, 150mm wide, and made of heavy duty polyethylene material with over-coated graphics. Red with black text that reads: 'CAUTION BURIED ELECTRIC LINE BELOW'.

.15 Install concrete pole riser to cover pipes that run to the surface on all wooden poles as per HRM standard drawing HRM 86. Dowel riser into pole using stainless steel bolts. Use anti-seize compound on all threaded hardware. A metal guard to a height of 2.5m plus expansion joint can be used in place of the concrete pole riser on a wooden pole with single conduit run.

.16 Leave pull wire in each empty duct. Fasten pull string to end of conduit with duct tape.

.17 Have conduit inspected and approved by the Engineer prior to backfilling.

.18 Backfill in accordance with Section 31 20 00 – Earthwork. Carry out surface reinstatement in accordance to Section 32 98 00 – Reinstatement.

3.4 Installation of Detector Loops

.1 Locations and dimensions indicated on drawings are approximate.

.2 Final locations and dimensions to be approved by Engineer prior to saw cutting asphalt.

.3 Unless otherwise directed, saw cut an 10mm wide slot in pavement to a uniform depth between 50mm and 75mm.

.4 Prior to laying the loop wire, ensure that the slots are clean with no sharp corners which could damage the loop wire. Remove chips and moisture using dry air at a pressure of at least 900 kPa. A heat wand may be used to dry the saw cut.

.5 Lay loop wire in one continuous length of wire around the saw cut as per the drawings or as directed by the Engineer. Loop wire to be continuous from junction box at the curb around the loop and back to the curb. No splices are permitted in this section of wiring.

.6 Number of turns as directed by the Engineer.

.7 Tag or label clearly with permanent ink, loop lead in-cable at controller to indicate assigned phase and function, and top and bottom of loop.

.8 Place sealant in saw cut in accordance with detector loop sealant manufacturer's recommendation.

.9 Gain access to curbside junction box by saw cutting curb from street side to back of curb. Saw cuts to be of sufficient depth to provide a minimum depth of 38mm to 50mm cover over loop wires.

.10 Tightly twist loop wires, from the saw cut to the curb side junction box, at a rate of least 15 turns per metre.

.11 Seal curb and saw cuts using detector loop sealant. Confirm no voids are formed between saw cut, loop wire, and sealant when sealant is being applied.

.12 Solder splice between detector loop cable and detector lead-in cable in junction box. Protect splice point with moisture proof seal.

.13 Loop Testing:
- .1 Conduct loop insulation test with 500 volt Megger from loop lead-in to earth ground. Obtain a reading of 100 megohm or greater.
- .2 Conduct loop continuity test at loop lead-in cable termination ends. Obtain a resistance of 5 ohms or less.
- .3 Provide test results to the Engineer.

.14 Loop tails to cabinet termination ends longer than 23 metres require shielded lead-in cable.

.15 Where lead-in cable must be longer than planned, the loop inductance must be equal to or greater than that of the lead-in cable. Loop inductance less than that of the lead-in cable will be considered unacceptable.

3.5 Installation of Transformer Bases Poles and Mast Arms

.1 Secure transformer base to concrete base anchor bolts using galvanized nuts and manufacturer-approved washers 10mm and 13mm thick at top of transformer base. Tighten nuts and torque an equal amount in accordance with the manufacturer's recommendations. Provide a vertical post (metal or wood), minimum 2.0m high, on all bases that do not have a pole.

.2 Confirm poles are installed and secured to a vertical alignment.

.3 Install mast arms and other required fixtures once pole is plumbed and secured.

.4 Install transformer bases flush with the concrete base. Do not install nuts between the transformer base and the concrete base.

.5 Use anti-seize compound on all threaded hardware.

3.6 Installation of Push Button Assemblies

.1 Aluminum and Steel Poles:
- .1 Drill and tap pole prior to installation.
- .2 Confirm contact points between push button and pole face are silicon sealed.

.3 Ream apertures through pole to provide smooth interior finish, remove all sharp edges and prevent damage to the insulation of the wires.
.4 Drill drain hole in bottom of push button.
.5 Mounting bolts to be stainless steel. Use anti-seize compound on all bolts.

.2 Wood Poles:
.1 Attach push button assembly to pole using a #10 x 50mm Robinson head stainless steel screw.
.2 Install wiring through bottom of push button using liquid tight flex or conduit to prevent condensation or leakage from shorting out the actuator. Drain hole added to the low point of the flex for drainage.
.3 Confirm contact points between push button and pole face are silicon sealed.

3.7 Installation of Traffic Signals and Pedestrian Signals

.1 Install traffic signal heads using mounting specified or as directed by Engineer. Provide aluminum mountings with hub plates, cast nipples, nuts, bolts, and fitting caps.

.2 Seal wire nut connections with professional grade vinyl electrical tape. Bundle off and tie wrap with wire nuts forming a cap and store bundle high up in traffic signal to minimize water damage to the wire nut connections. Do not use terminal strips in signal heads.

.3 Use anti-seize compound on all threaded connections.

.4 For horizontal signal heads, hinges to be on top for doors to swing upward.

3.8 Installation of Pedestrian (RA-5) Signals

.1 Install RA-5 sign as per manufacturer's directions. Test photocell flashing beacon, and fixture light after installation.

3.9 Installation of Pre-emption Equipment

.1 Install and test traffic pre-emption equipment and accessories as Per manufacturer's directions. Provide all necessary wiring for pre-emption equipment to ensure proper operation of system. No splices are permitted.

.2 Test detectors using tester provided by the Engineer. Provide test results to the Engineer.

3.10 Wiring of Poles, and Mast Arms

.1 Keep wire connections to a minimum, both in junction boxes and transformer bases. The use of pull pits for wire connections will not be permitted. Break out of the cable only those wires that are required, leaving unused wires uncut.

.2 Seal wire nut connections with professional grade vinyl electrical tape. Bundle off and tie wrap with wire nuts forming a cap and store bundle high up in transformer base to minimize water damage to wire nut connections.

.3 Install multi-conductor cable (#14 AWG stranded copper wire) from each signal head location through mast arm and the pole aperture, down through pole to the centre of the access door in the transformer base. Wire to be appropriate number of conductors for each application.

.4 Provide an additional 600mm of cable run for connection.

.5 Continue multi-connector cable run to controller and leave 1200mm additional cable.

.6 Provide drip loop where cable enters the pole from the bracket.

.7 Connect conductors in signal heads to wire nuts. Tape individually and face joints upwards in each head. Leave spare conductors full length, coiled and end terminated by folding back the last 150mm of the conductors with insulating tape.

.8 Ground all metal equipment to ground terminal in base using separate ground wire.

.9 Make final connections. Test the wiring and provide written results to Engineer in duplicate. Obtain approval from Engineer for finished work.

.10 Hot test all signals in the presence of the Engineer.

.11 Label each wire indicating appropriate signal head at pole base.

3.11 Mounting of Traffic Signal Controller Cabinet

.1 Install cabinet on base. If cabinet is to be fastened to a pole, use 19mm stainless steel band-it strapping.

.2 Seal cabinet to concrete base, using rubber gasket and silicone between cabinet and concrete base. Trim gasket to be flush with cabinet.

.3 Connect traffic signal field wires to cabinet field terminals. Test to confirm operation as per wiring diagram and as directed by the Engineer.

.4 Contractor to connect detector loop and pre-emption device wires to cabinet as per wiring diagram and as directed by the Engineer.

3.12 Installation of Pedestrian (RA-5) Signal Controller

.1 Install controller cabinet in accordance with manufacturers directions.

.2 If cabinet is to be fastened to a pole, use 19mm stainless steel band-it strapping.

3.13 Removal and Disposal of Damaged or Obsolete Equipment

.1 Dispose of hazardous material in accordance with all applicable laws including the Environmental Protection Act.

.2 If requested by the Engineer, return traffic signal equipment and wires to HRM. Disassemble and handle with care all traffic signal equipment to be returned to HRM.

.3 When upgrading a traffic signal system, dismantle and remove abandoned traffic signal infrastructure from site.

3.14 Grounding

.1 Ground equipment in accordance with CSA C22.2 No. 41

.2 Ground each pole and transformer base back to the ground rod or plate and bring the grounding wire back to the ground at the power source and not to the controller.

.3 Ground the traffic Signal Controller separately from all other equipment to a ground rod at the cabinet location and run back to the service ground.

****** END SECTION 34 41 13 ******

INDEX

For Halifax Water Standard Details, see Halifax Regional Water Commission Supplementary Standard Specifications Section 39 00 00 – Standard Details, latest edition

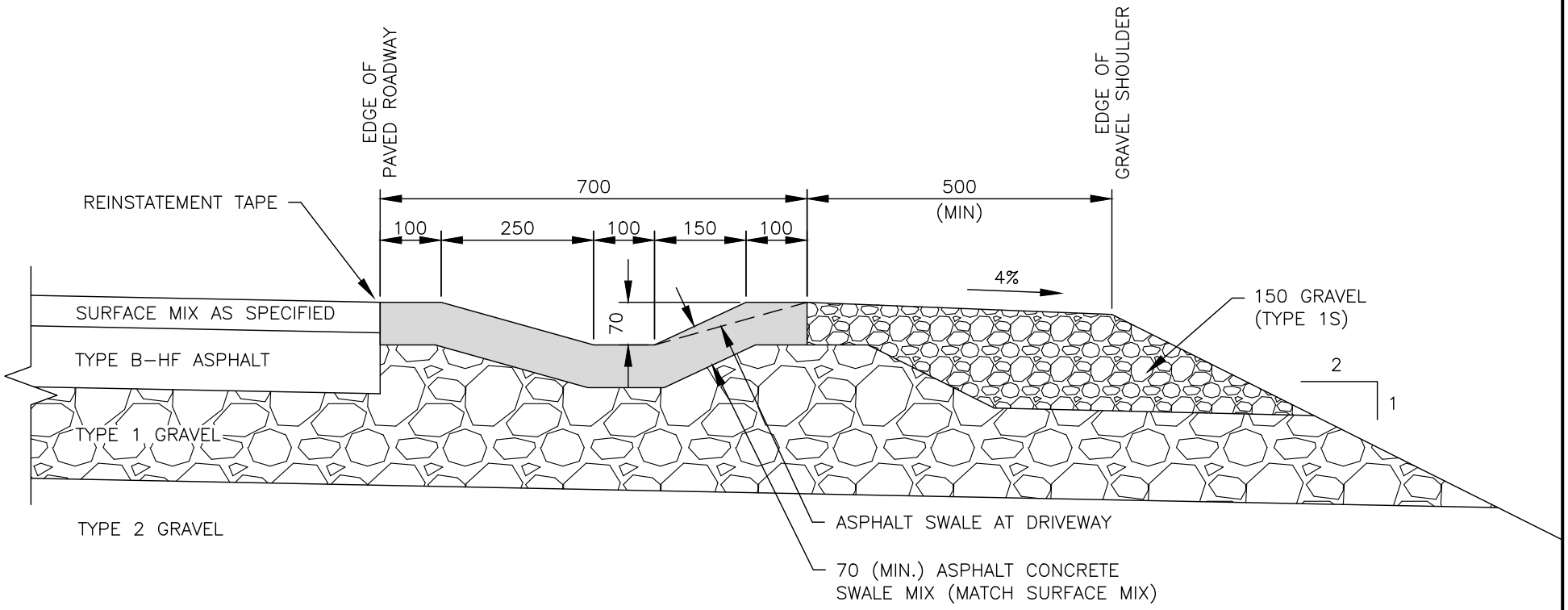
TITLE	DETAIL No.	Date
Asphalt Swale	HRM 30	2021
Speed Hump	HRM 31	2023
Driveway Deflection Angles & Grades	HRM 32	2025
Guide Rail Installation	HRM 36	2025
Railing	HRM 37	2021
Urban Traffic Sign Post	HRM 38	2023
Rural Traffic Sign Post	HRM 39	2023
Typical Walkway	HRM 40	2021
Active Transportation Off Road Trail	HRM 41	2021
Urban Sidewalk	HRM 44	2021
Rural Type I Sidewalk	HRM 45	2021
Rural Type II Sidewalk	HRM 46	2021
Rural Type III Sidewalk	HRM 47	2021
Concrete Sidewalk Reinforcing	HRM 48	2023
Pedestrian Ramp Alignment	HRM 49	2025
Driveway Ramp	HRM 50	2021
New Driveway Access in Existing Full-Depth Curb	HRM 51	2021
Concrete Traffic Island	HRM 52	2021
Concrete Curb & Gutter	HRM 53	2021
Curb Renewal / Payment	HRM 54	2021
Asphalt Curb	HRM 55	2021
Concrete Bus Bay Pad - End Block	HRM 57	2024
Concrete Bus Bay Pad - Mid Block	HRM 58	2024
Trench Backfill and Reinstatement Testing	HRM 61	2021
Tree Planting in Parks/Open Space	HRM 66	2021
Underground Conduit	HRM 78	2021
Pull Pit	HRM 79	2021
Wooden Pole Power Feed (For Traffic Signals)	HRM 86	2021
Aluminium Pole RA-5 Signal Configuration	HRM 87	2021

Wooden Pole RA-5 Traffic Signal With Power Feed Configuration	HRM 88	2021
Standard Intersection Pavement Marking Layout	HRM 89	2025
Longitudinal and Transverse Markings	HRM 90	2021
Pavement Arrows	HRM 91	2021
Bicycle Symbol & Shared Use Lane Symbol	HRM 92	2023
Pedestrian & Trail Crossing Pavement Markings	HRM 93	2025
Pedestrian Gate	HRM 119	2023
Urban Traffic Sign Installation	HRM 129	2024
Rural Traffic Sign Installation	HRM 130	2025
Tactile Attention Indicator Plate Placement	HRM 131	2025
Walkway with Pedestrian Ramp	HRM 132	2025
Concrete Sidewalk Adjacent Curb	HRM 133	2021
Red In-Lay Reserved Lane	HRM 134	2021
Fence Detail (Round Wooden Rails & Steel Posts)	HRM 135	2021
Speed Hump Survey Verifications	HRM 136	2021
Concrete Bus Stop Landing Pad (With Sidewalk)	HRM 138	2025
Tree Protection Zone & Barrier	HRM 140	2021
Decorative Paver Edge	HRM 141	2025
Narrow Decorative Paving Edge	HRM 142	2025
Speed Table Detail	HRM 143	2023
Speed Table Survey Verification	HRM 144	2021
Bus Stop Shelter on Concrete Sidewalk	HRM 153	2024
Bus Stop Shelter on Concrete Wall	HRM 155	2024
Bus Stop Shelter on Concrete Sono-Tubes	HRM 156	2024
Utility Pole Service Detail	HRM 160	2021
Inverted U Bike Rack	HRM 165	2021
Multi Inverted U Bike Rack	HRM 166	2021
Post & Ring Bike Rack	HRM 167	2021
Rectangular Rapid Flashing Beacon (Solar Cabinet-Based)	HRM 172	2025
Rectangular Rapid Flashing Beacon (Solar Self-Contained)	HRM 180	2025
Soil Texture Triangle	HRM 181	2021
Tree Planting in SOD Boulevard	HRM 182	2021
Tree in Hardscape with Soil Cells and Tree Grate	HRM 186	2025
Tree Grate Details	HRM 187	2025

Tree in Sod Boulevard with Soil Cells	HRM 188	2025
Accessible Parallel Parking (Beginning Of Block)	HRM 193	2025
Accessible Parallel Parking (Midblock & End of Block)	HRM 194	2025
Tactile Direction Indicator Plate Placement	HRM 199	2025

Traffic Signal Bases

Traffic Signal Base for Configuration A	HRM 68	2021
Standard Notes – Shaft Foundations	HRM 68N1	2021
Standard Notes – Spread Footings	HRM 68N2	2021
Pole Base Selection Guide	HRM 68N3	2021
Traffic Signal Base for Configurations B, C, D and E	HRM 69	2021
Traffic Signal Base for Configurations F, G, and H	HRM 70	2021
Traffic Signal Base for Configurations I, J, K and L	HRM 71	2021
Traffic Signal Base for Configuration M	HRM 71A	2021
Traffic Signal Base for Configurations N, O and P	HRM 72	2021
Traffic Signal Base for Configurations Q, R and S	HRM 72A	2021
Traffic Signal base for Configurations T, U and V	HRM 73	2021
Traffic Signal Base for Configurations W, X and Y	HRM 73A	2021
Traffic Signal Base for Configurations Z, AA and AB	HRM 74	2021
Traffic Signal base for Configurations AC, AD and AE	HRM 74A	2021
Foundation Revisions for Doweling into Rock	HRM 74B.1	2021
Foundation Revisions for Doweling into Rock	HRM 74B.2	2021
Traffic Signal base for Configuration AF	HRM 74X	2021
Base Mounted Traffic Signa Controller Cabinet	HRM 175	2021
Base Mounted Traffic Signal Controller Cabinet with Battery Back-Up Unit	HRM 176	2021
Street Lighting Power Enclosure Base	HRM 177	2021



NOTE:

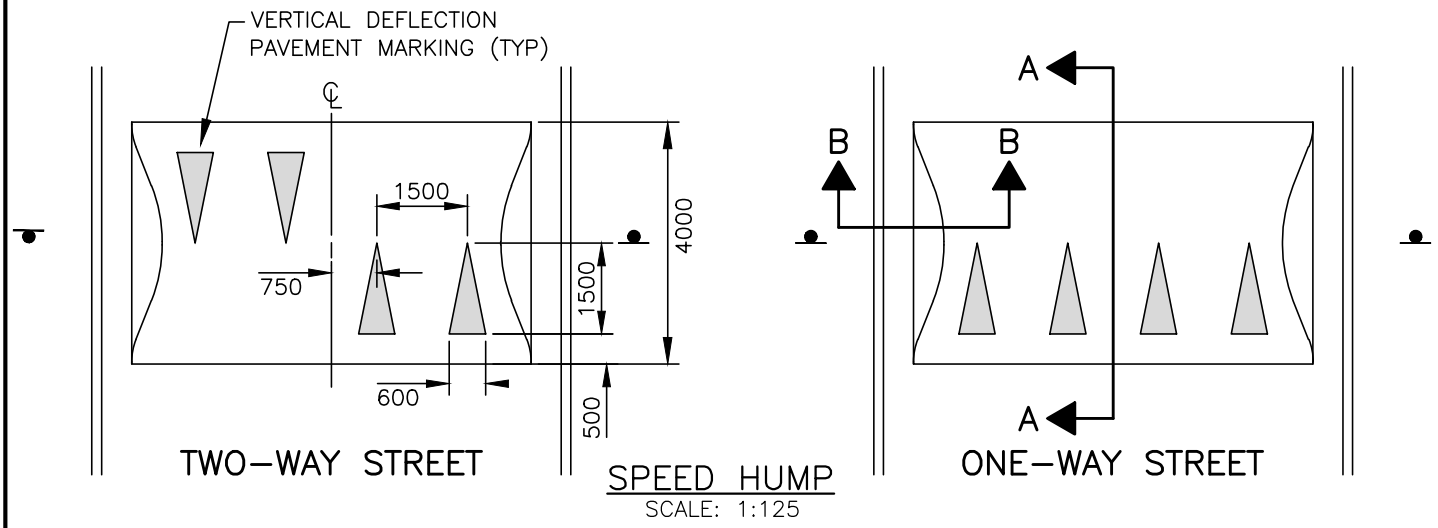
1. FOR ALL RURAL ROADS HAVING A GRADE EXCEEDING 7%, ASPHALT SWALES ARE REQUIRED ON EACH SIDE OF THE ROAD (ABUTTING THE ASPHALT TRAVELLED WAY) ASPHALT SWALE RUNOFF TO THE DITCH EVERY 30m OR UPSTREAM AT DRIVEWAYS.
2. ASPHALT SWALE SHALL EXTEND TO THE EDGE OF SHOULDER AND DOWN THE SLOPE BY 1 m MINIMUM.
3. MINIMUM SWALE CROSSFALL TO MATCH THE EXISTING SLOPE OF THE ROAD.
4. ASPHALT SWALE TO BE MACHINE PLACED.
5. 1 m ASPHALT APRON REQUIRED AT GRAVEL DRIVEWAYS.
6. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

ASPHALT SWALE

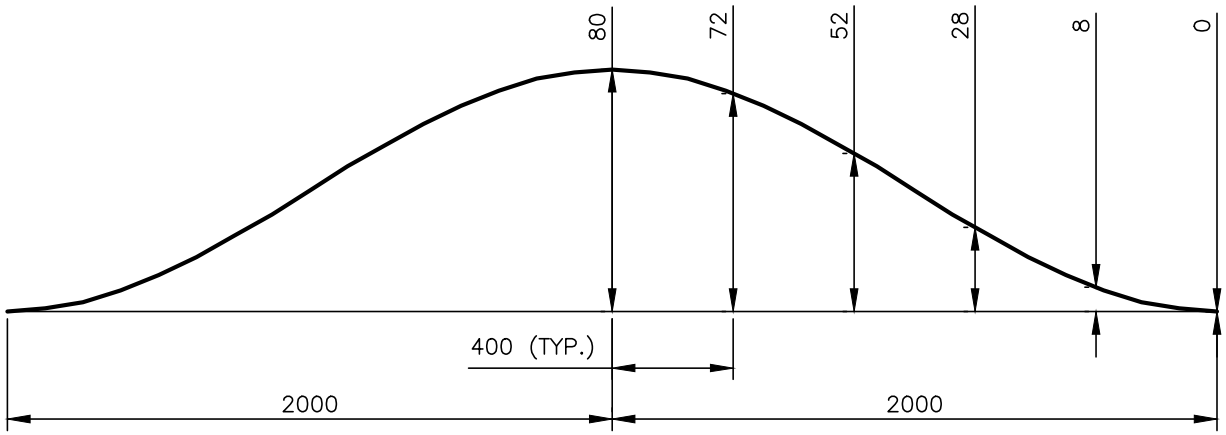
DATE: 2021	REFERENCE	APPROVED
SCALE: 1:10		FIG No.: HRM 30



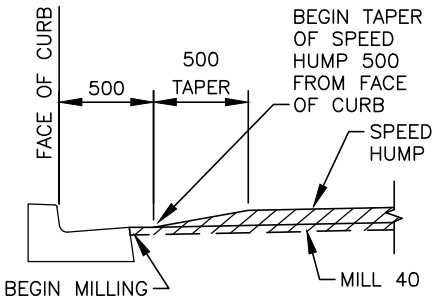
TWO–WAY STREET

SPEED HUMP
SCALE: 1:125

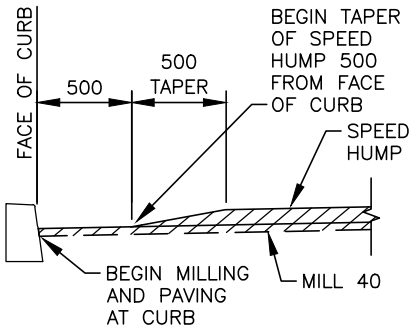
ONE–WAY STREET



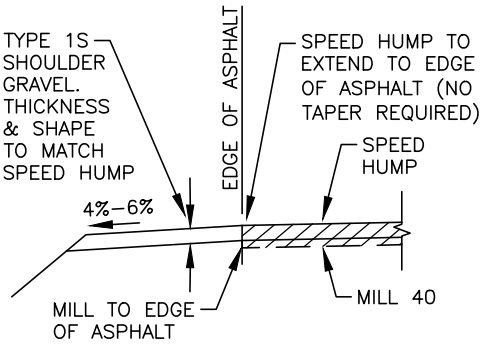
SECTION A–A
SCALE: Horz. 1:25 , Vert. 1:2.5



CURB & GUTTER
SECTION B–B
SCALE: 1:40



CURB ONLY
SECTION B–B
SCALE: 1:40



RURAL–GRAVEL SHOULDER
SECTION B–B
SCALE: 1:40

NOTES:

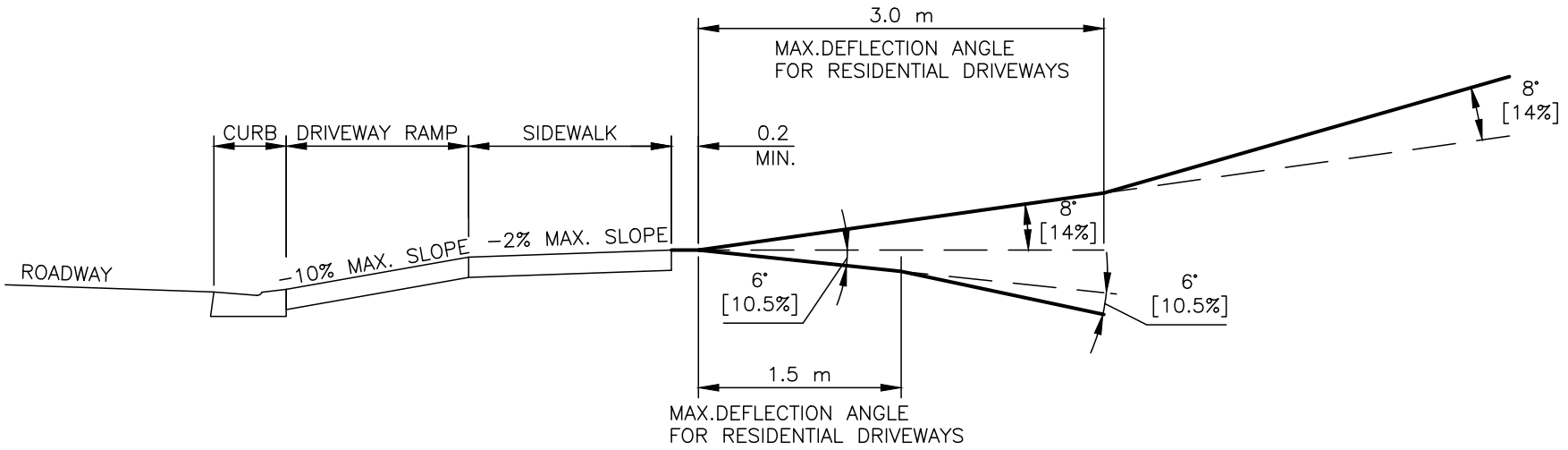
1. TOLERANCE FOR CONSTRUCTION IS +/– 10mm RELATIVE TO THE CURVE.
2. THE EXISTING ASPHALT SURFACE TO BE MILLED TO A DEPTH OF 40mm WHEN RETROFITTING.
3. SPEED HUMPS TO BE CONSTRUCTED USING TYPE D–HF ASPHALT (UNLESS OTHERWISE APPROVED BY HRM).
4. WHERE SPECIFIED, EXISTING UTILITY POLE OR EXISTING SIGN POSTS MAY BE USED FOR SIGNAGE.
5. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

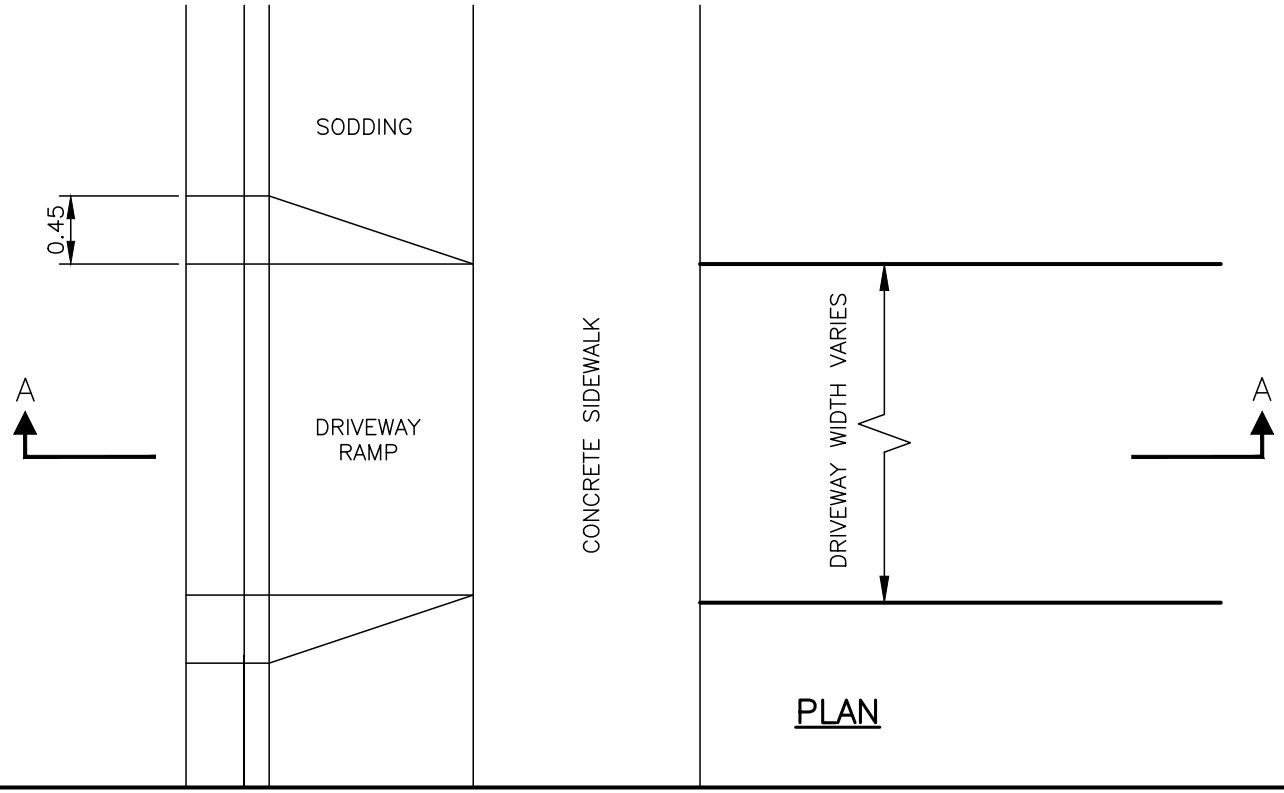
STANDARD DETAIL

SPEED HUMP

DATE: 2023	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 31



SECTION A–A



PLAN

NOTE:

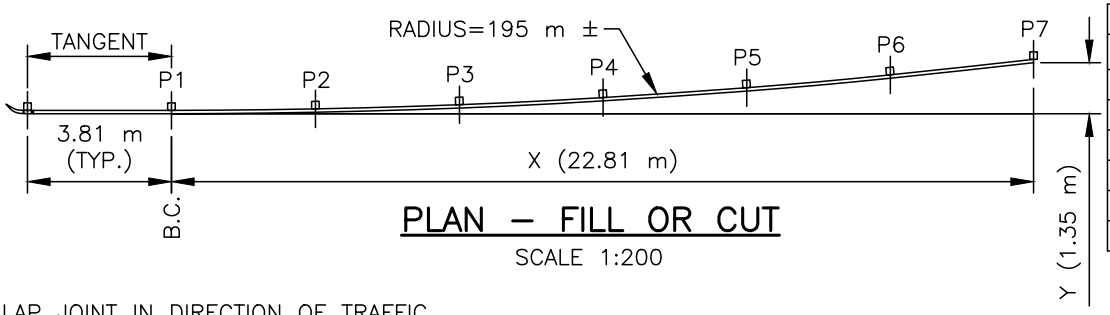
THIS DETAIL IS INTENDED FOR RETROFIT SITUATIONS, I.E. WHERE EXISTING DRIVEWAY GRADES MUST BE ADJUSTED TO MATCH NEW CONDITIONS IN THE STREET RIGHT–OF–WAY.

HALIFAX

STANDARD DETAIL

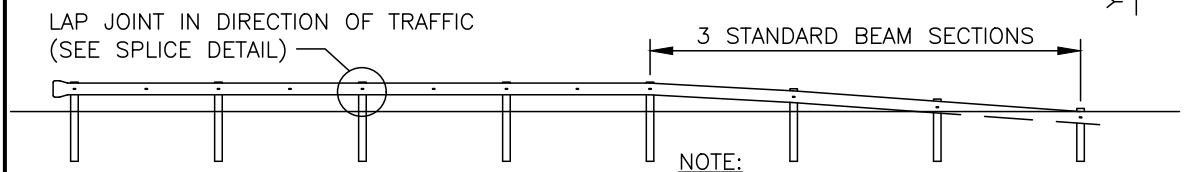
DRIVEWAY DEFLECTION ANGLES & GRADES

DATE: 2025	REFERENCE	APPROVED
SCALE: 1:50		FIG No.: HRM 32



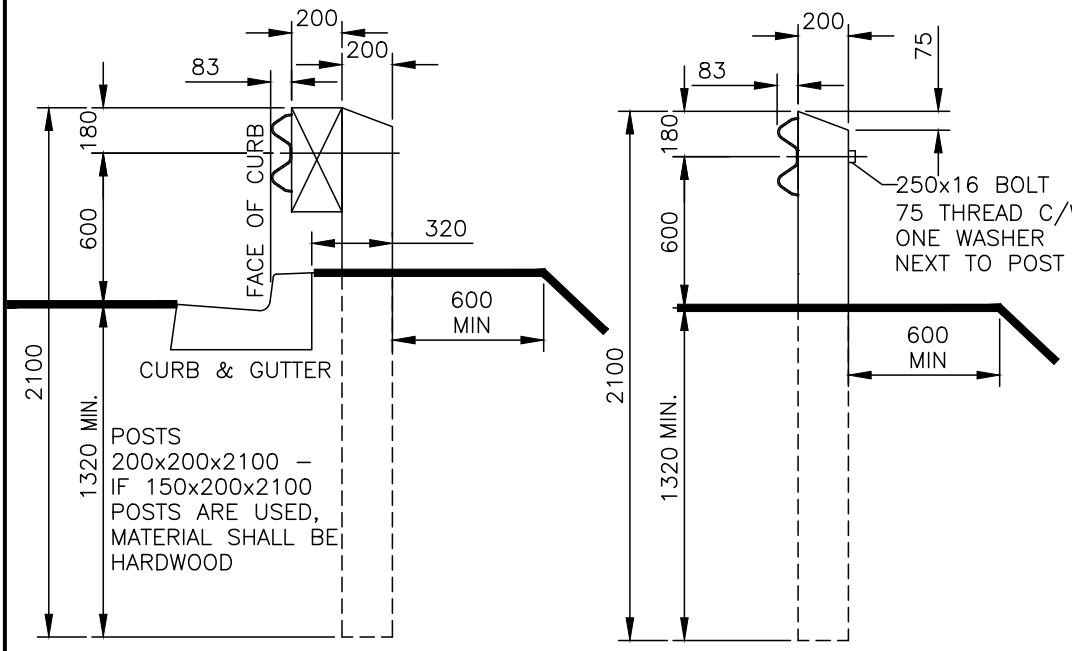
POST OFFSET TABLE		
POST #	X	Y
P1–P2	3.81	0.04
P1–P3	7.62	0.15
P1–P4	11.42	0.34
P1–P5	15.22	0.60
P1–P6	19.02	0.94
P1–P7	22.81	1.35

PLAN – FILL OR CUT
SCALE 1:200

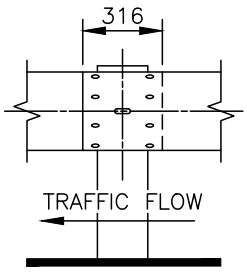


NOTE:
FOR 2 LANE/2 WAY ROADWAYS, BURY BOTH ENDS.

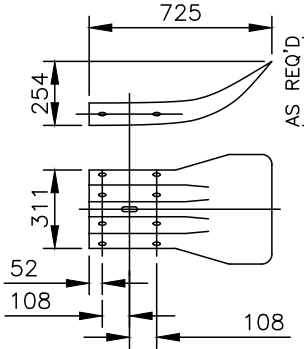
ELEVATION
SCALE 1:200



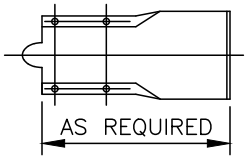
SECTION
SCALE 1:30



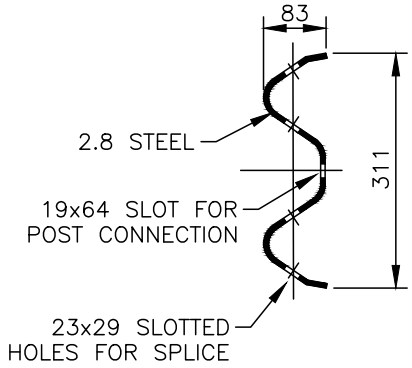
SPLICE DETAIL
SCALE 1:30



TERMINAL END
SCALE 1:30



BUFFER END
SCALE 1:30



BEAM SECTION (TYP.)
SCALE 1:10

NOTES:

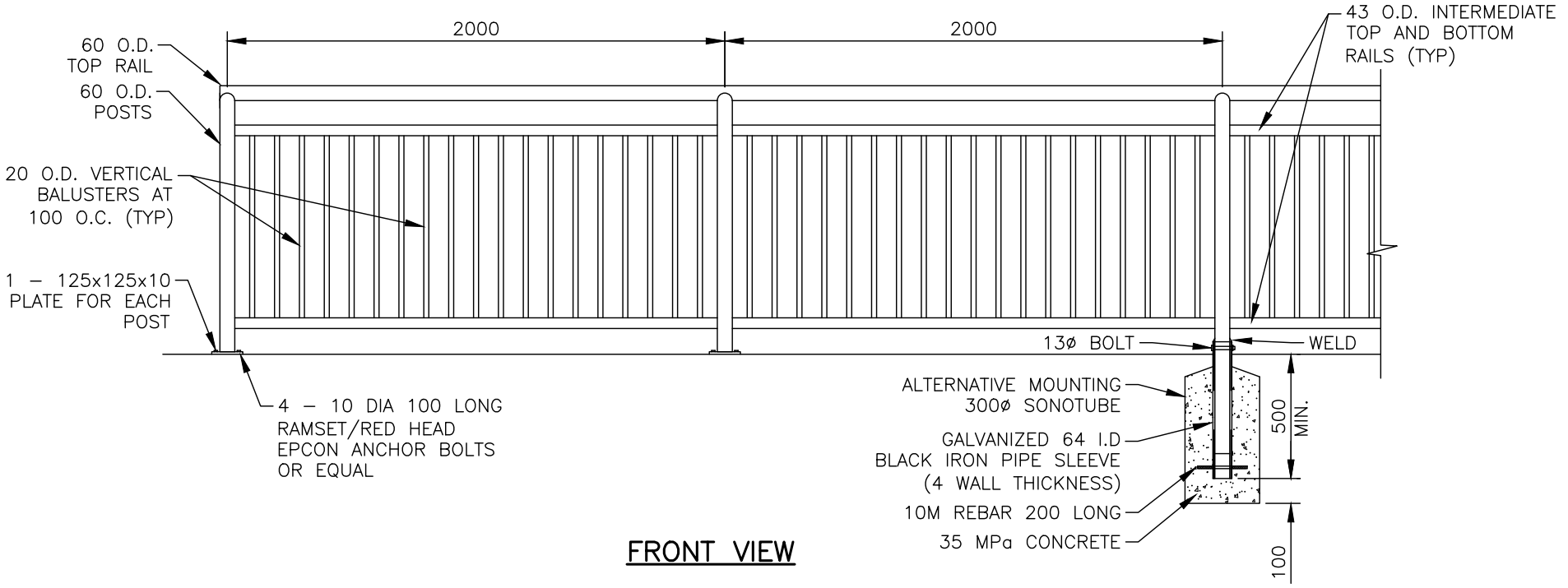
1. TWO 50x75 DELINEATORS ARE REQUIRED FOR EACH POST.
2. A WHITE DELINEATOR SHALL BE PLACED ON THE SIDE OF THE POST FACING TRAFFIC.
3. A YELLOW DELINEATOR SHALL BE PLACED ON THE OPPOSITE SIDE.
4. THE DELINEATOR SHALL BE PLACED ON THE OPPOSITE SIDE.
5. THE DELINEATOR SHALL BE LOCATED AT THE EDGE OF THE POST NEAREST THE ROAD, VERTICAL, WITH THE TOP 75 BELOW THE LOWEST POINT OF THE GUIDE RAIL PANEL.
6. THE DELINEATOR SHALL BE ATTACHED WITH GALVANIZED NAILS.

HALIFAX

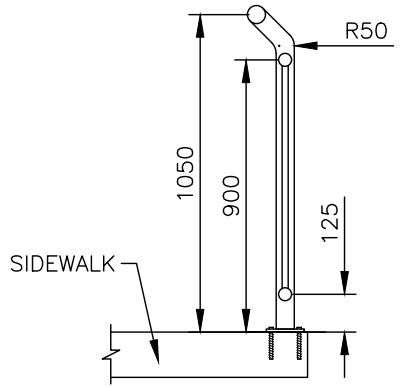
STANDARD DETAIL

GUIDE RAIL INSTALLATION

DATE: 2025	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 36



FRONT VIEW



SIDE VIEW

NOTE:

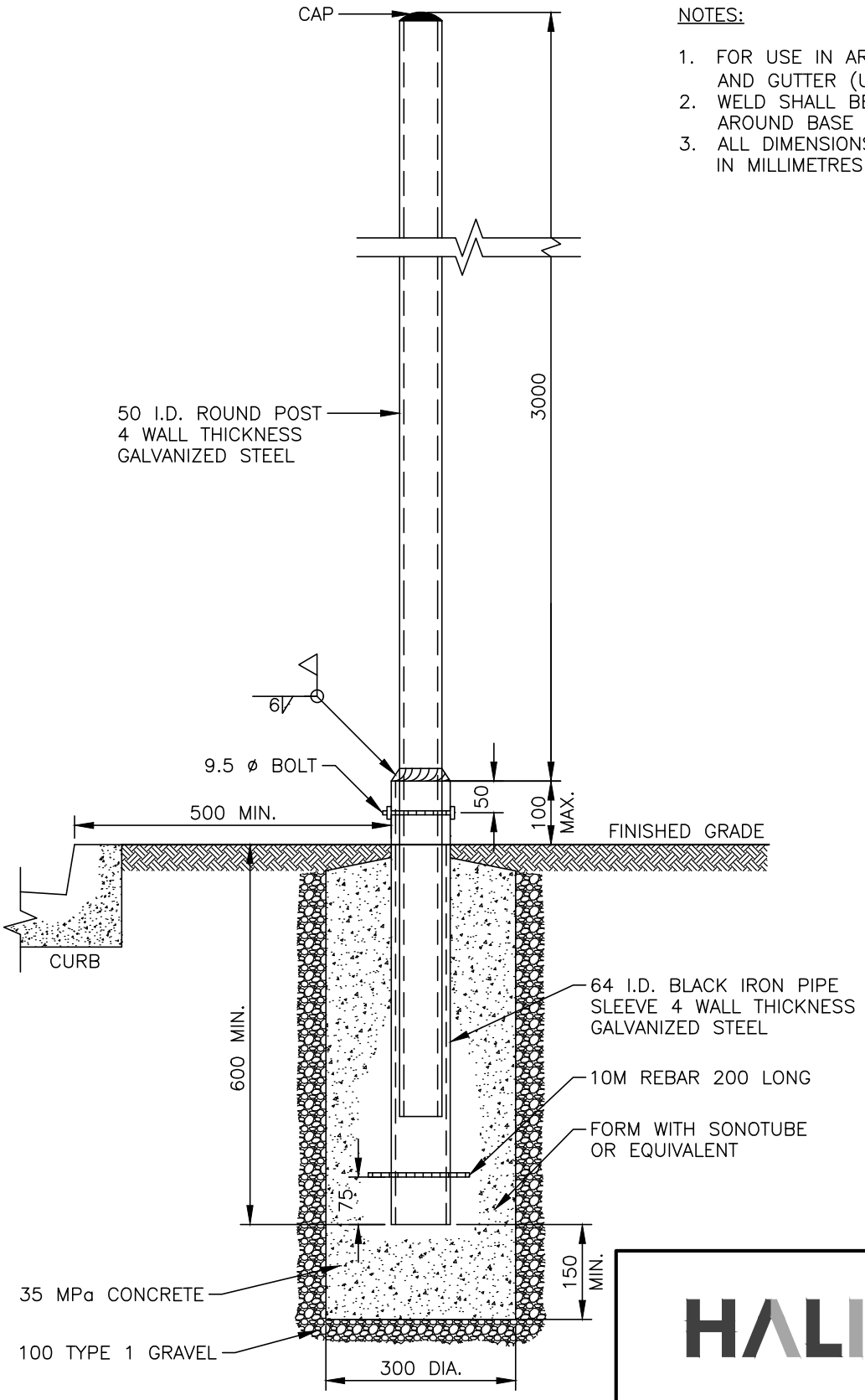
RAILING SYSTEM TO BE HOT DIPPED GALVANIZED AFTER FABRICATION. FIELD WELDS, IF NECESSARY SHALL BE PROTECTED WITH COLD GALVANIZING.

HALIFAX

STANDARD DETAIL

RAILING

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 37



NOTES:

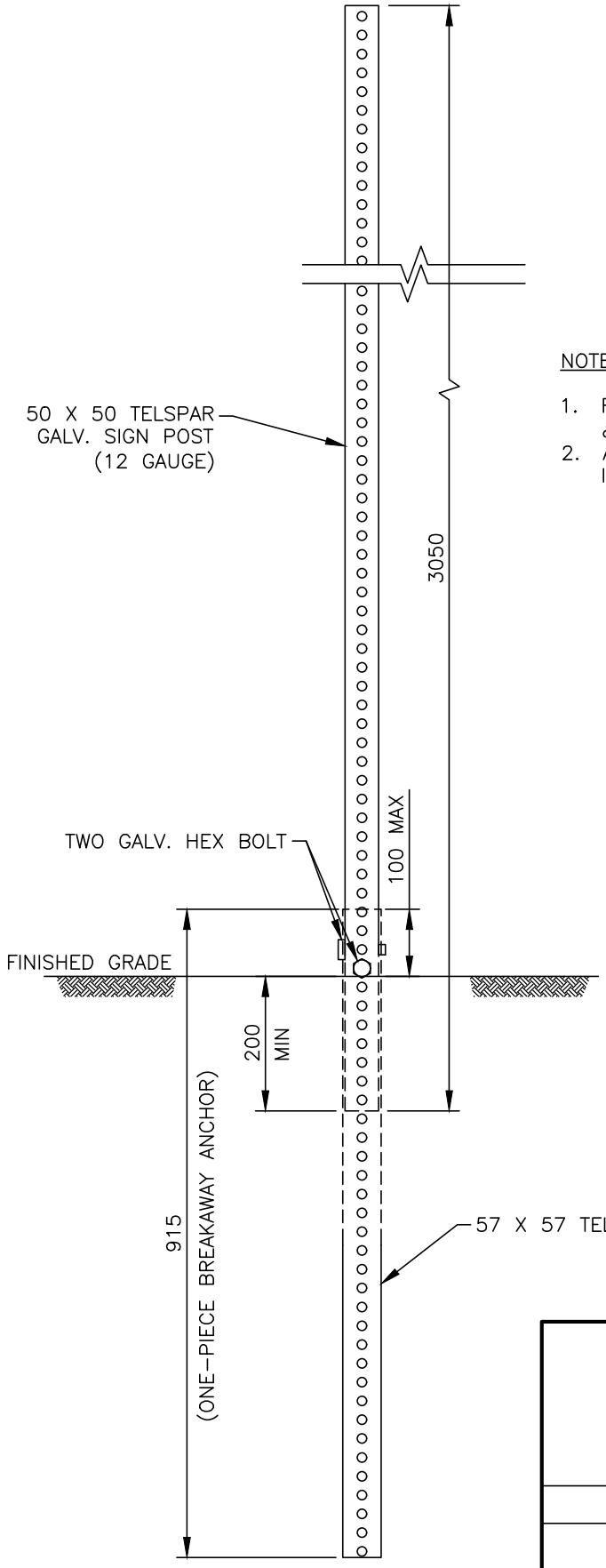
1. FOR USE IN AREAS WITH CURB AND GUTTER (URBAN LOCATIONS)
2. WELD SHALL BE COMPLETED AROUND BASE AND POST.
3. ALL DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

URBAN TRAFFIC SIGN POST

DATE: 2023	REFERENCE	APPROVED
SCALE: 1:10		FIG No.: HRM 38



NOTES:

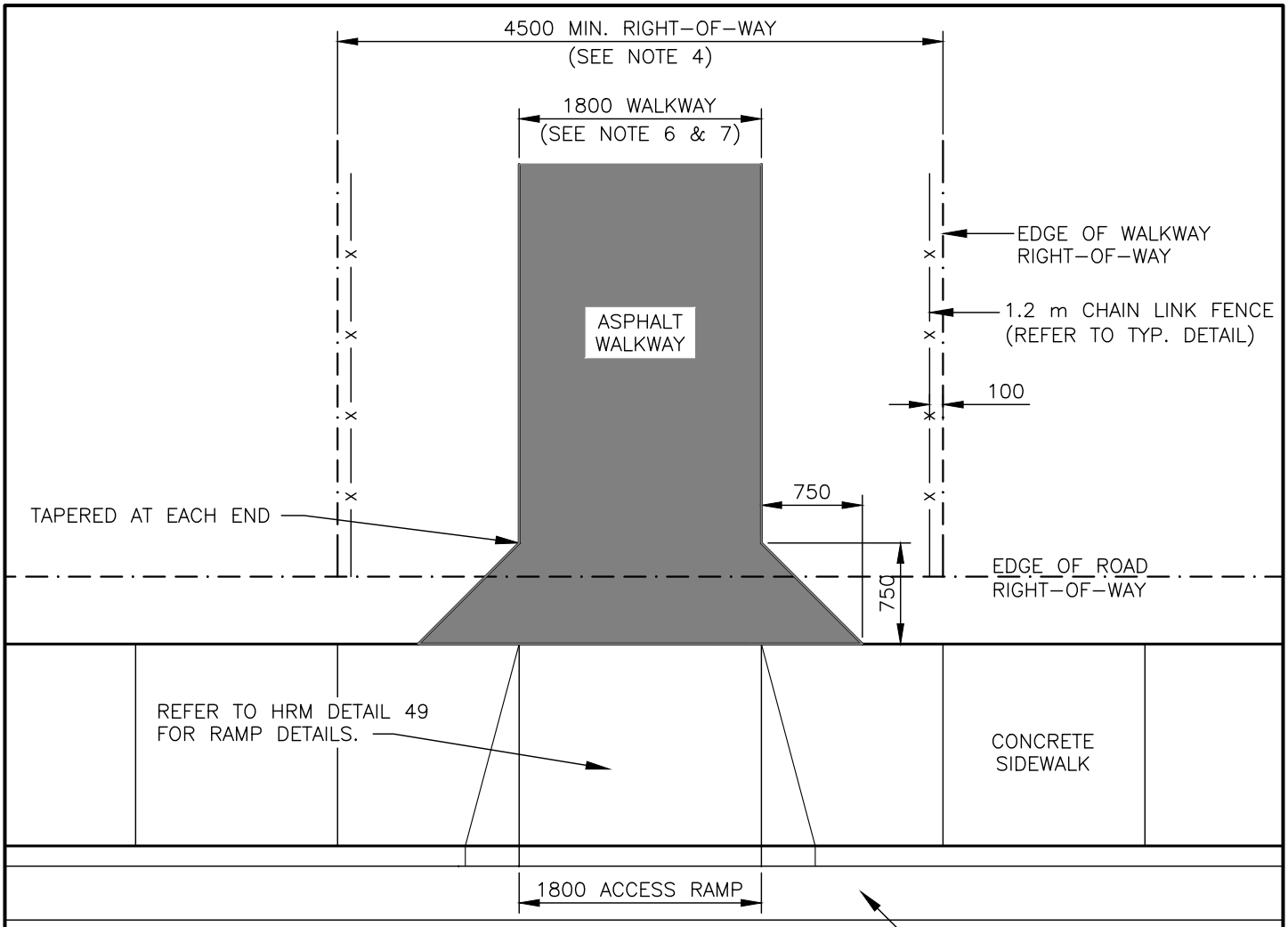
1. FOR USE IN AREAS WITHOUT CURB & GUTTER (RURAL LOCATIONS)..
2. ALL DIMENSIONS ARE IN MILLIMETRES

HALIFAX

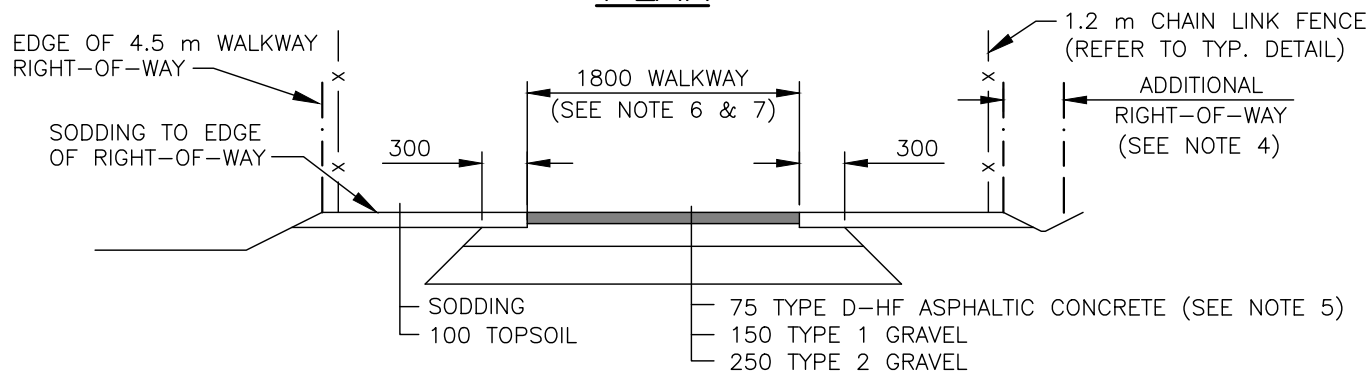
STANDARD DETAIL

RURAL TRAFFIC SIGN POST

DATE: 2023	REFERENCE	APPROVED
SCALE: 1:10		FIG No.: HRM 39



PLAN



PROFILE

NOTES:

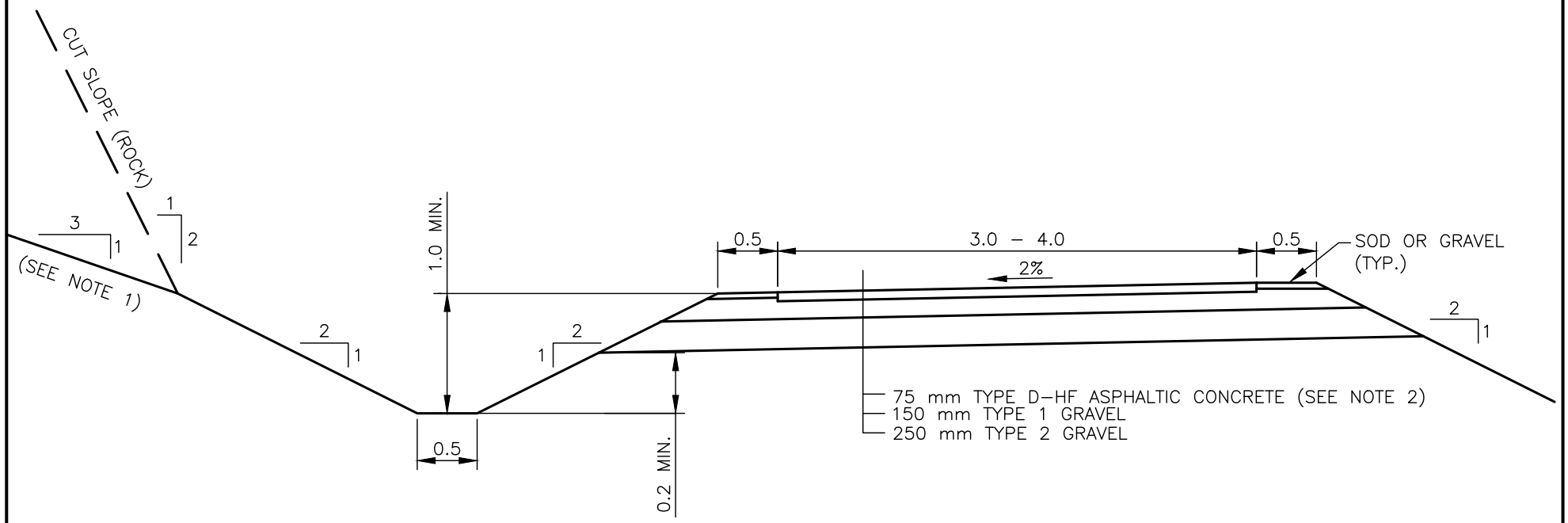
1. WALKWAY CROSSFALL TO BE 2% WITH NO CROWN.
2. THE ENGINEER MAY REQUIRE OR PERMIT USE OF LOW MAINTENANCE MATERIALS IN PLACE OF SODDING.
3. WHERE MUNICIPAL SERVICE SYSTEMS ARE REQUIRED THE MIN. R.O.W. IS TO BE INCREASED TO 6.0 m. THE CHAIN LINK FENCE SHALL BE LOCATED 100 FROM THE EDGE OF THE INCREASED 6.0 m R.O.W..
4. TO ACCOMMODATE SWALE OR CUT/FILL SLOPES ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED.
5. SURFACE MATERIAL TO BE ASPHALTIC CONCRETE UNLESS DIRECTED BY THE ENGINEER.
6. GRADE AS DIRECTED BY THE ENGINEER.
7. TO BE PLACED WITH SPREADER.

HALIFAX

STANDARD DETAIL

TYPICAL WALKWAY

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:50		FIG No.: HRM 40



NOTES:

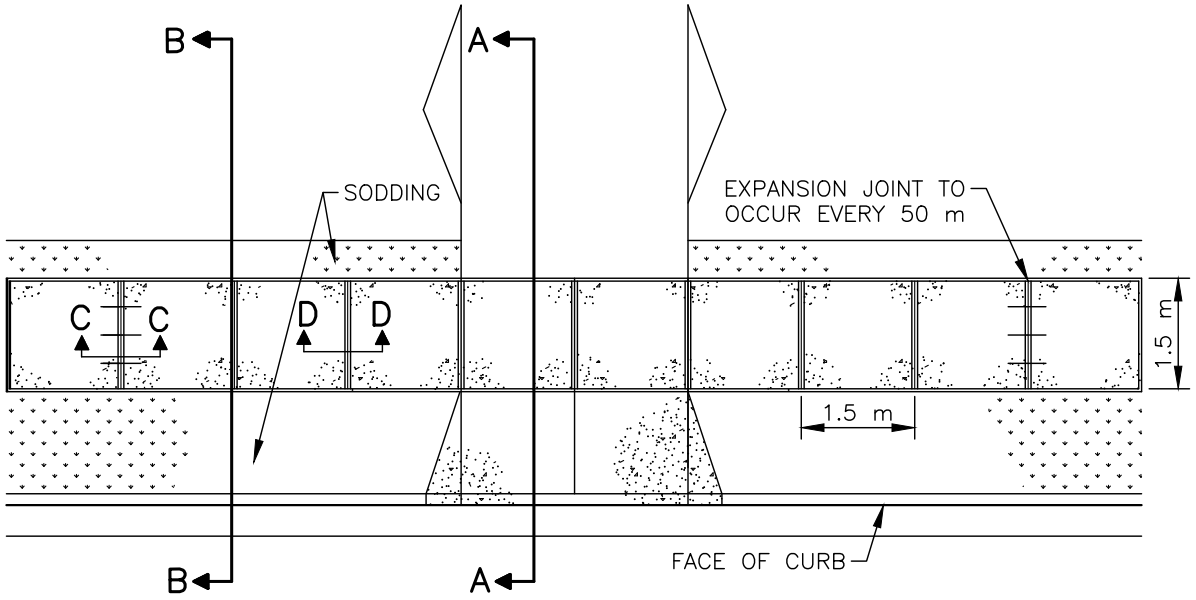
1. ADDITIONAL SLOPE STABILIZATION AS PER GEOTECHNICAL REPORT.
2. SURFACE MATERIAL TO BE ASPHALTIC CONCRETE UNLESS DIRECTED BY THE ENGINEER.
3. RAILING REQUIRED IN FILL GREATER THAN 1.5 m, OR ADJACENT TO WATER.
4. FALSE DITCH REQUIREMENTS SHALL MEET HALIFAX WATER SPECIFICATIONS.
5. MINIMUM 3.0 m CLEAR WIDTH.

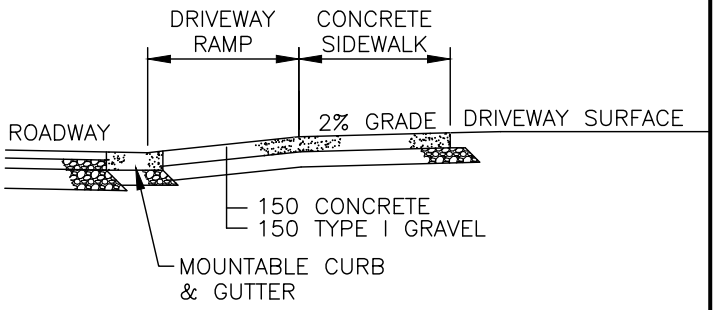
HALIFAX

STANDARD DETAIL

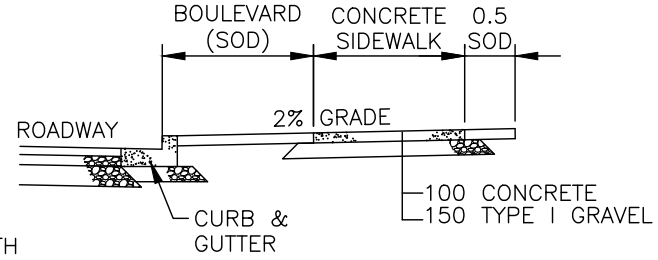
ACTIVE TRANSPORTATION OFF ROAD TRAIL

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:50		FIG No.: HRM 41





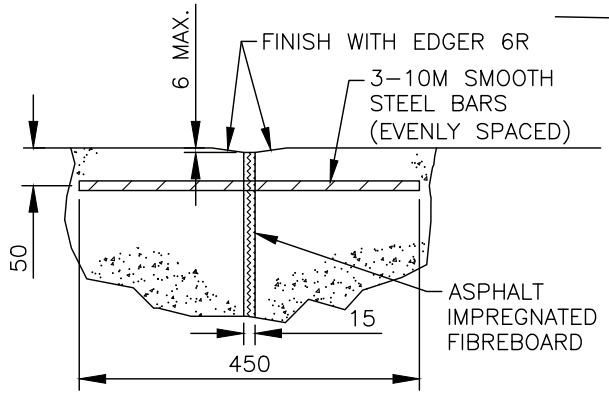
SECTION A–A
(DRIVEWAY CROSS–SECTION)



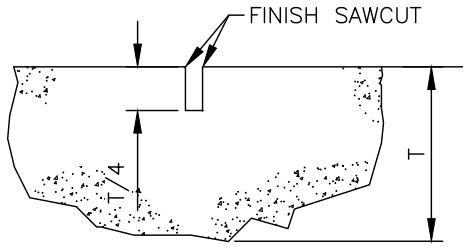
SECTION B–B
(SIDEWALK CROSS–SECTION)

NOTES:

1. CONCRETE SIDEWALK AT COMMERCIAL DRIVEWAY TO BE 150 THICK WITH 150x150 WELDED WIRE MESH.
2. CRUSHED ROCK BASE TO EXTEND 150 BEYOND EDGE OF SIDEWALK STRUCTURE.
3. CONTROL JOINTS ARE TO BE SAW CUT.
4. SIDEWALK ABUTTING HIGH DENSITY AREAS SHALL HAVE FULL WIDTH (3 m) SIDEWALKS.
5. SIDEWALKS ABUTTING COMMERCIAL AREAS ARE TO BE FULL WIDTH (3 m) AND 150 mm THICKNESS.
6. EXPANSION JOINT BARS ARE TO BE GREASED ON ONE SIDE OF THE JOINT.
7. DURING CONSECUTIVE POURS, THE END OF EACH POUR IS TO OCCUR AT AN EXPANSION JOINT. WHERE THIS IS NOT FEASIBLE, AN ADDITIONAL EXPANSION JOINT IS TO BE INSTALLED.
8. INSTALL A 9 m LONG CONCRETE LANDING PAD AT ALL BUS STOP LOCATIONS. INCREASE THIS TO 14.5 m FOR ARTICULATED BUS ROUTES.
9. WHEN BOULEVARD IS LESS THAN 1.5 m OR WHEN THE SIDEWALK ABUTS THE CURB & GUTTER, REFER TO HRM 133.
10. SEE HRM 48 FOR SIDEWALK WITHIN 6 m OF TREES.
11. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.



SECTION C–C
(EXPANSION JOINT)



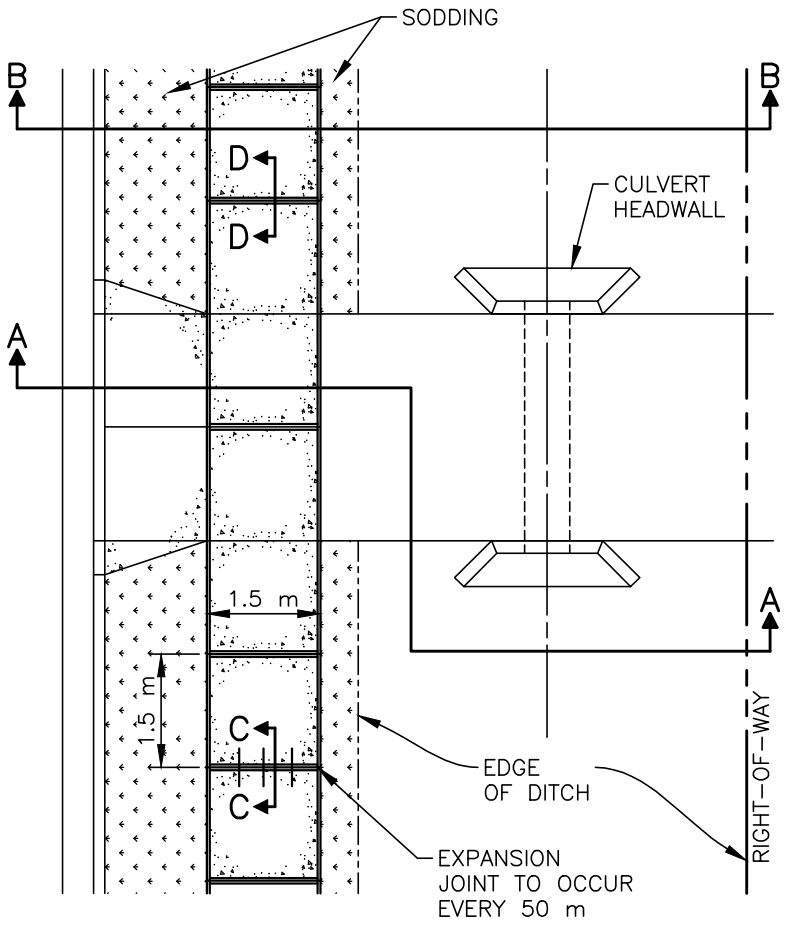
SECTION D–D
(CONTROL JOINT)

HALIFAX

STANDARD DETAIL

URBAN SIDEWALK

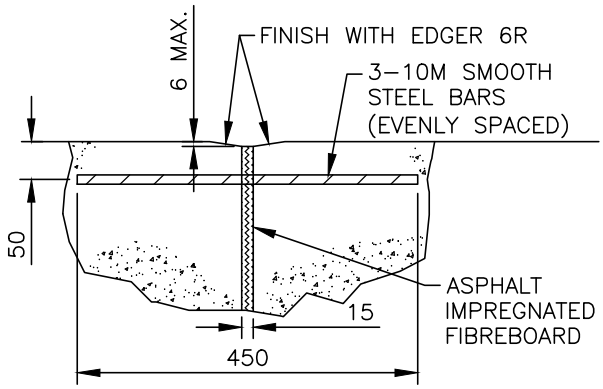
DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 44



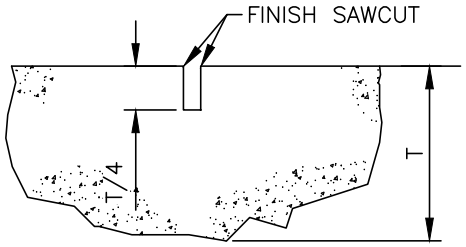
PLAN

NOTES:

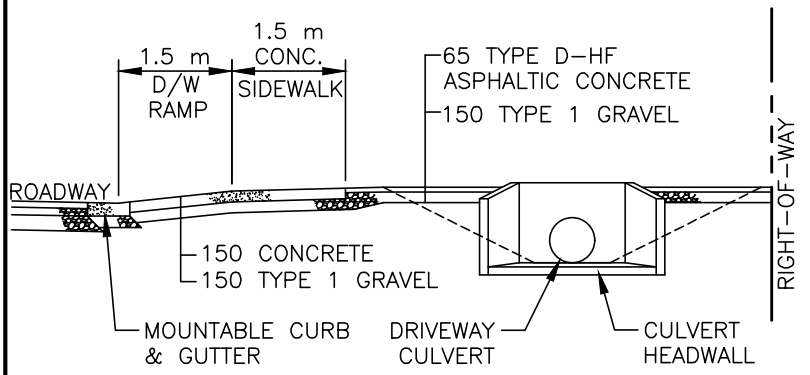
1. CONCRETE SIDEWALK AT COMMERCIAL DRIVEWAY TO BE 150 THICK WITH 150 x 150 WELDED WIRE MESH.
2. CRUSHED ROCK BASE TO EXTEND 150 BEYOND EDGE OF SIDEWALK STRUCTURE.
3. CONTROL JOINTS ARE TO BE SAW CUT.
4. SIDEWALKS ABUTTING COMMERCIAL AREAS ARE TO BE FULL WIDTH (3 m) AND 150 mm THICKNESS.
5. EXPANSION JOINT BARS ARE TO BE GREASED ON ONE SIDE OF THE JOINT.
6. DURING CONSECUTIVE POURS, THE END OF EACH POUR IS TO OCCUR AT AN EXPANSION JOINT. WHERE THIS IS NOT FEASIBLE, AN ADDITIONAL EXPANSION JOINT IS TO BE INSTALLED.
7. INSTALL A 9 m LONG CONCRETE LANDING PAD AT ALL BUS STOP LOCATIONS. INCREASE THIS TO 14.5 m FOR ARTICULATED BUS ROUTES.
8. WHEN BOULEVARD IS LESS THAN 1.5 m OR WHEN THE SIDEWALK ABUTS THE CURB & GUTTER, REFER TO HRM 133.
9. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.



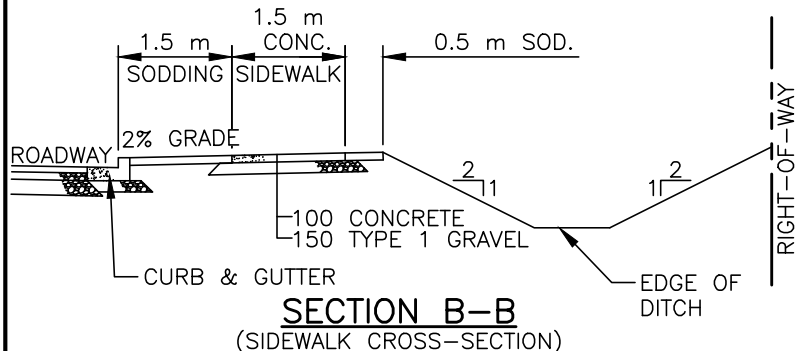
SECTION C-C
(EXPANSION JOINT)



SECTION D-D
(CONTROL JOINT)



SECTION A-A
(DRIVEWAY CROSS-SECTION)



SECTION B-B
(SIDEWALK CROSS-SECTION)

HALIFAX

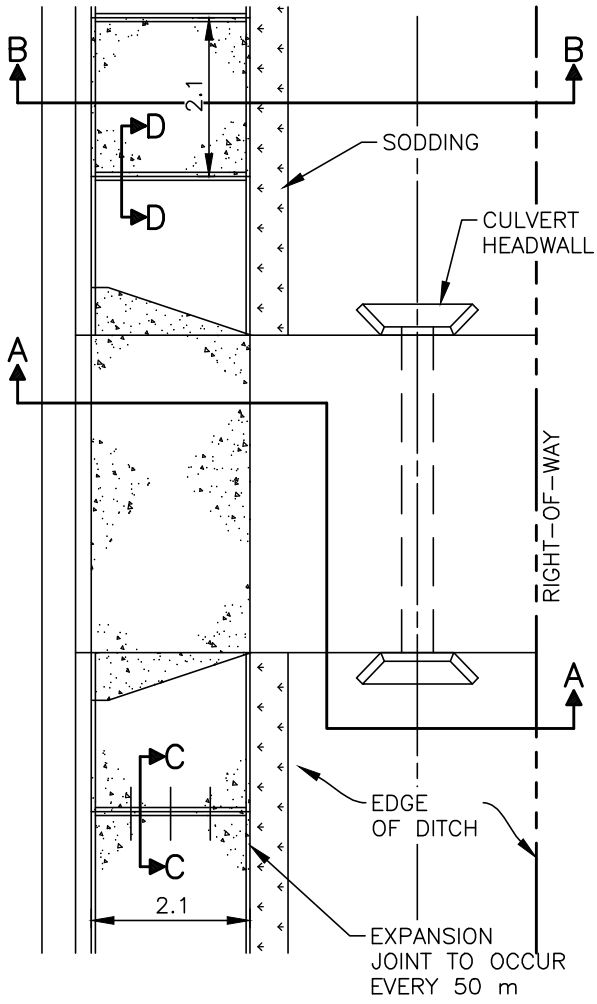
STANDARD DETAIL

RURAL TYPE I SIDEWALK

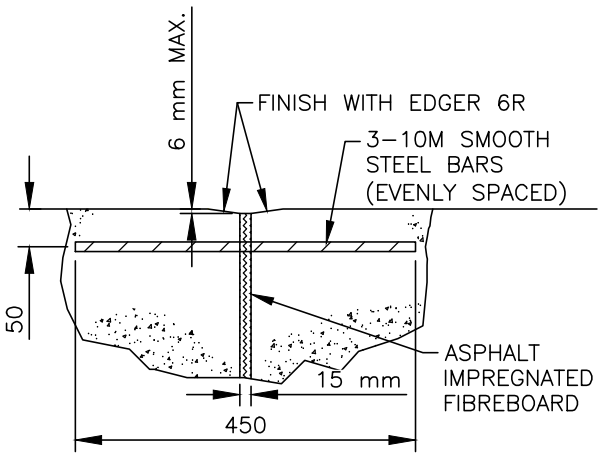
DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 45

NOTES:

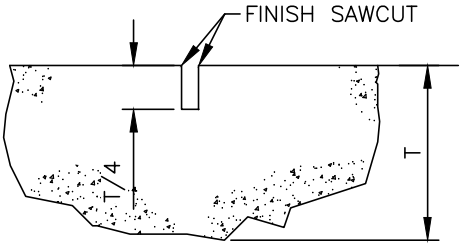
1. CONCRETE SIDEWALK AT COMMERCIAL DRIVEWAY TO BE 150 THICK WITH 150x150 WELDED WIRE MESH.
2. CRUSHED ROCK BASE TO EXTEND 150 BEYOND EDGE OF SIDEWALK STRUCTURE.
3. CONTROL JOINTS ARE TO BE SAW CUT.
4. SIDEWALKS ABUTTING COMMERCIAL AREAS ARE TO BE FULL WIDTH (3 m) AND 150 mm THICKNESS.
5. EXPANSION JOINT BARS ARE TO BE GREASED ON ONE SIDE OF THE JOINT.
6. DURING CONSECUTIVE POURS, THE END OF EACH POUR IS TO OCCUR AT AN EXPANSION JOINT. WHERE THIS IS NOT FEASIBLE, AN ADDITIONAL EXPANSION JOINT IS TO BE INSTALLED.
7. INSTALL A 9 m LONG CONCRETE LANDING PAD AT ALL BUS STOP LOCATIONS. INCREASE THIS TO 14.5 m FOR ARTICULATED BUS ROUTES.
8. WHEN BOULEVARD IS LESS THAN 1.5 m OR WHEN THE SIDEWALK ABUTS THE CURB & GUTTER, REFER TO HRM 133.



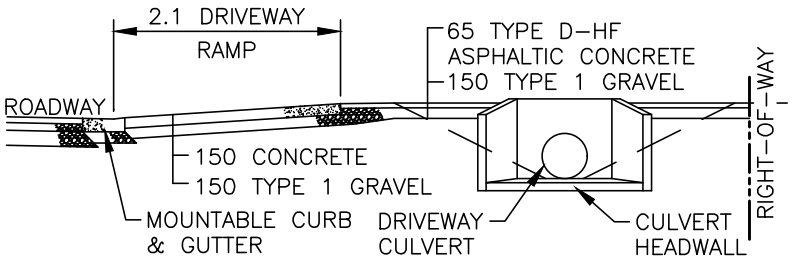
PLAN



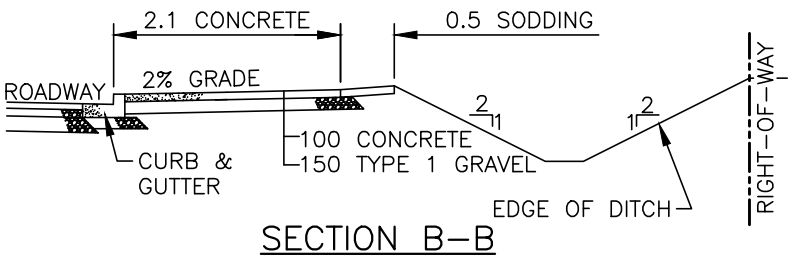
SECTION C-C
(EXPANSION JOINT)



SECTION D-D
(CONTROL JOINT)



SECTION A-A
(DRIVEWAY CROSS-SECTION)



SECTION B-B
(DRIVEWAY CROSS-SECTION)

HALIFAX

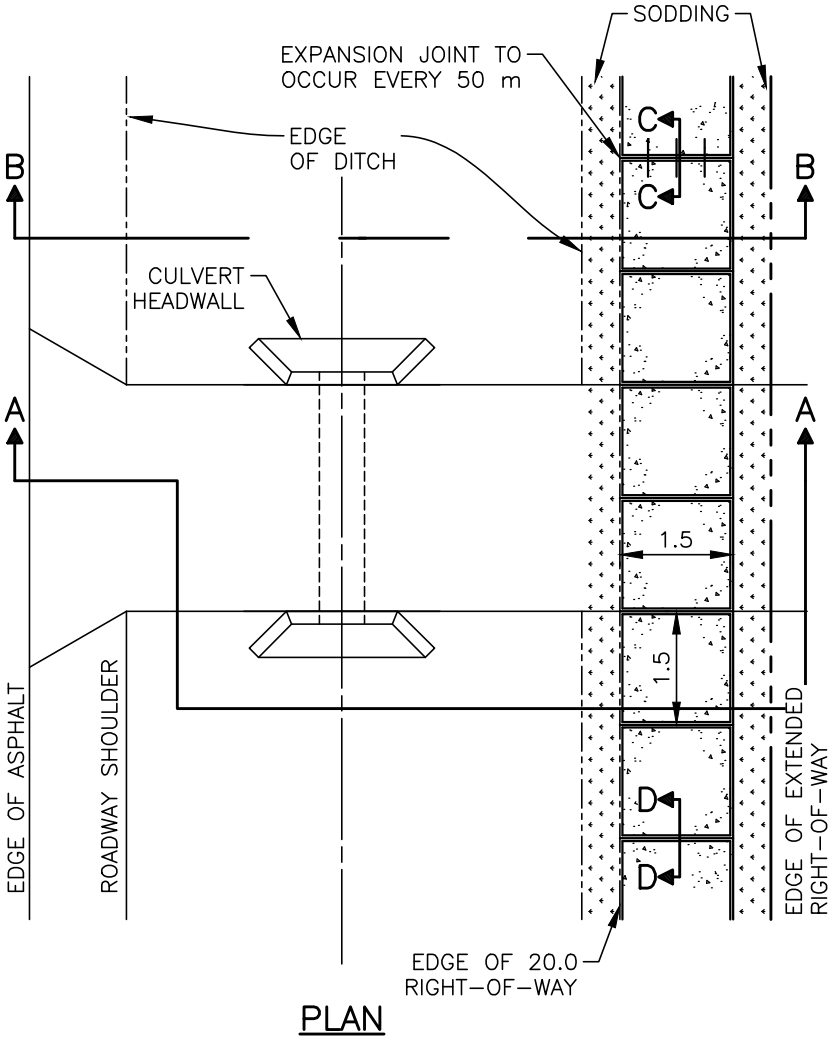
STANDARD DETAIL

RURAL TYPE II SIDEWALK

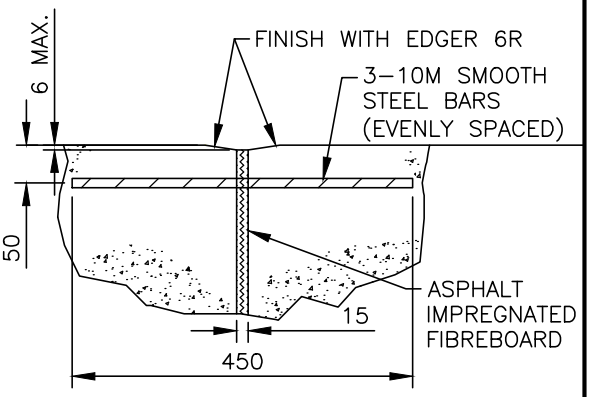
DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 46

NOTES:

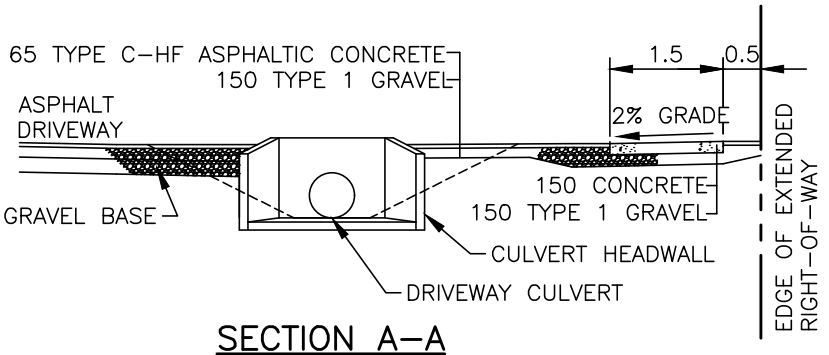
1. CONCRETE SIDEWALK AT COMMERCIAL DRIVEWAY TO BE 150 THICK WITH 150 x 150 WELDED WIRE MESH.
2. CRUSHED ROCK BASE TO EXTEND 150 BEYOND EDGE OF SIDEWALK STRUCTURE.
3. CONTROL JOINTS ARE TO BE SAW CUT.
4. SIDEWALKS ABUTTING COMMERCIAL AREAS ARE TO BE FULL WIDTH (3 m) AND 150 mm THICKNESS.
5. EXPANSION JOINT BARS ARE TO BE GREASED ON ONE SIDE OF THE JOINT.
6. DURING CONSECUTIVE POURS, THE END OF EACH POUR IS TO OCCUR AT AN EXPANSION JOINT. WHERE THIS IS NOT FEASIBLE, AND ADDITIONAL EXPANSION JOINT IS TO BE INSTALLED.
7. INSTALL A 9 m LONG CONCRETE LANDING PAD AT ALL BUS STOP LOCATIONS. INCREASE THIS TO 14.5 m FOR ARTICULATED BUS ROUTES.



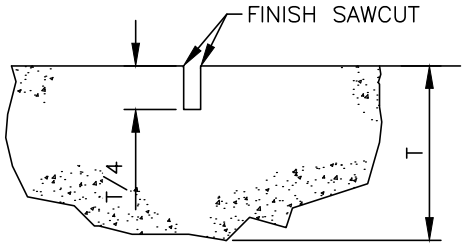
PLAN



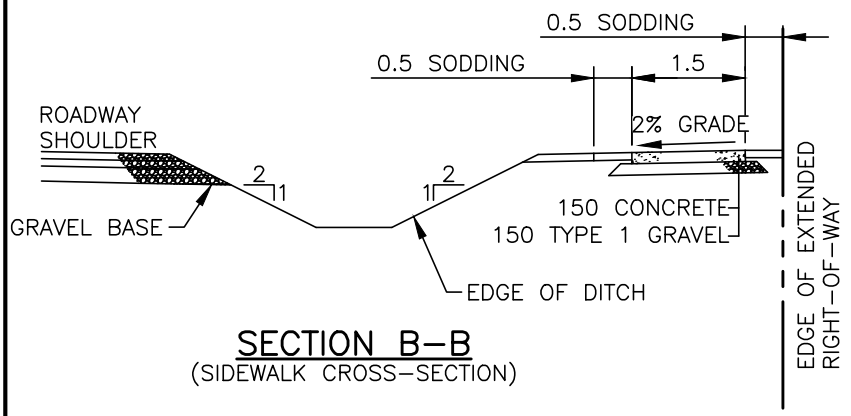
SECTION C-C
(EXPANSION JOINT)



SECTION A-A
(DRIVEWAY CROSS-SECTION)



SECTION D-D
(CONTROL JOINT)



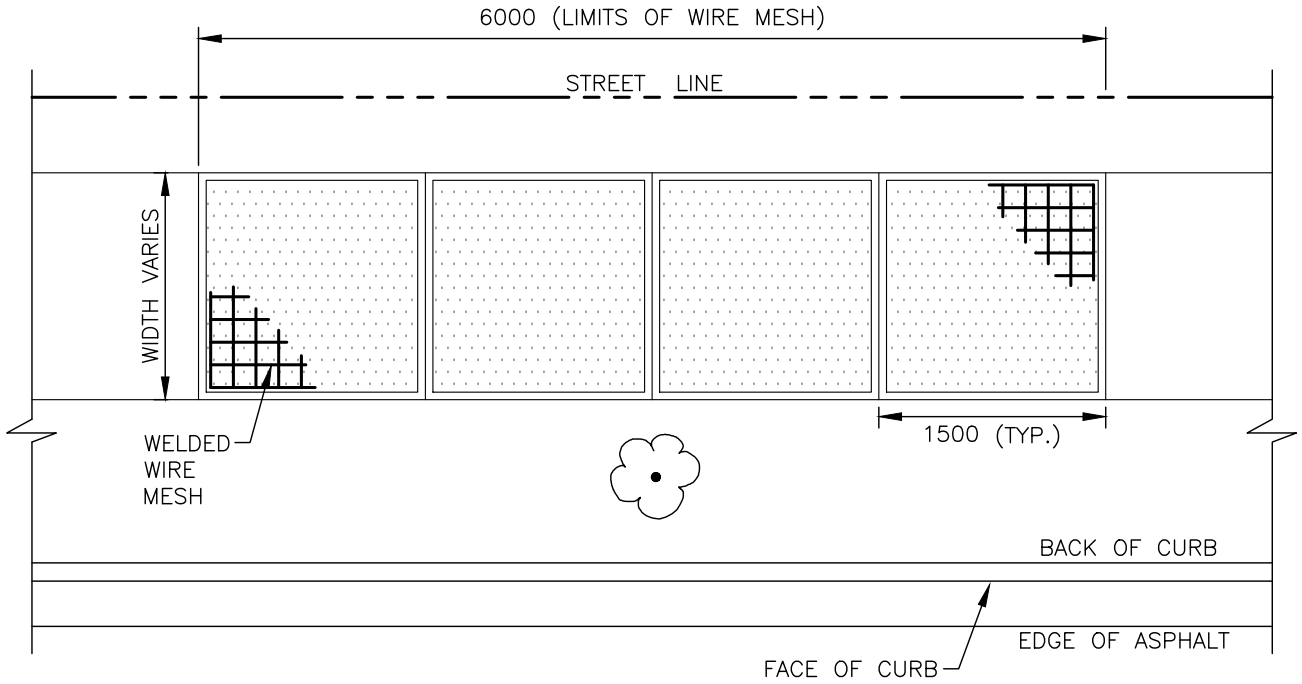
SECTION B-B
(SIDEWALK CROSS-SECTION)

HALIFAX

STANDARD DETAIL

RURAL TYPE III SIDEWALK

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 47



PLAN

NOTES:

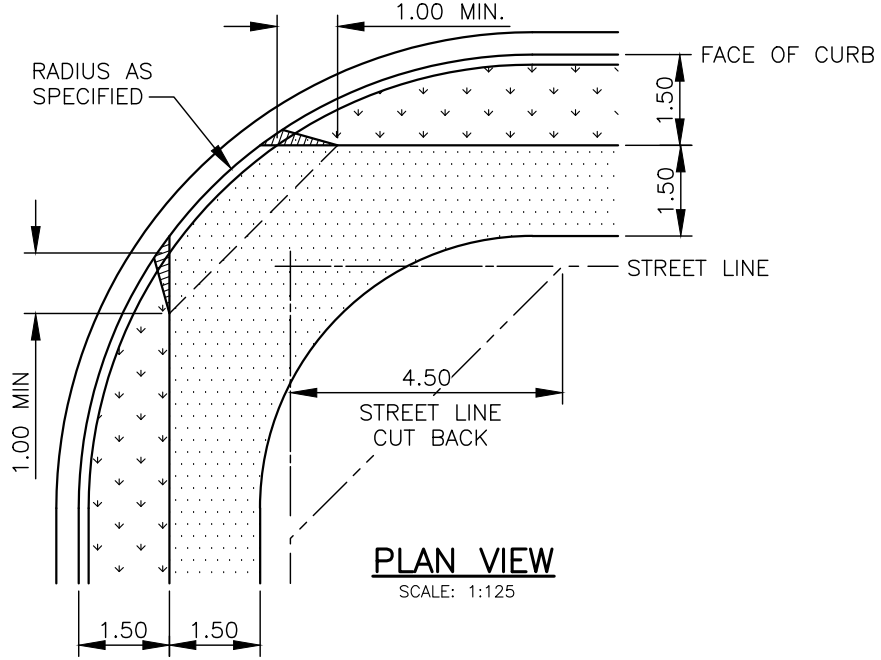
1. WELDED WIRE MESH TO BE 150 X 150 – M.W. 18.7 X M.W. 18.7 (WELDED WIRE FABRIC 4.88 MM DIA.)
2. PLACED 3000 EACH SIDE FROM CENTRE OF TREE AT 1/2 THE SLAB DEPTH, FULL SIDEWALK WIDTH, CHAIRS REQUIRED TO ACHIEVE 1/2 DEPTH PLACEMENT OF WWF.
3. NO TREE ROOTS TO BE REMOVED WITHOUT HRM APPROVAL.
4. ALL DIMENSIONS IN MILLIMETRES.

HALIFAX

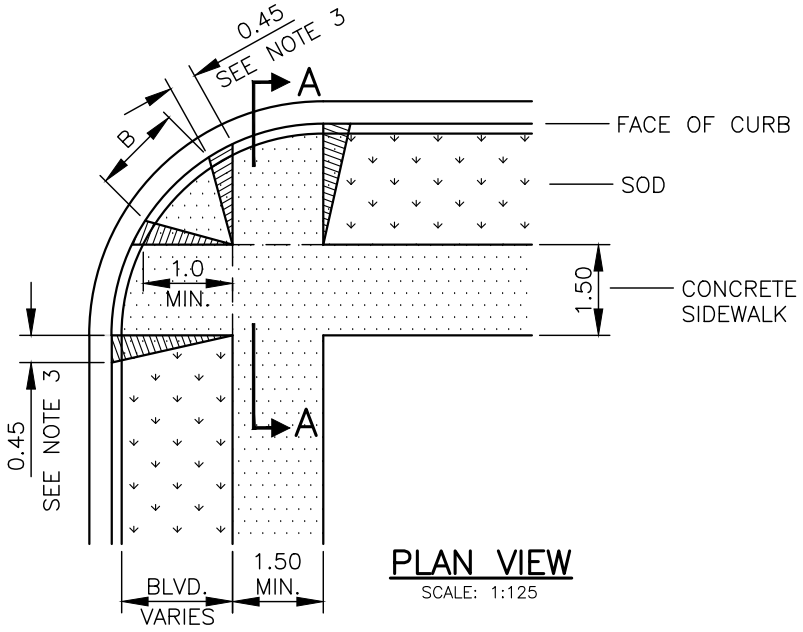
STANDARD DETAIL

CONCRETE SIDEWALK REINFORCING

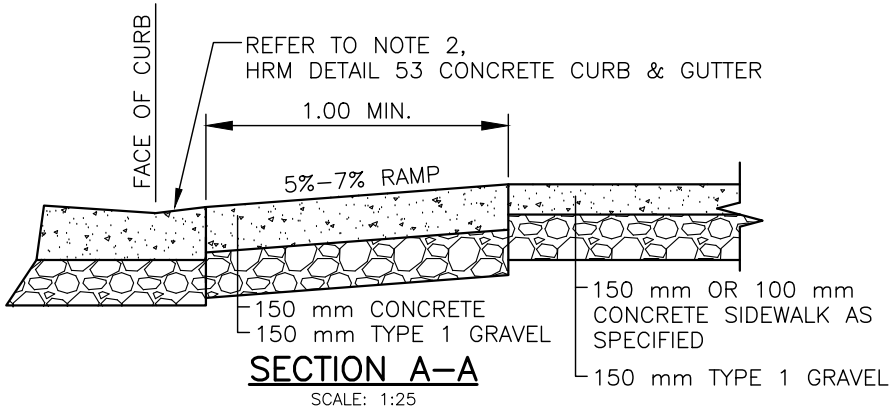
DATE: 2023	REFERENCE	APPROVED
SCALE: 1:50		FIG No.: HRM 48



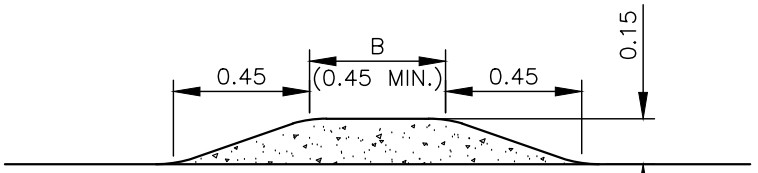
PLAN VIEW
SCALE: 1:125



PLAN VIEW
SCALE: 1:125



SECTION A–A
SCALE: 1:25



PEDESTRIAN RAMP DIVIDER VIEW
SCALE: 1:25

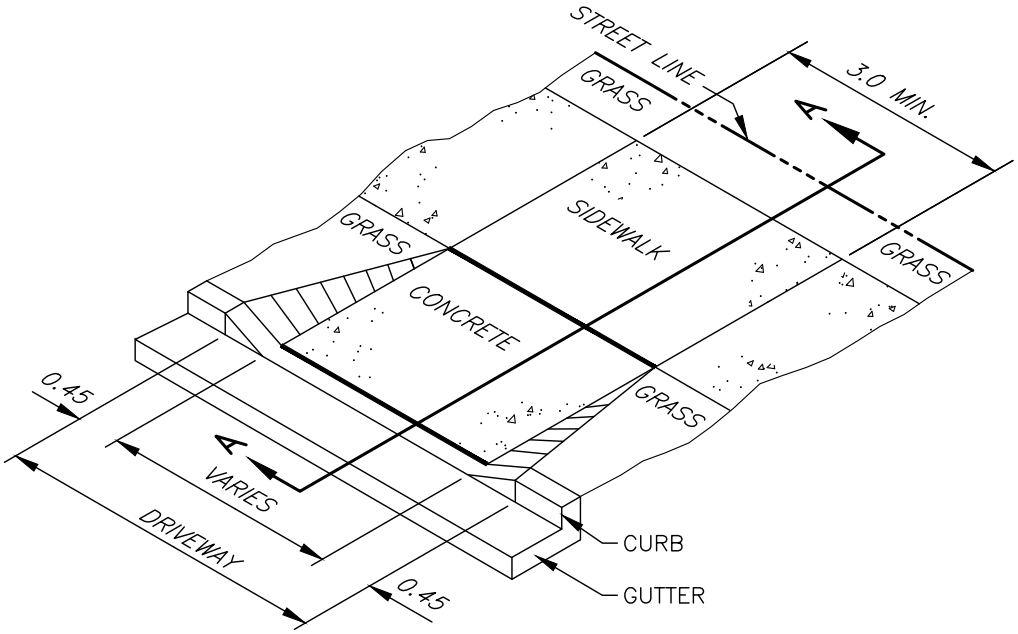
NOTES:
1. PEDESTRIAN RAMPS SHALL BE ALIGNED WITH THE SIDEWALK INSIDE EDGE.
2. INSTALL RAMP DIVIDER ONLY WHEN (B) WILL BE GREATER THAN 0.45 m.
3. WHERE THE BOULEVARD IS LESS THAN 1.5 m, A 1.3 m CURB TRANSITION TAPER IS REQUIRED.
4. IF THE DISTANCE FROM BACK OF CURB TO BACK OF SIDEWALK IS LESS THAN 2 m, SLOPE AT 5% FROM BACK OF CURB TO BACK OF SIDEWALK.
5. TACTILE ATTENTION INDICATOR PLATES (TWSI) REQUIRED AT ALL NEW RAMPS AS PER HRM DETAIL 131.
6. FOR STREETS OF LESS THAN 8%, TRANSITION CURB AND SIDEWALK TO MAXIMUM GRADE OF 8%, OR TIE IN AT 3 m. FOR SIDEWALK, 1.3 m FOR CURB.
7. PEDESTRIAN RAMP OPENING TO BE 1.7 m MINIMUM, MEASURED FROM 0.1 m BEYOND THE EXTENSION OF THE SIDEWALK TO THE CURB.
8. DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

HALIFAX

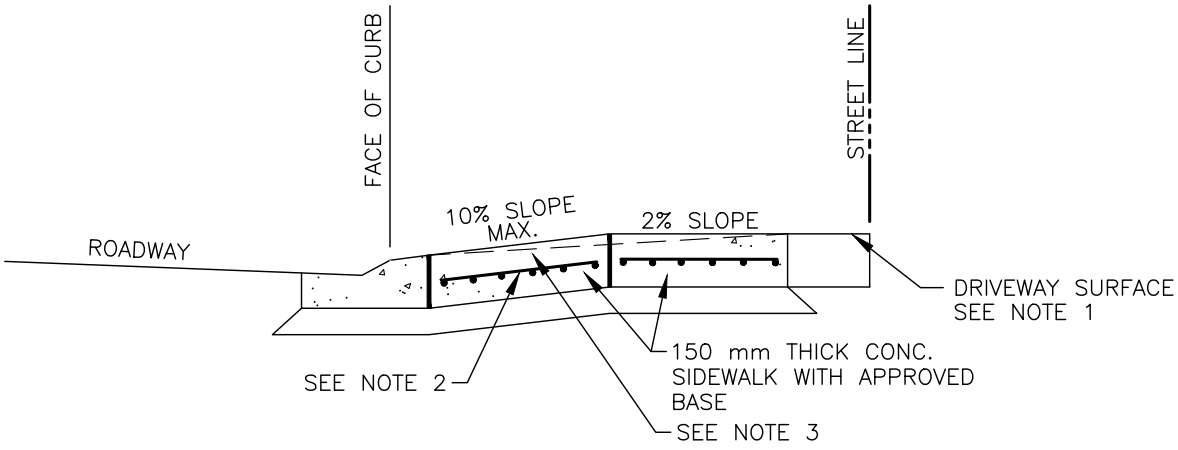
STANDARD DETAIL

PEDESTRIAN RAMP ALIGNMENT

DATE: 2025	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 49



VIEW PLAN



SECTION A–A

NOTES:

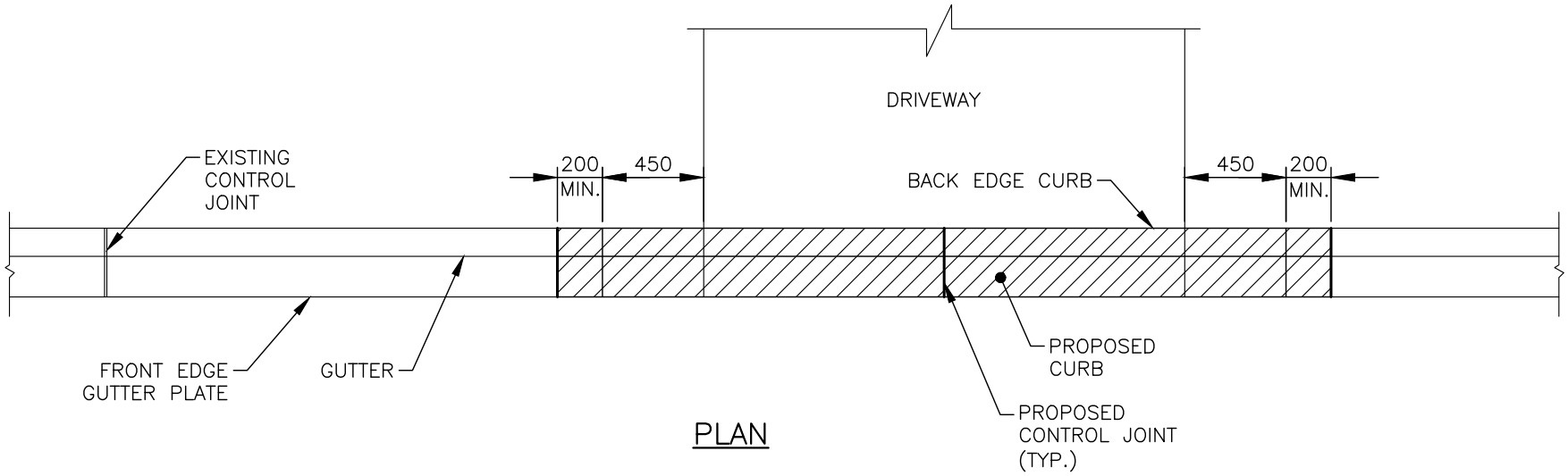
1. GRAVEL DRIVEWAYS ARE TO BE PAVED 1 m BEHIND THE SIDEWALK OR TO THE STREETLINE WHICHEVER IS LESS. IF NO SIDEWALK EXISTS, 1 m ASPHALT PAVING IS REQUIRED.
2. FOR COMMERCIAL AND INDUSTRIAL DRIVEWAYS PLACE 150 x 150 – M.W. 18.7 x M.W. 18.7 PLACED 50 mm FROM BOTTOM OF CONCRETE RAMP AND SIDEWALK.
3. WHEN BOULEVARD IS LESS THAN 1.5 m OR WHEN THE SIDEWALK ABUTS THE CURB & GUTTER, REFER TO HRM 133.
4. MINIMUM DISTANCE BETWEEN CONTROL JOINTS IS 1.2. PROVIDE CONTROL JOINTS WITHIN 150 mm OF CHANGE IN CROSS SECTION OF CURB.
5. DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

HALIFAX

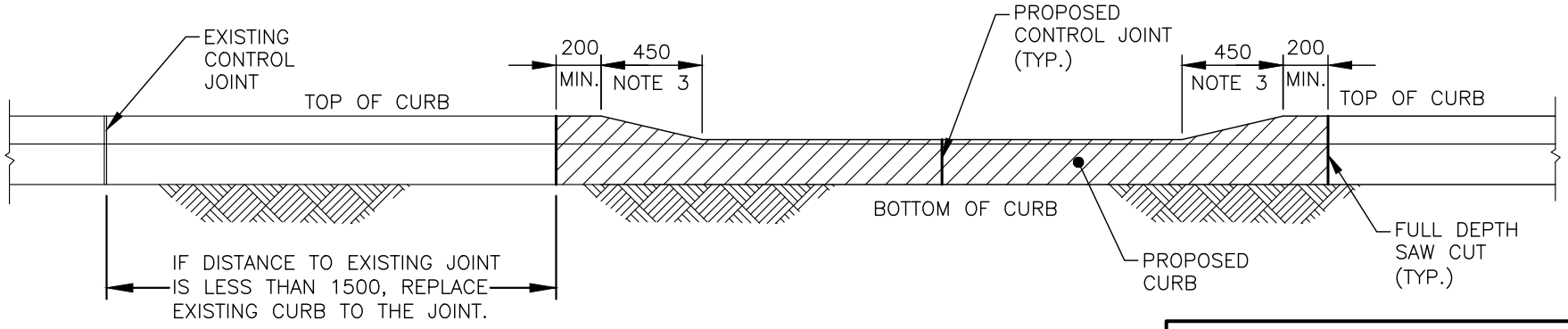
STANDARD DETAIL

DRIVEWAY RAMP

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 50



PLAN



ELEVATION

NOTES:

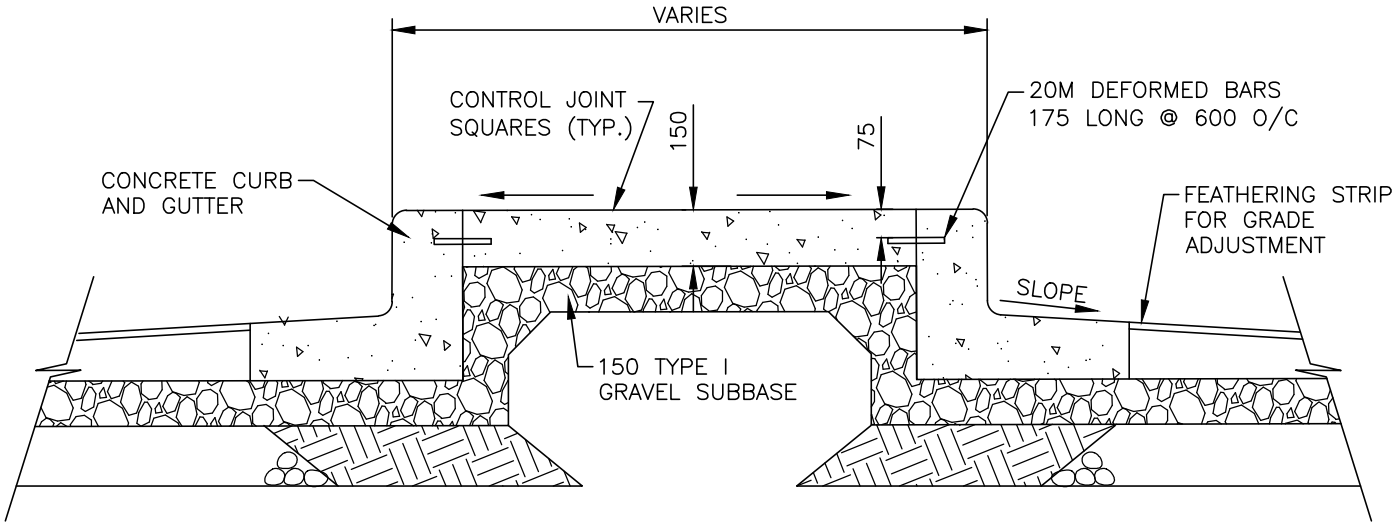
1. MINIMUM DISTANCE BETWEEN CONTROL JOINTS IS 1200 mm.
2. PROVIDE CONTROL JOINTS WITHIN 150 mm OF CHANGE IN CROSS SECTION OF CURB.
3. IF SIDEWALK ABUTS THE CURB, THE TAPER SHALL BE 1300 mm.
4. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

DRIVEWAY ACCESS IN EXISTING FULL-DEPTH CURB

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:30		FIG No.: HRM 51



TYPICAL CONCRETE ISLAND CROSS SECTION

NOTES:

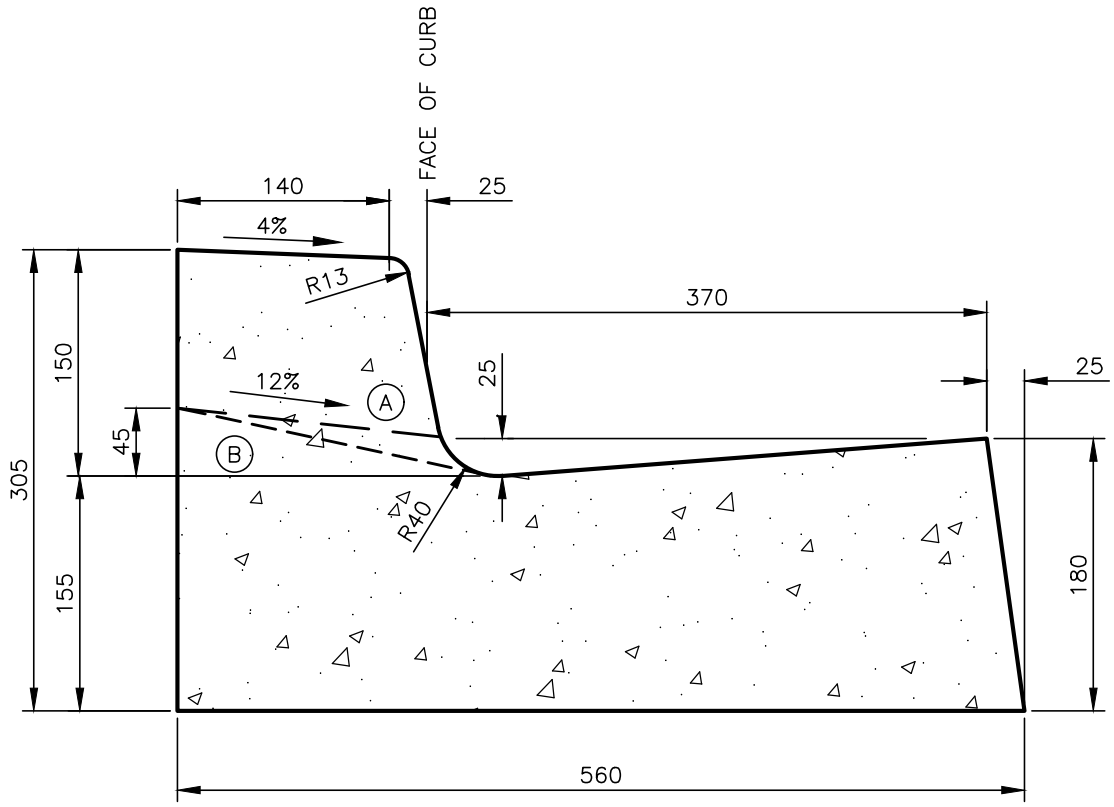
1. MAXIMUM SPACING FOR CONTROL JOINTS IS TO BE 2.5 m.
2. SLOPE SLAB TO FACILITATE DRAINAGE.
3. SLOPE GUTTER TO MATCH STREET CROSS SECTION.
4. ENDS AND CORNERS OF TRAFFIC ISLANDS TO HAVE HIGH BACK CONCRETE CURB AND GUTTER.
5. GEOMETRIC DESIGN OF CONCRETE ISLANDS TO BE AS PER PART A OF THE MUNICIPAL DESIGN GUIDELINES AND/OR THE TAC GEOMETRIC DESIGN GUIDE.
6. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

CONCRETE TRAFFIC ISLAND

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:20		FIG No.: HRM 52



CURB & GUTTER SECTION

NOTES:

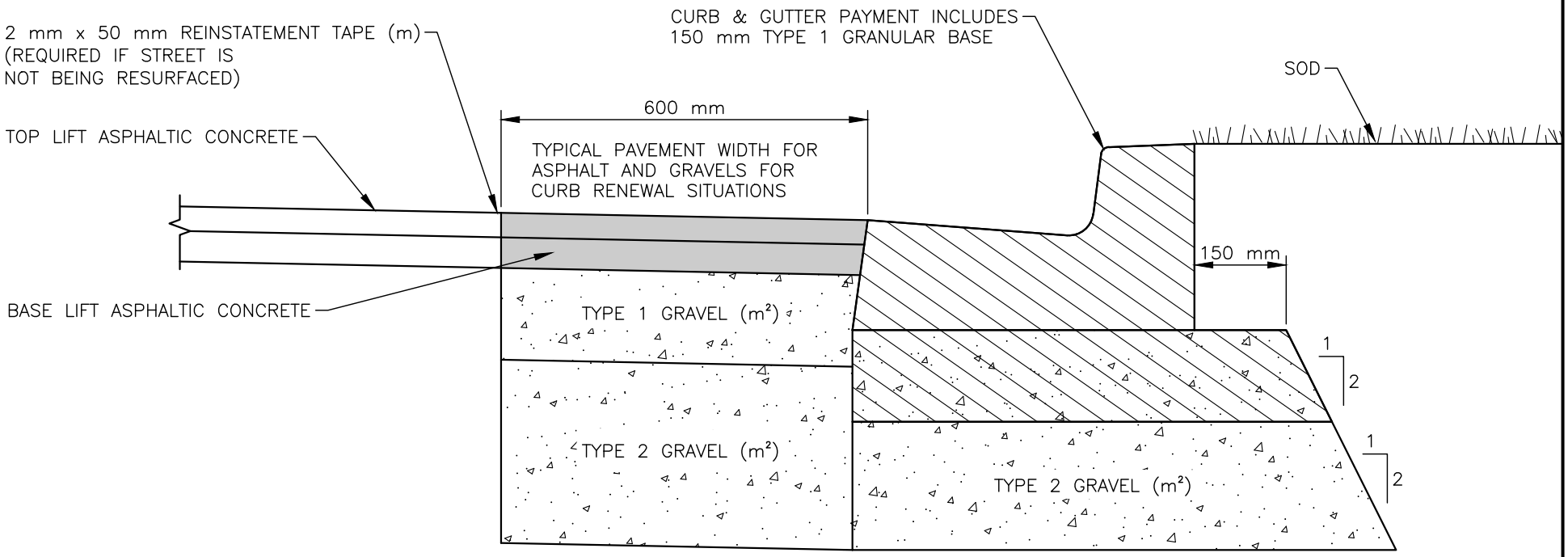
1. DASHED LINE "A" INDICATES CURB AT DRIVEWAYS.
2. DASHED LINE "B" INDICATES CURB AT PEDESTRIAN RAMPS.
3. TRANSITION TAPERS SHALL BE PROVIDED AT DRIVEWAYS AND PEDESTRIAN RAMPS AS PER THE "PEDESTRIAN RAMP ALIGNMENT" DETAIL AND "DRIVEWAY RAMP" DETAIL.
4. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

HALIFAX

STANDARD DETAIL

CONCRETE CURB & GUTTER

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:5		FIG No.: HRM 53



NOTES:

1. CURB AND GUTTER PAYMENT INCLUDES A GRANULAR BASE OF 150 mm OF TYPE 1 GRAVEL, OR AS INDICATED ON DRAWINGS.

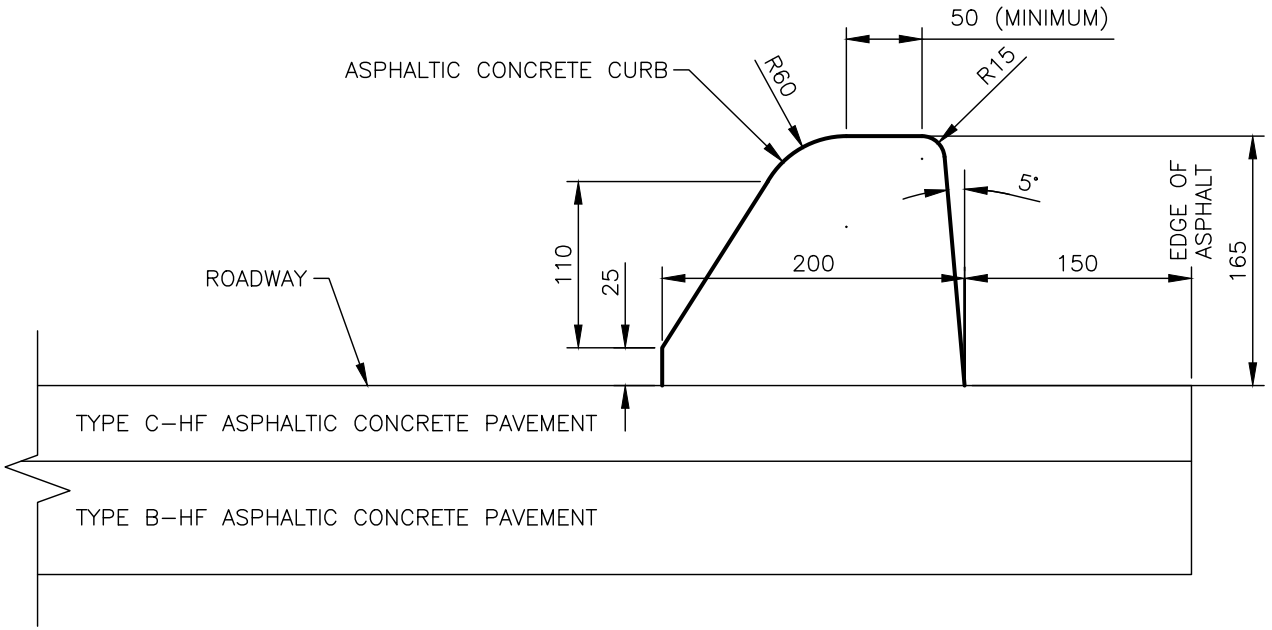
2. PAVEMENT STRUCTURE THICKNESS AS INDICATED ON DRAWINGS.

HALIFAX

STANDARD DETAIL

CURB RENEWAL/PAYMENT

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:10		FIG No.: HRM 54

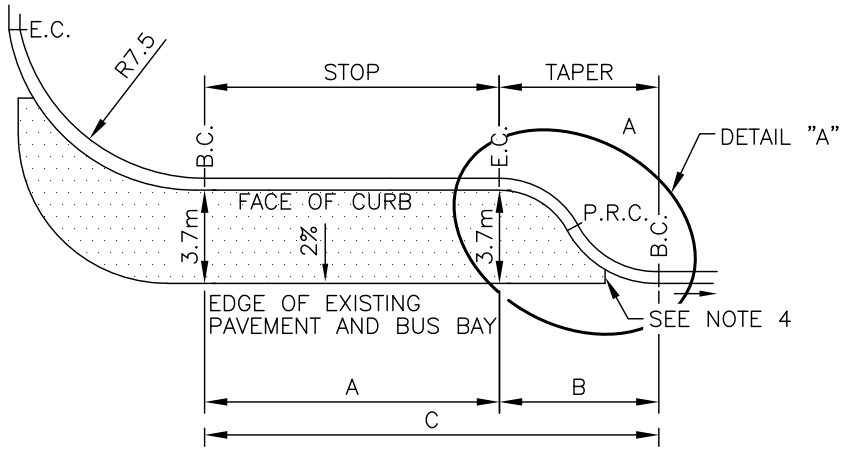


HALIFAX

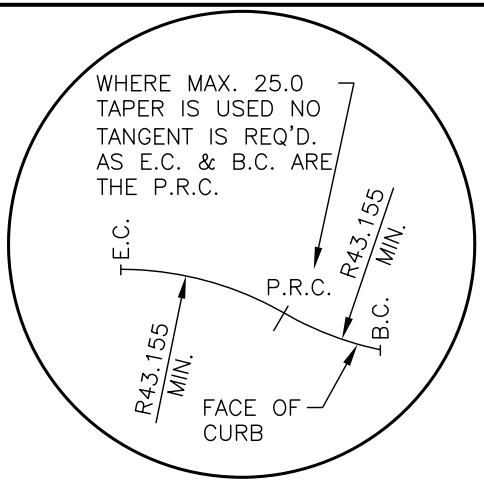
STANDARD DETAIL

ASPHALT CURB

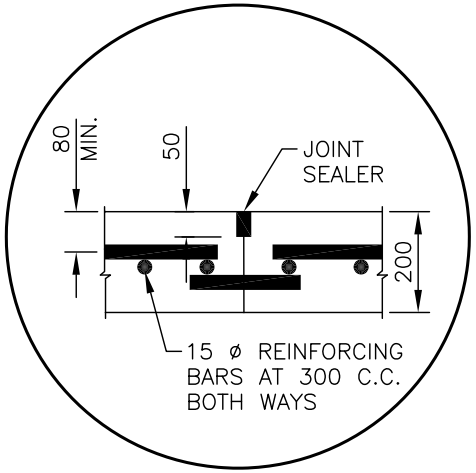
DATE: 2021	REFERENCE	APPROVED
SCALE: 1:5		FIG No.: HRM 55



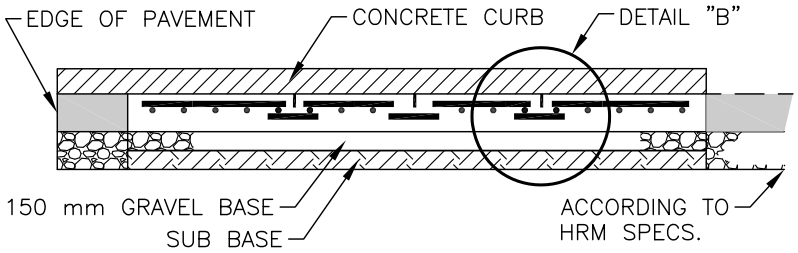
PLAN



DETAIL "A"

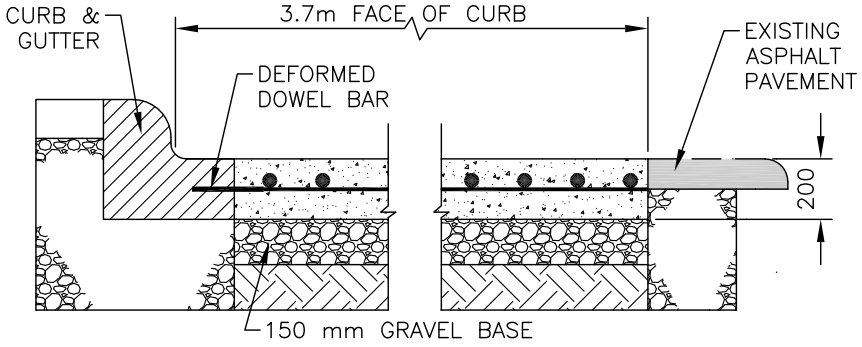


DETAIL "B"
(CONTRACTION JOINT)



LONGITUDINAL SECTION

	SINGLE BUS BAY (MINIMUM DIMENSION)	DOUBLE BUS BAY (MINIMUM DIMENSION)
A	*16m	34m
B	25m	25m
C	41m	59m



TRANSVERSE SECTION

NOTES:

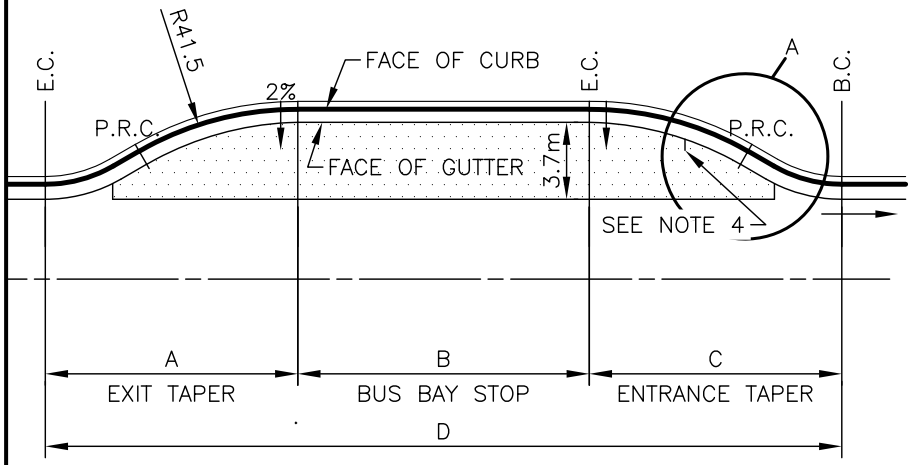
1. 15M BARS AT 300 mm C.C. BOTH WAYS.
2. CONTROL JOINTS TO BE AT A DEPTH OF 1/4 OF PAD THICKNESS & SEALED ACCORDING TO HRM SPECS.
3. CONTROL JOINT EVERY 4.0 m MAXIMUM.
4. MINIMUM WIDTH OF CONCRETE BASE IS 0.6 m.
5. *FOR ARTICULATED BUS ROUTES INCREASE TO 22m.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

HALIFAX

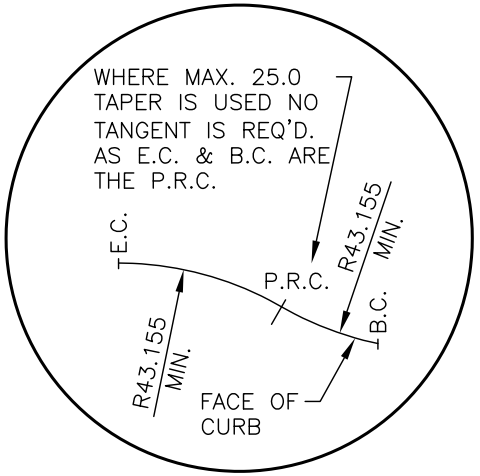
STANDARD DETAIL

CONCRETE BUS BAY PAD – END BLOCK

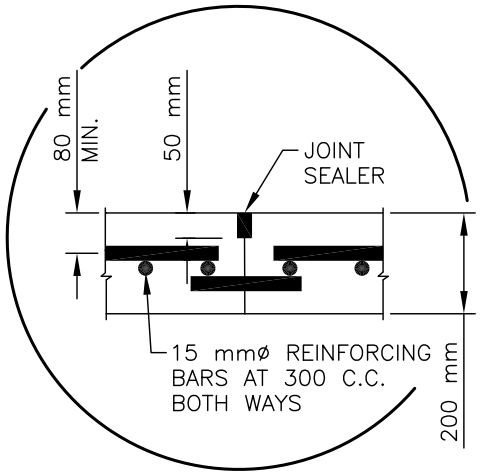
DATE: 2024	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 57



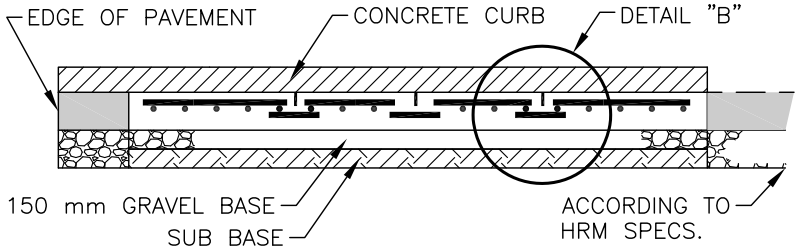
PLAN



DETAIL "A"

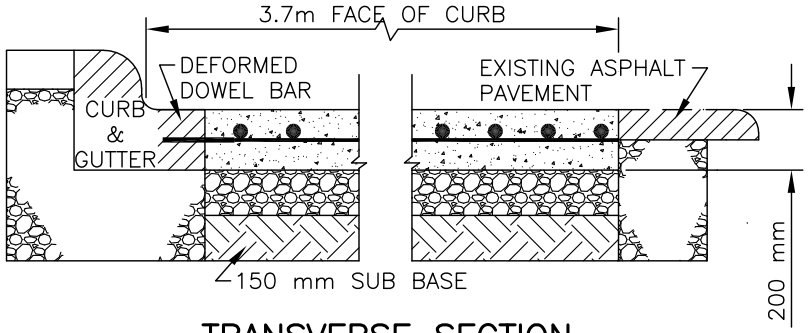


DETAIL "B"
(CONTRACTION JOINT)



LONGITUDINAL SECTION

	SINGLE BUS BAY MINIMUM DIMENSION	DOUBLE BUS BAY MINIMUM DIMENSION
A	25m	25m
B	*16m	34m
C	25m	25m
D	66m	84m



TRANSVERSE SECTION

NOTES:

1. 15M BARS AT 300 mm C.C. BOTH WAYS.
2. CONTROL JOINTS TO BE AT A DEPTH OF 1/4 OF PAD THICKNESS & SEALED ACCORDING TO HRM SPECS.
3. CONTROL JOINT EVERY 4.0 m MAXIMUM.
4. MINIMUM WIDTH OF CONCRETE BASE IS 0.6 m.
5. *FOR ARTICULATED BUS ROUTES INCREASE TO 22m.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

HALIFAX

STANDARD DETAIL

CONCRETE BUS BAY PAD – MID BLOCK

DATE: 2024	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 58

TRENCH BACKFILL AND REINSTATEMENT – TESTING REQUIREMENTS

TEST REQUIRED	COMPACTION REQUIRED	MINIMUM TEST FREQUENCY	
		TRENCH LESS THAN 1.5m WIDE	TRENCH GREATER THAN 1.5m WIDE
COMPACTION OF BEDDING, HAUNCH AND COVER MATERIALS (ASTM D698) *SEE NOTE 3	95% MINIMUM AT 3% ± OF OPTIMUM MOISTURE. (SEE NOTES)	1 PER 25 m AT THE CENTRELINE OF THE TRENCH (AND EACH BENCH OR SECTION OF TRENCH LESS THAN 25 m IN LENGTH) FOR EACH 600 VERTICAL DEPTH OF BACKFILL MATERIAL A MINIMUM OF 3 TESTS PER TRENCH SHALL BE PERFORMED.	3 PER 25 m (AND EACH BENCH OR SECTION OF TRENCH LESS THAN 25 m IN LENGTH) FOR EACH 600 VERTICAL DEPTH OF BACKFILL MATERIAL 1 TEST SHALL BE TAKEN AT THE CENTRELINE OF THE TRENCH (SET BACK AT LEAST 300 mm FROM THE EDGE OF THE TRENCH). A MINIMUM OF 3 TESTS PER TRENCH SHALL BE PERFORMED.
COMPACTION OF STRUCTURAL FILL TO SUBGRADE ELEVATION (ASTM D698) *SEE NOTE 3	TOP 300 98% COMPACTION MINIMUM AT 3% ± OF OPTIMUM MOISTURE. (SEE NOTES)		
	BELOW 300 95% COMPACTION MINIMUM AT 3% ± OF OPTIMUM MOISTURE. (SEE NOTES)		
COMPACTION OF TYPE 1 & TYPE 2 BASE & SUB–BASE MATERIALS (ASTM D698)	100% COMPACTION MINIMUM AT 3% ± OF OPTIMUM MOISTURE (SEE NOTES)	FOR EACH MATERIAL, 1 PER 25 m AT THE CENTRELINE OF THE TRENCH (AND EACH BRANCH OR SECTION OF THE TRENCH LESS THAN 25 m IN LENGTH) FOR EACH 300 VERTICAL DEPTH OF BACKFILL MATERIAL. A MINIMUM OF 3 TESTS PER TRENCH SHALL BE PERFORMED.	FOR EACH MATERIAL, 3 PER 25 m (AND EACH BRANCH OR SECTION OF TRENCH LESS THAN 25 m IN LENGTH) FOR EACH 300 VERTICAL IN DEPTH OF BACKFILL MATERIAL. 1 TESTS SHALL BE TAKEN AT THE CENTRELINE OF THE TRENCH AND 1 AT EACH EDGE OF THE TRENCH (SET BACK AT LEAST 300 mm FROM THE EDGE OF THE TRENCH). A MINIMUM OF 3 TESTS PER TRENCH SHALL BE PERFORMED.
COMPACTION OF HOT MIX ASPHALT PAVEMENT (ASTM D3549 & 2726)	95% OF MAXIMUM THEORETICAL DENSITY OF COMPARATIVE MARSHALL LABORATORY SAMPLE.	ONE TEST FOR EACH 75 m^2 OF PAVEMENT SURFACE. A MINIMUM OF 1 TEST PER TRENCH.	ONE TEST FOR EACH 75 m^2 OF PAVEMENT SURFACE. A MINIMUM OF 1 TEST PER TRENCH.

NOTES:

1. THE TRENCH WIDTH FOR DETERMINATION OF THE TEST SHALL BE THE WIDTH OF THE TRENCH AT THE LEVEL OF THE TEST BEING PERFORMED.
2. IF MINIMUM MOISTURE DENSITY REQUIREMENTS ARE NOT MET BY THESE TESTS, THE CONTRACTOR SHALL RECOMPACT THE TRENCH AS NEEDED TO ACHIEVE THE SPECIFIED COMPACTION. SUCH RECOMPACTION SHALL EXTEND ON BOTH SIDES OF THE FAILED TEST SECTION A DISTANCE EQUAL TO 1/2 THE DISTANCE FROM WHERE THE LAST TEST WAS TAKEN OR 50 m, WHICHEVER IS LEAST. AN ALTERNATIVE PROCEDURE WOULD BE TO MORE CLEARLY DEFINE THE LIMITS OF THE FAILED AREA TO ADDITIONAL TESTS.
3. TESTING FOR BEDDING, HAUNCH AND STRUCTURAL FILL ARE NOT ONLY REQUIRED WHEN THE TOTAL LENGTH OF TRENCH EXCEEDS 100 m, OR WHEN REQUESTED BY THE HRM INSPECTOR.

HALIFAX

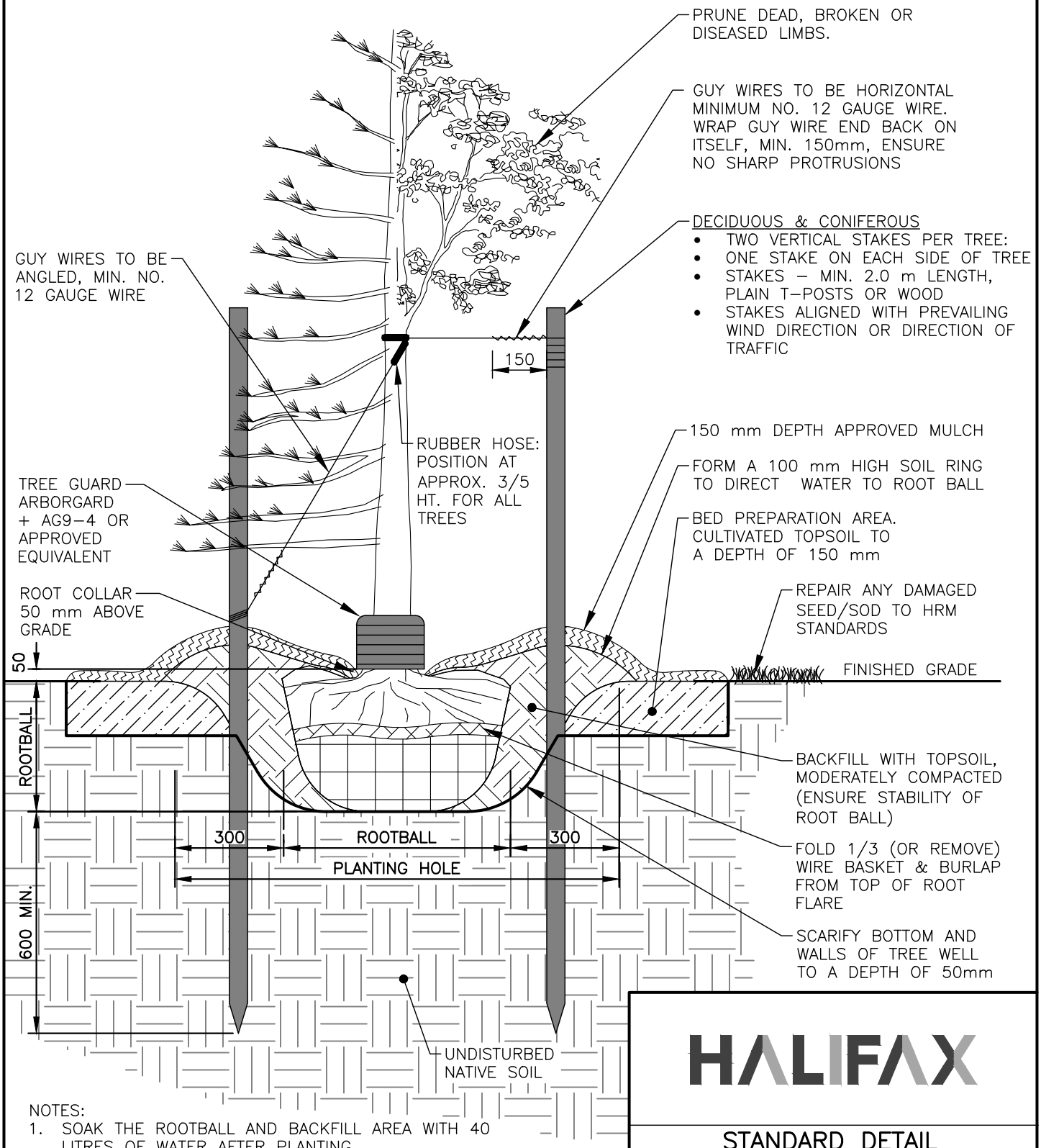
STANDARD DETAIL

TRENCH BACKFILL & REINSTATEMENT–TESTING

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 61

CONIFEROUS
1.8–2 m HEIGHT

DECIDUOUS
60 mm CALIPER



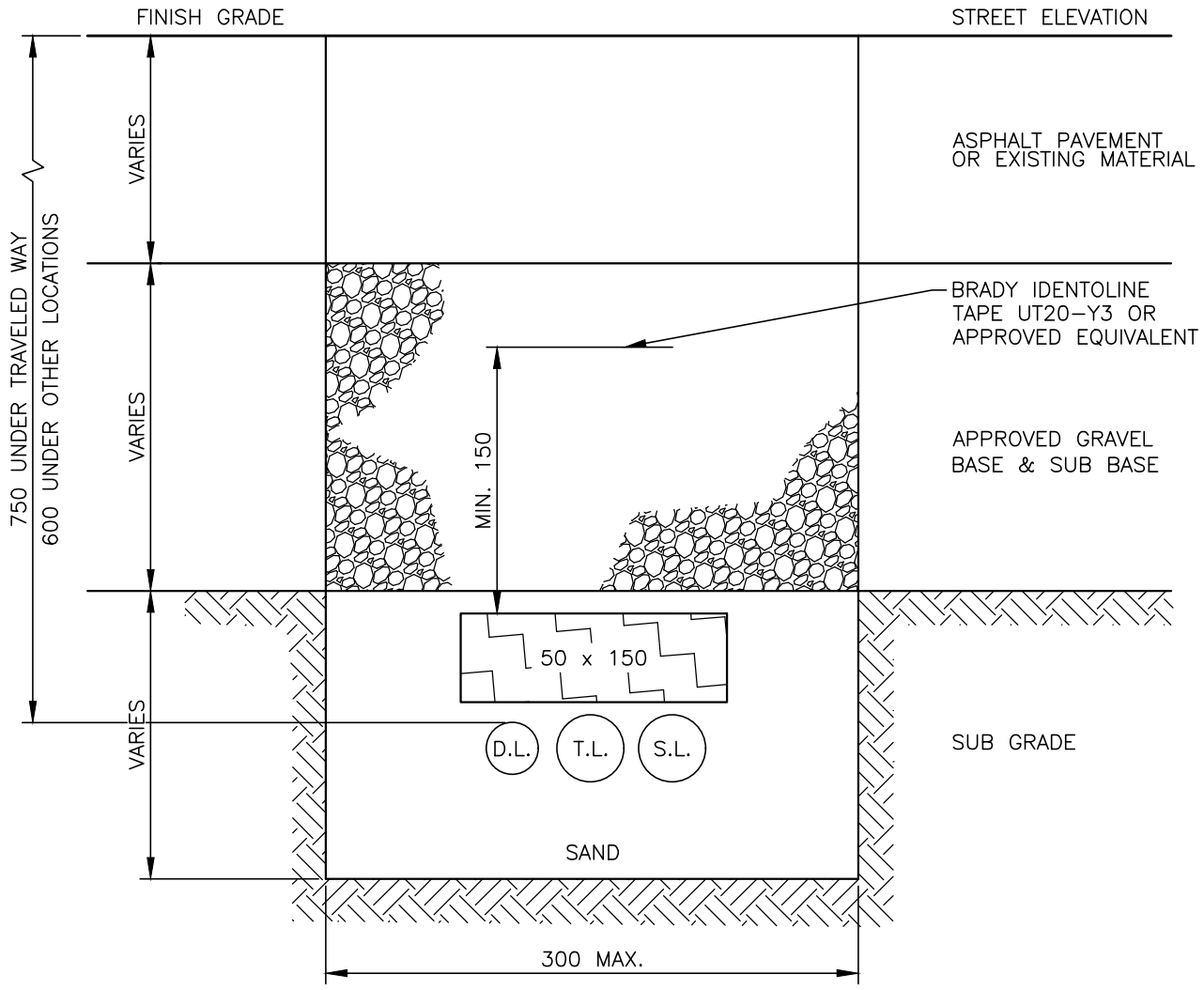
NOTES:
1. SOAK THE ROOTBALL AND BACKFILL AREA WITH 40 LITRES OF WATER AFTER PLANTING
2. CUT AND REMOVE ALL WIRE, ROPE, BURLAP AND TWINE FROM THE TOP 1/3 OF THE ROOTBALL
3. PRUNE AT PLANTING TO CAREFULLY REMOVE DEAD, BROKEN AND DAMAGED BRANCHES
4. ROOT BALL MIN. SIZE AS PER CNLA STANDARDS FOR NURSERY STOCK.
5. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

HALIFAX

STANDARD DETAIL

TREE PLANTING IN PARKS/OPEN SPACE

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:15		FIG No.: HRM 66



SIZE AND CONFIGURATION OF PVC CONDUIT INDICATED ON DRAWINGS

NOTES:

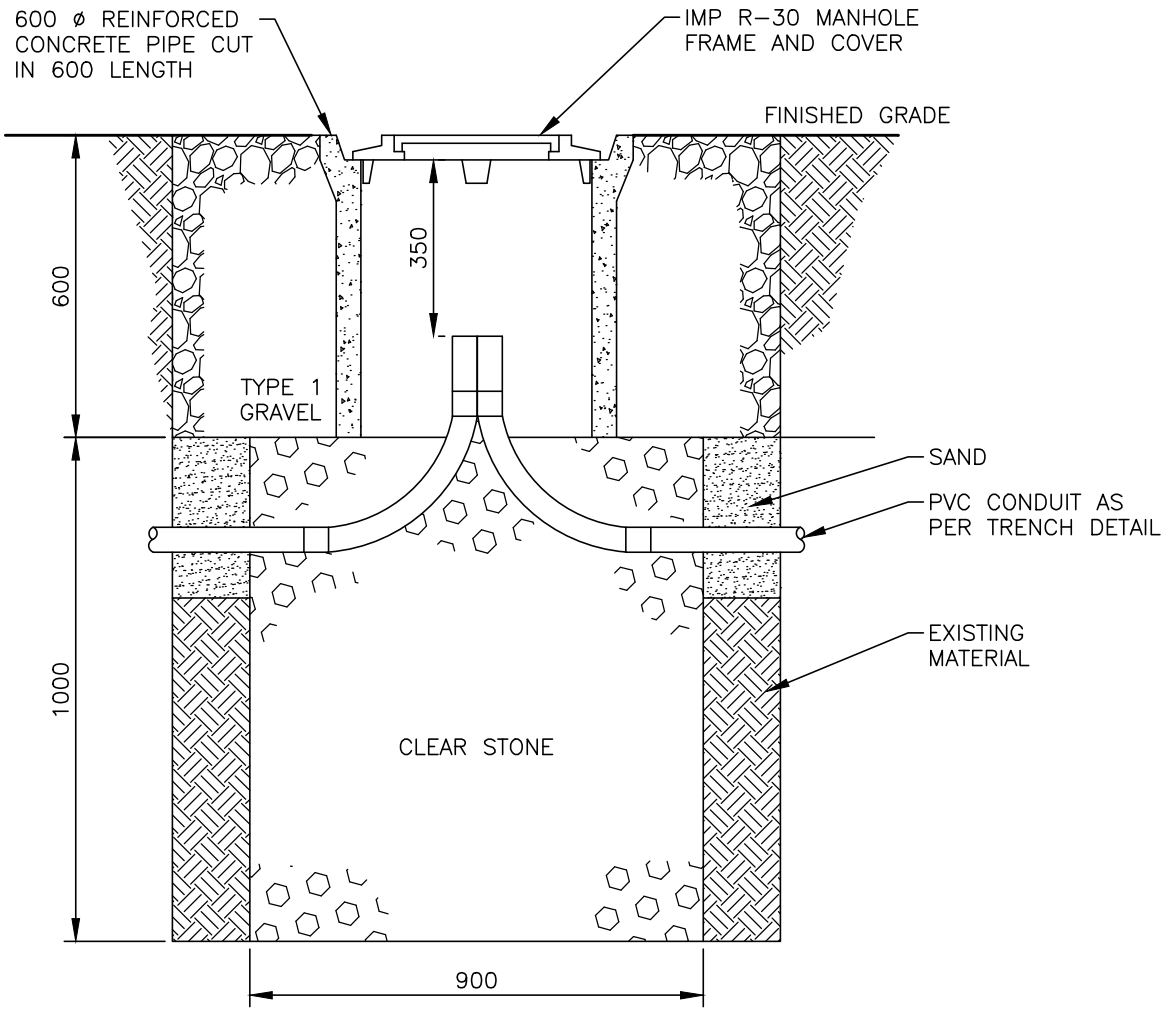
1. 50 mm x 150 mm WOOD PLANK TO BE PRESSURE TREATED WOOD.
2. "CAUTION BURIED ELECTRICAL LINE" TAPE TO BE PLACED OVER CONDUIT 150 mm TO 250 mm BELOW FINISHED GRADE.
3. SURROUND SAND WITH GEOTEXTILE SEPARATOR IN AREAS OF HIGH GROUNDWATER MOVEMENT (PERVIOUS SUB GRADE).

HALIFAX

STANDARD DETAIL

UNDERGROUND CONDUIT

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 78

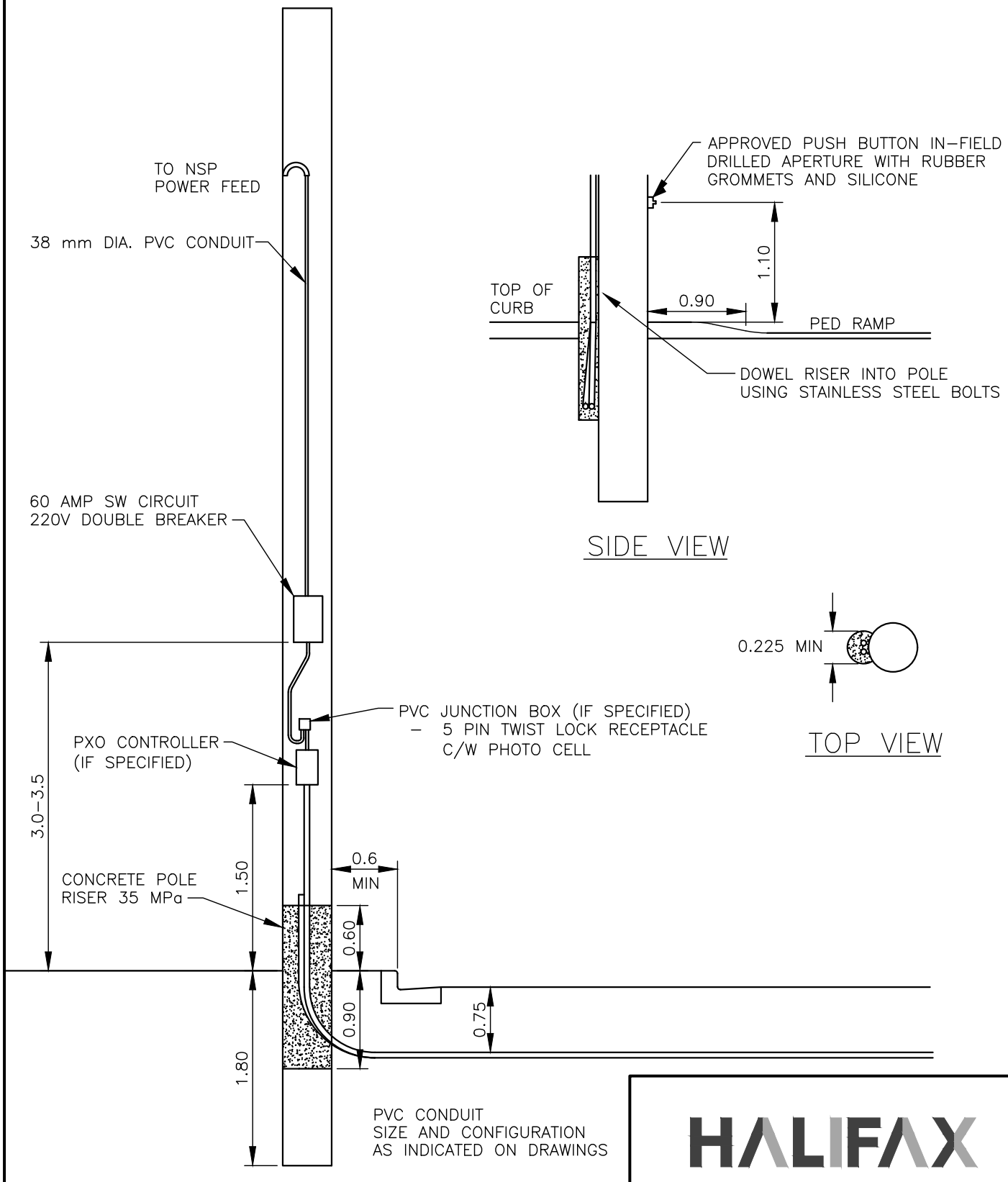


HALIFAX

STANDARD DETAIL

PULL PIT

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:15		FIG No.: HRM 79



NOTE:

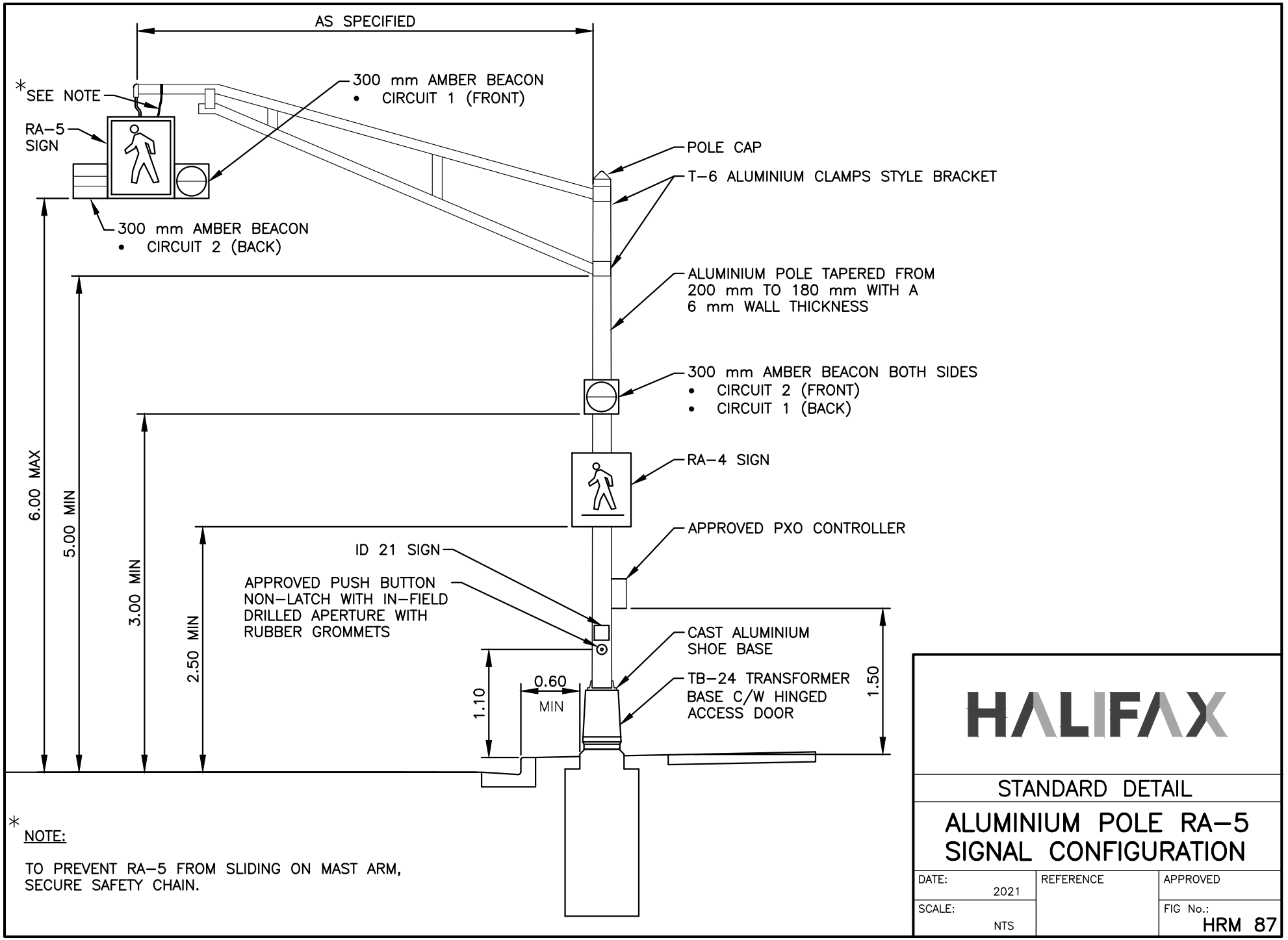
1. PLUG DUCTS NOT IN USE.
2. DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

HALIFAX

STANDARD DETAIL

WOODEN POLE POWER FEED (FOR TRAFFIC SIGNALS)

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 86



* NOTE:

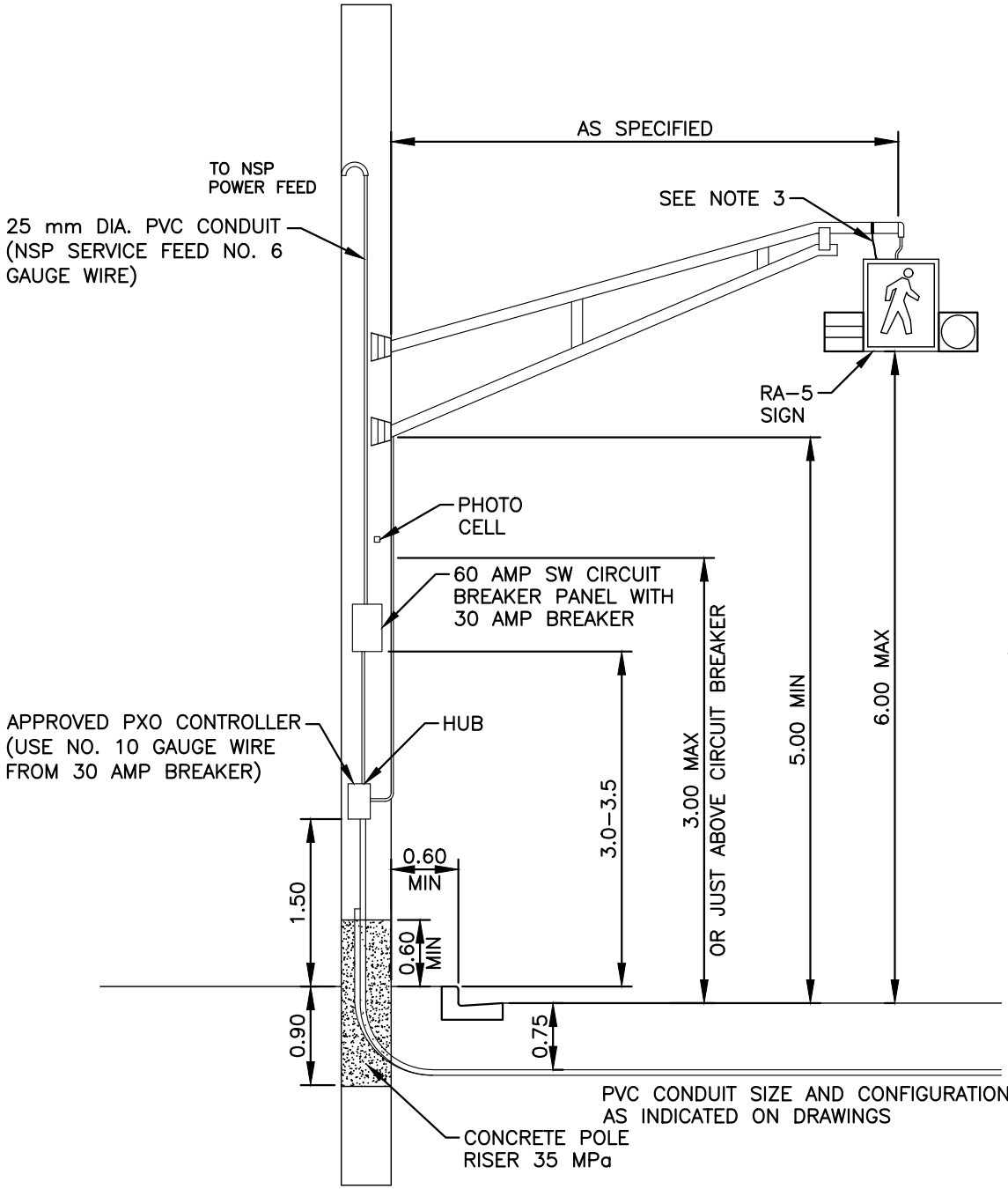
TO PREVENT RA–5 FROM SLIDING ON MAST ARM, SECURE SAFETY CHAIN.

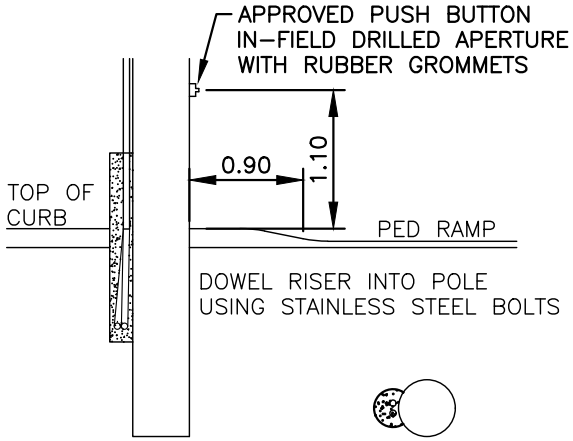
HALIFAX

STANDARD DETAIL

ALUMINIUM POLE RA–5 SIGNAL CONFIGURATION

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 87





SIDE VIEW TOP VIEW

NOTES:

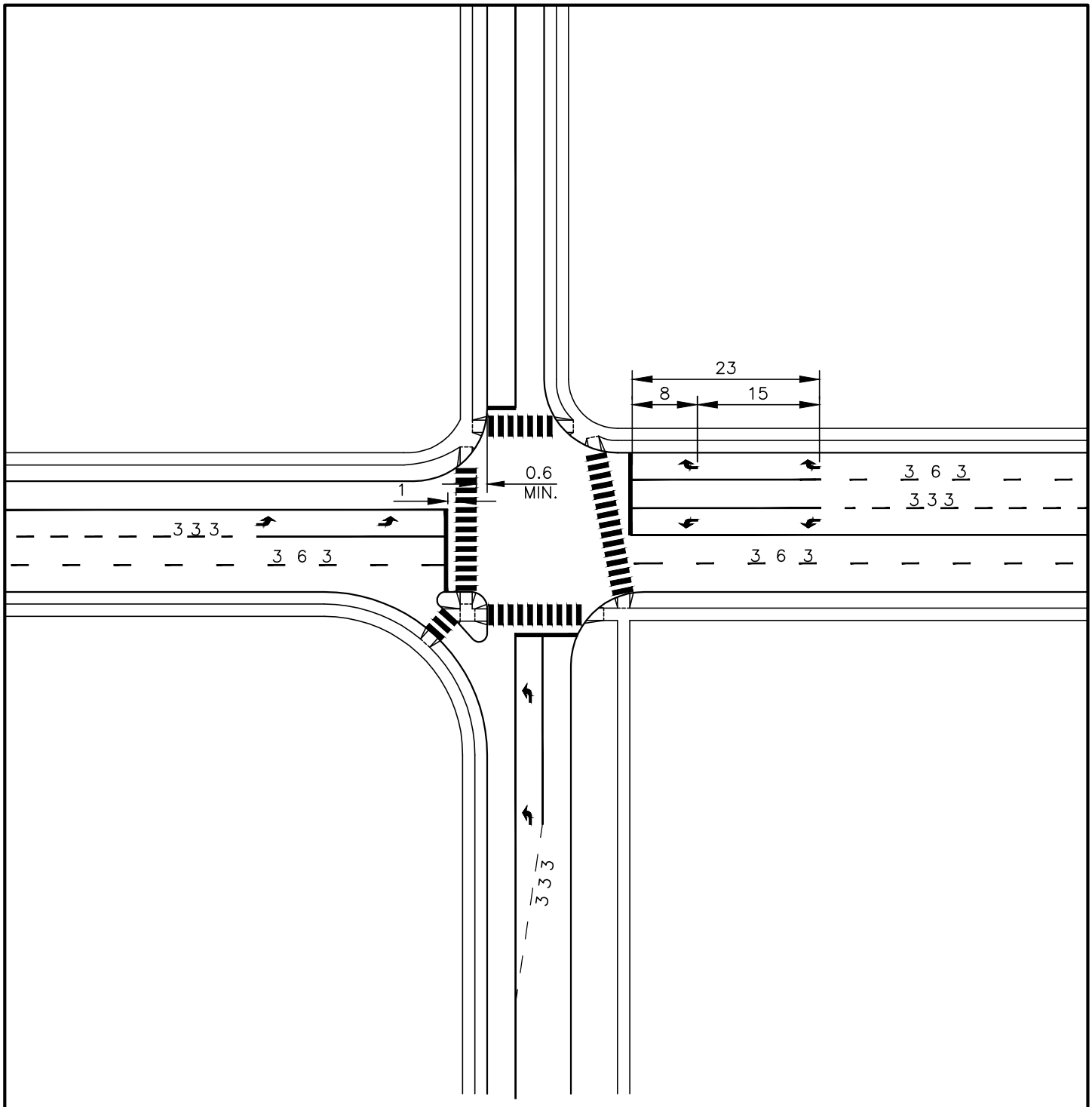
1. PLUG DUCTS NOT IN USE
2. INSTALL MUTCD ID21 SIGN JUST ABOVE PUSH BUTTON
3. TO PREVENT RA-5 FROM SLIDING ON MAST ARM, SECURE SAFETY CHAIN.
4. DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

HALIFAX

STANDARD DETAIL

WOODEN POLE RA-5 TRAFFIC SIGNAL WITH POWER FEED CONFIGURATION

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 88



NOTES:

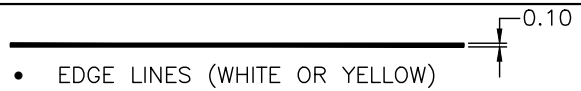
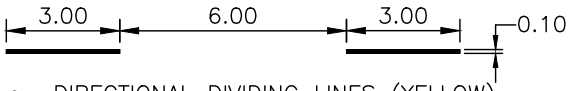
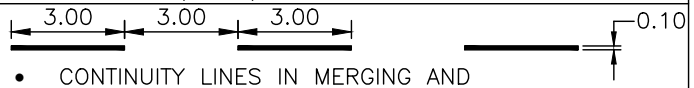
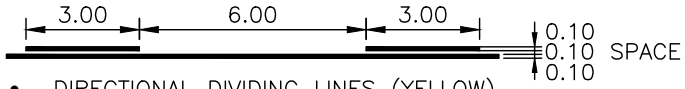
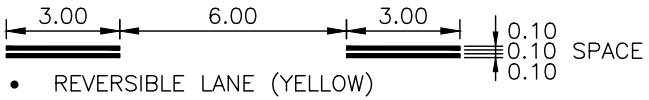
1. ALL PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH HRM STANDARD DETAILS.
2. WHEN REQUIRED, THIRD AND SUBSEQUENT ARROWS TO BE SPACED AT 15.0 m INTERVALS.
3. USE OF TWIN PARALLEL LINE OR ZEBRA CROSSWALK WILL BE SPECIFIED ON PLAN.

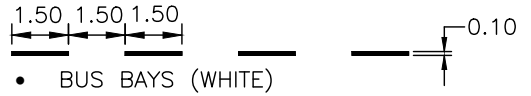
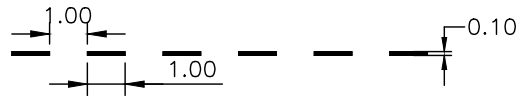
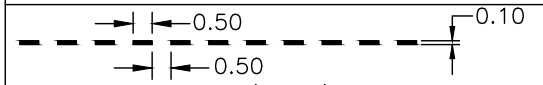
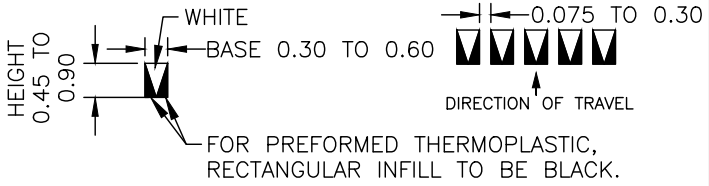
HALIFAX

STANDARD DETAIL

STANDARD INTERSECTION PAVEMENT MARKING LAYOUT

DATE: 2025	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 89

NAME OF LINE	
SOLID	 • EDGE LINES (WHITE OR YELLOW) • DIRECTIONAL DIVIDING LINES (YELLOW) • LANE LINES, PROHIBITING LINES (WHITE) • BIKE LINES (WHITE)
3 m x 6 m BROKEN	 • DIRECTIONAL DIVIDING LINES (YELLOW) • LANE LINES (WHITE)
3 m x 3 m	 • CONTINUITY LINES IN MERGING AND DIVERGING AREAS AND TAPERS FOR LEFT–TURN AND RIGHT–TURN LANES.
SIMULTANEOUS SOLID & BROKEN	 • DIRECTIONAL DIVIDING LINES (YELLOW) • TWO–WAY LEFT TURN LINES (YELLOW)
DOUBLE SOLID	 • DIRECTIONAL DIVIDING LINES (YELLOW)
DOUBLE BROKEN 3 m x 6 m	 • REVERSIBLE LANE (YELLOW)
YIELD	 • SINGLE LANE ROUNDABOUT YIELD LINES (WHITE) 0.60 m x 0.60 m
	 • DOUBLE LANE ROUNDABOUT YIELD LINES (WHITE) 1.00 m x 0.60 m

NAME OF LINE	
1.8 m x 1.8 m	 • LANE LINES WITHIN MULTI–LANE ROUNDABOUT (WHITE)
1.5 m x 1.5 m	 • BUS BAYS (WHITE)
DASHED 1.0 m x 1.0 m	
0.5 m x 0.5 m	 • GUIDING LINES (WHITE)
ADVANCED YIELD TO PEDESTRIANS LINE	
STOP BAR	 • INTERSECTION STOP BAR (WHITE)

NOTE:

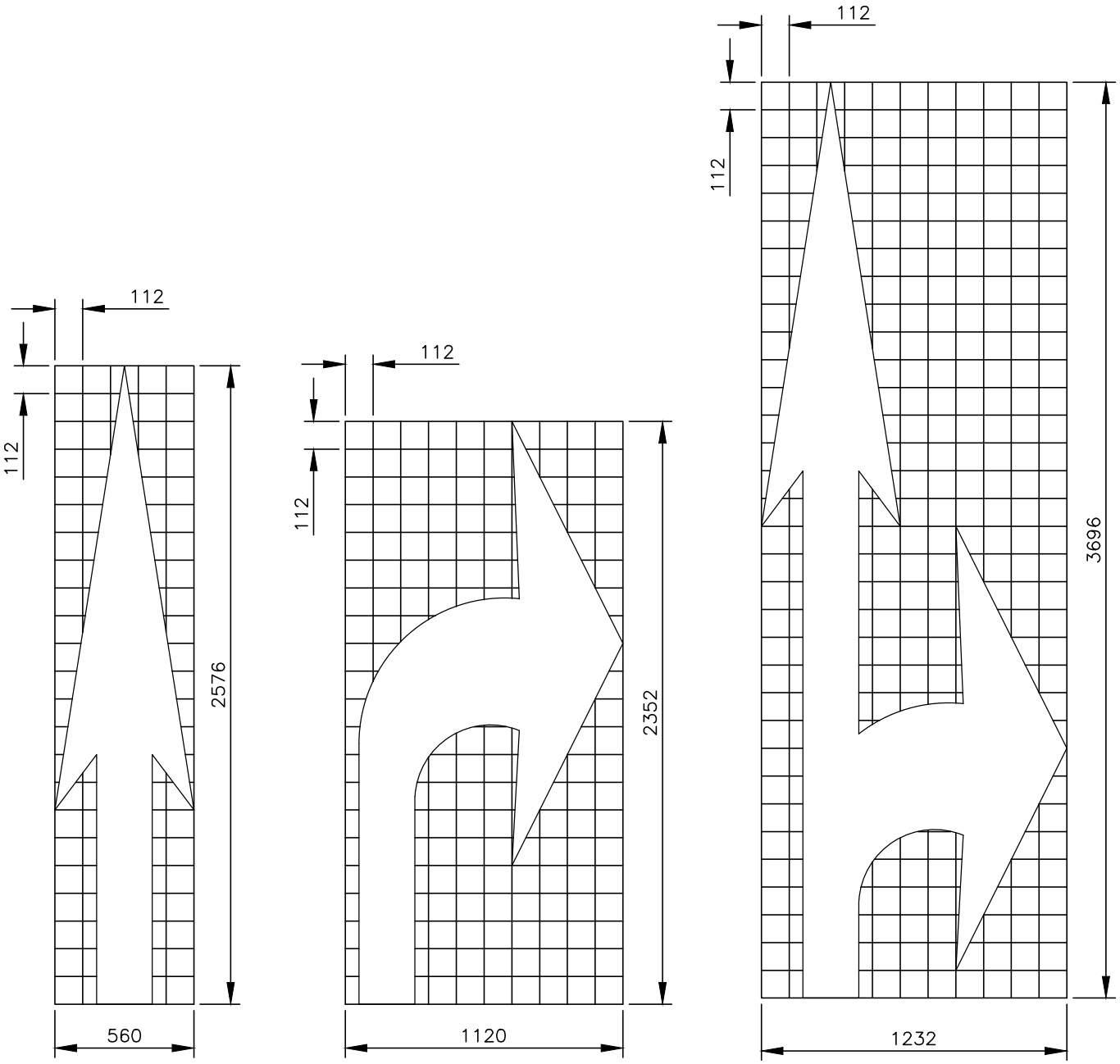
1. DIMENSIONS ARE IN METRES.

HALIFAX

STANDARD DETAIL

LONGITUDINAL & TRANSVERSE PAVEMENT MARKINGS

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 90



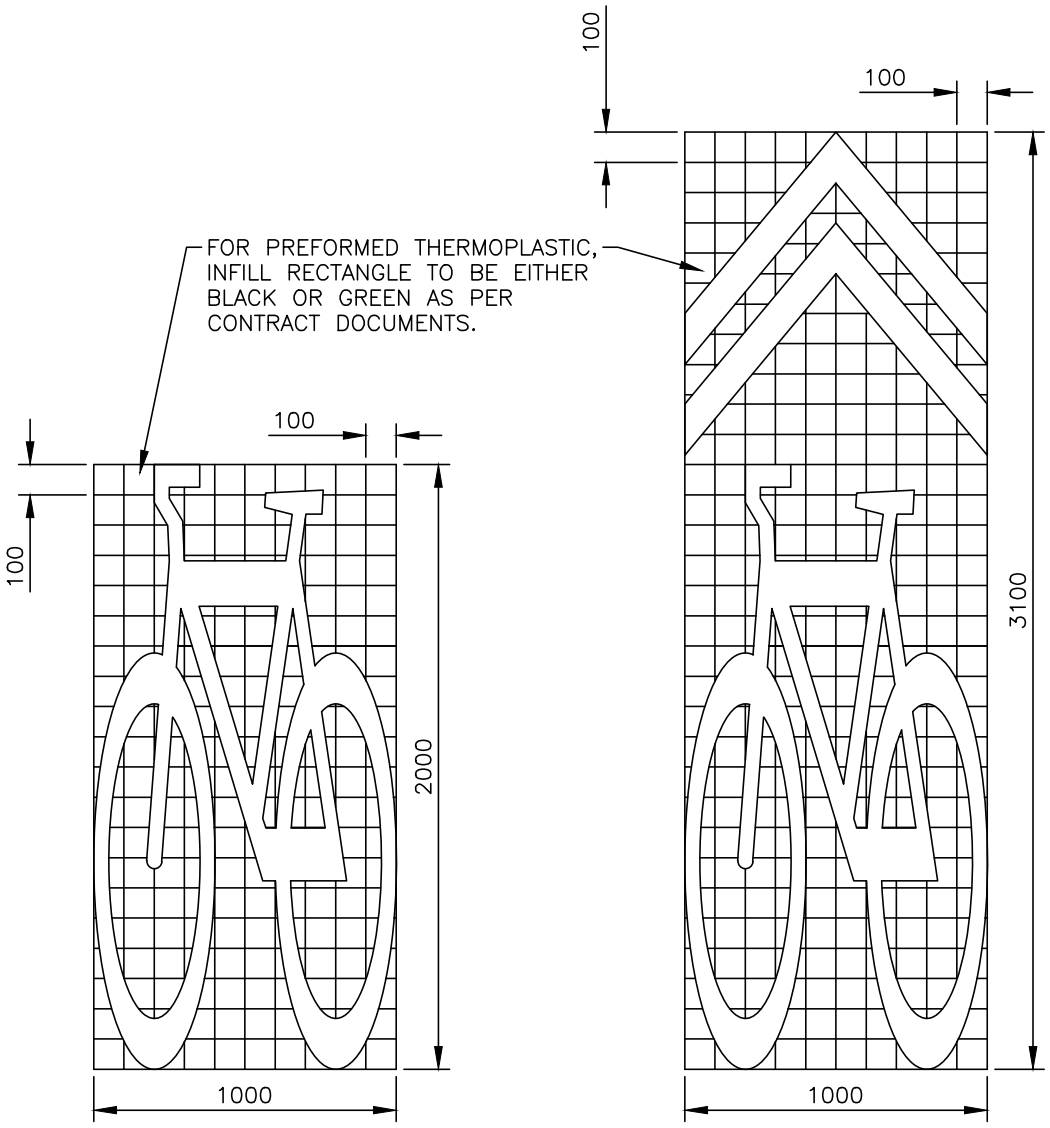
NOTE:
1. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

PAVEMENT ARROWS

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 91



BICYCLE SYMBOL

SHARED USE LANE SYMBOL

NOTE:

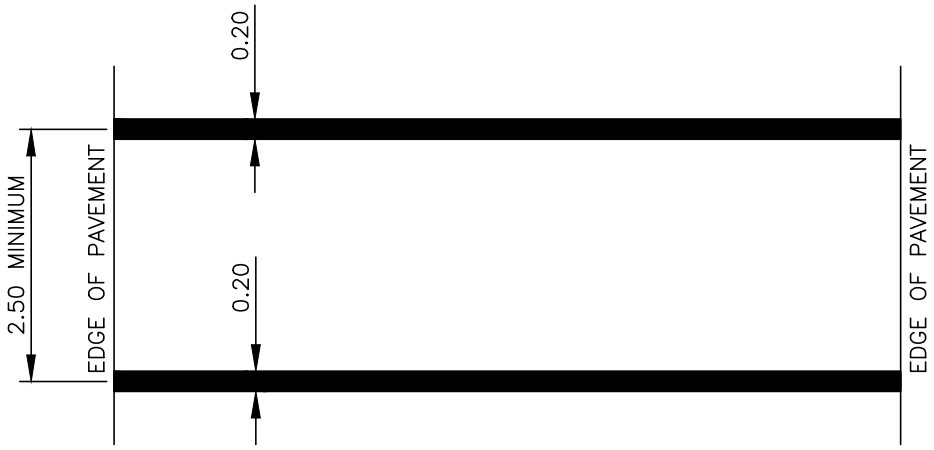
1. DIMENSIONS MAY BE SLIGHTLY ALTERED FOR THERMOPLASTIC IF APPROVED BY THE ENG.
2. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

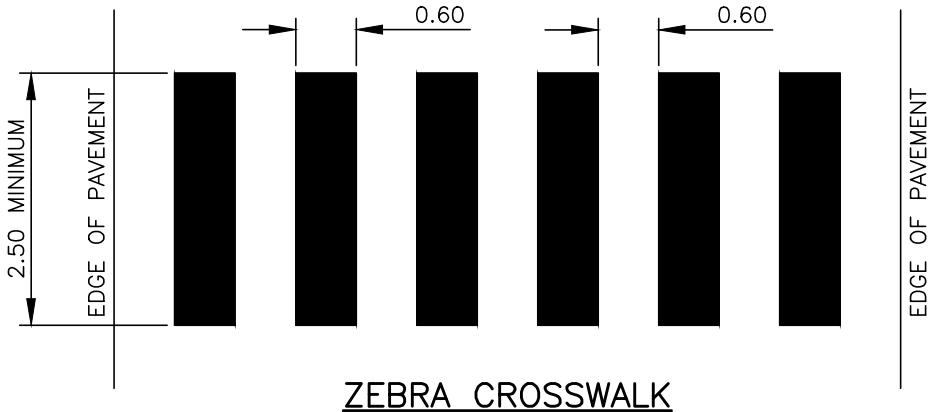
STANDARD DETAIL

BICYCLE SYMBOL & SHARED USE LANE SYMBOL

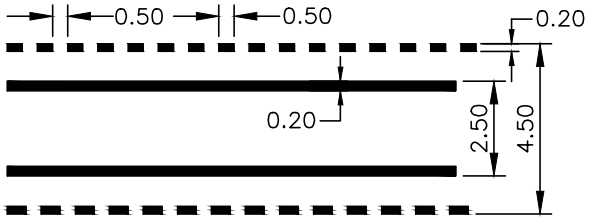
DATE: 2023	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 92



TWIN PARALLEL LINE CROSSWALK

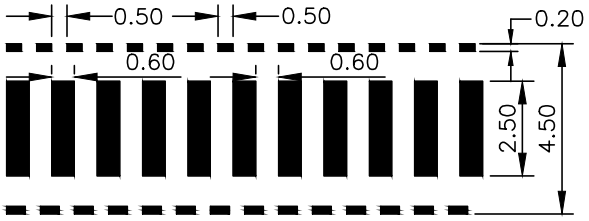


ZEBRA CROSSWALK



- 2.50 m WIDE CROSSWALK WITH 4.50 m WIDE TRAIL CROSSWALK

UNSIGNALIZED TRAIL CROSSING



- 2.50 m WIDE ZEBRA CROSSWALK WITH 4.50 m WIDE TRAIL CROSSWALK

SIGNALIZED TRAIL CROSSING

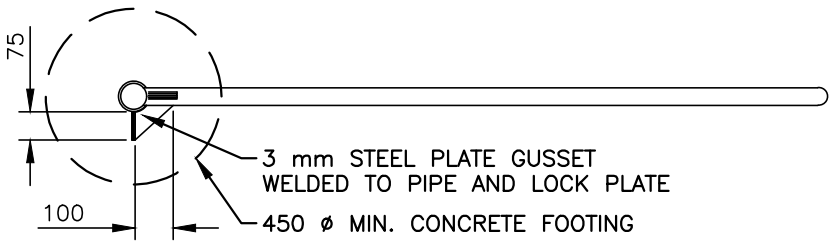
NOTE:
1. DIMENSIONS ARE IN METRES.

HALIFAX

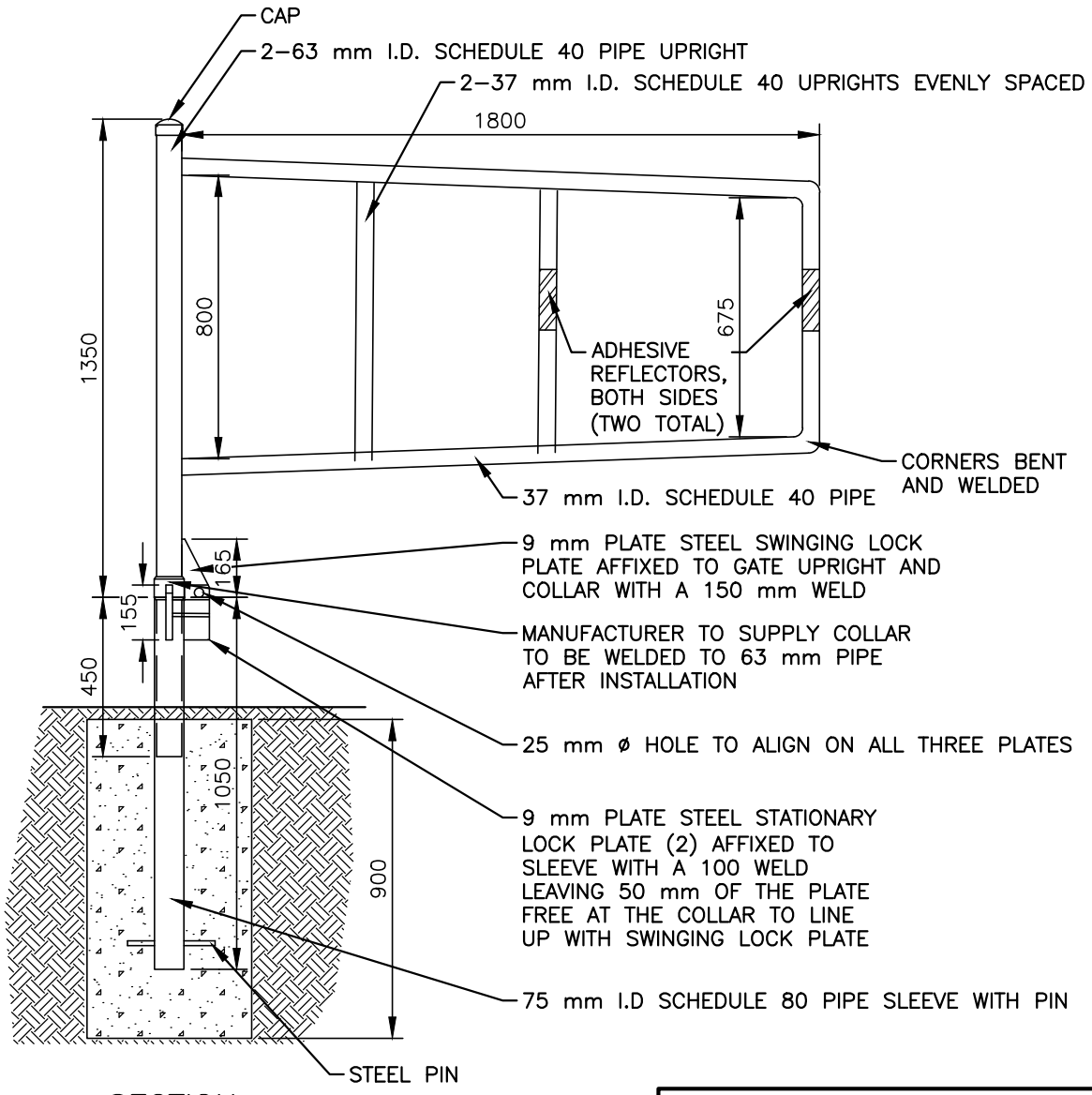
STANDARD DETAIL

PEDESTRIAN & TRAIL CROSSING PAVEMENT MARKINGS

DATE: 2025	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 93



PLAN



SECTION

NOTES:

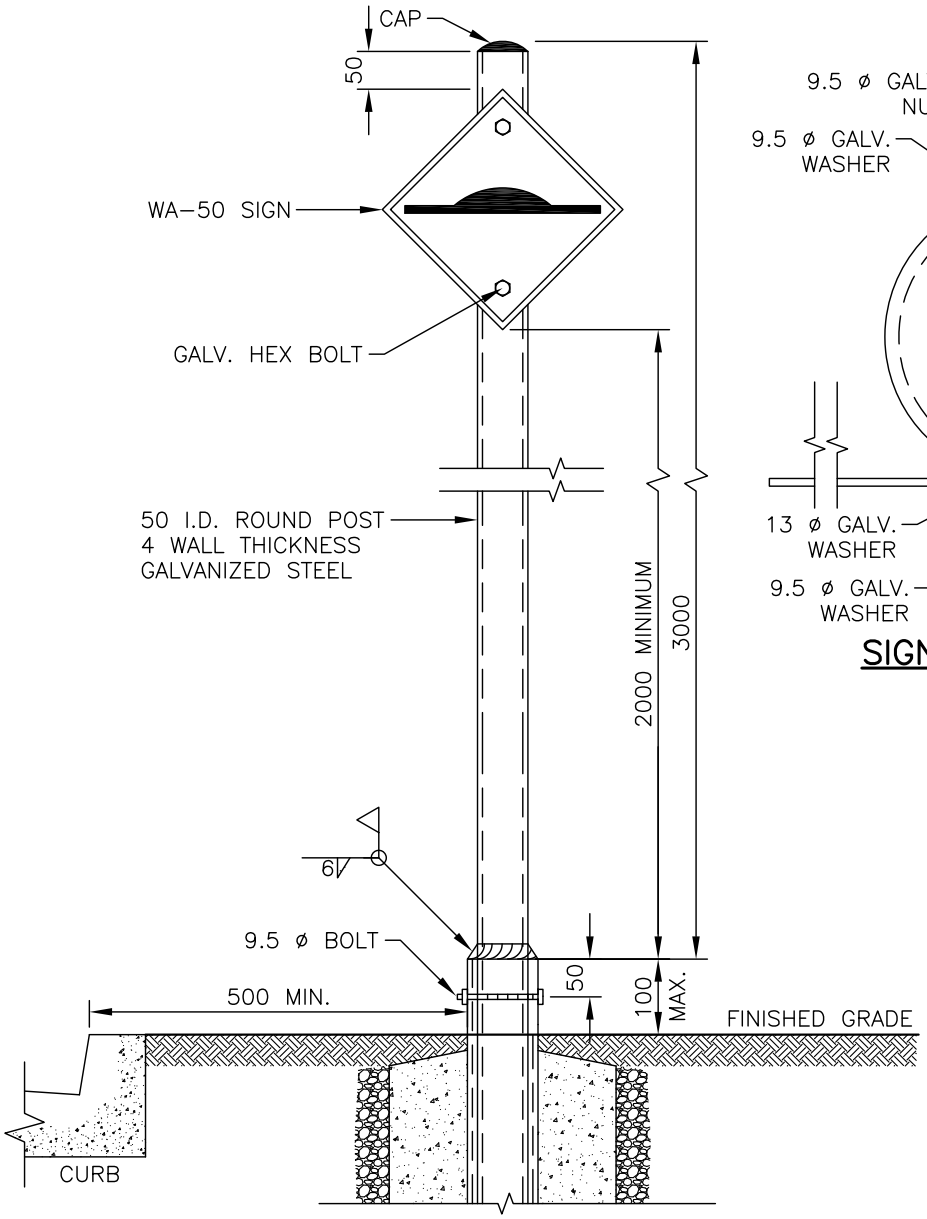
1. ALL PIPE TO BE GALVANIZED EXCEPT 75 mm GROUND SLEEVE (BLACK IRON)
2. ALL WORK TO BE DONE ACCORDING TO HRM SPECIFICATIONS
3. ALL METAL TO RECEIVE ONE COAT OF RUST INHIBITING PRIMER AND TWO COATS OF R&M PAINT E1245 CODE L (HOLLY GREEN) ENAMEL AUTOMOTIVE PAINT OR EQUIVALENT.

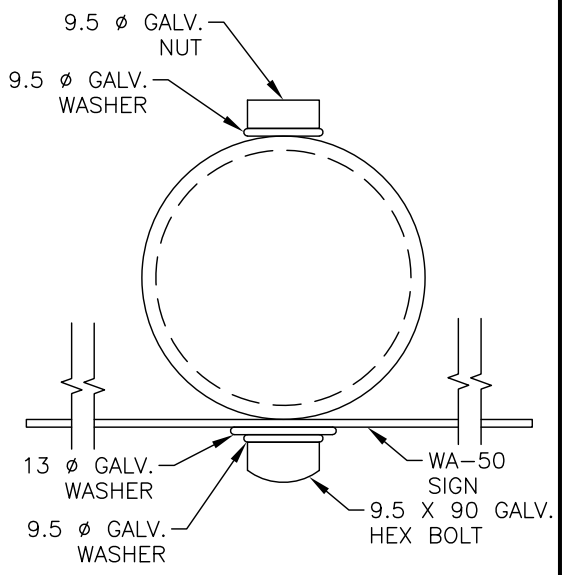
HALIFAX

STANDARD DETAIL

PEDESTRIAN GATE

DATE: 2023	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 119





SIGN CONNECTION

NOTES:

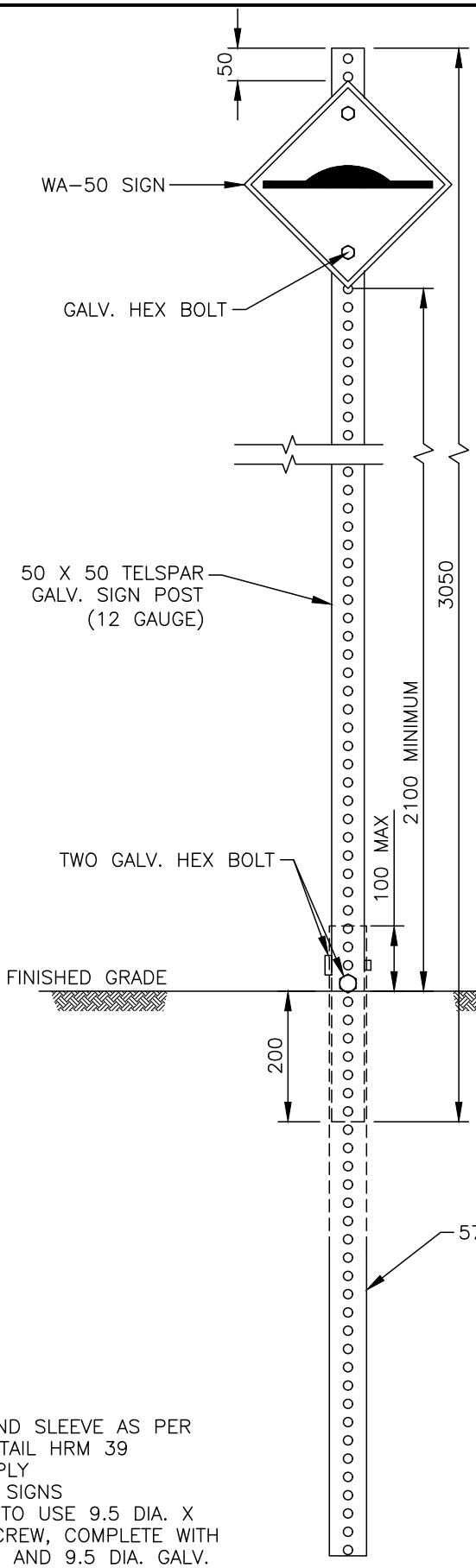
1. SIGN POST AND BASE AS PER STANDARD DETAIL HRM 38
2. HRM TO SUPPLY APPROPRIATE SIGNS.
3. WELD SHALL BE COMPLETED AROUND BASE AND POST.
4. CONTRACTOR TO USE 9.5 DIA. X 75MM LAG SCREW, COMPLETE WITH 13 DIA. GALV. AND 9.5 DIA. GALV. WASHERS WHEN INSTALLING SIGN TO UTILITY POLE.
5. ALL DIMENSIONS ARE IN MILLIMETRES.

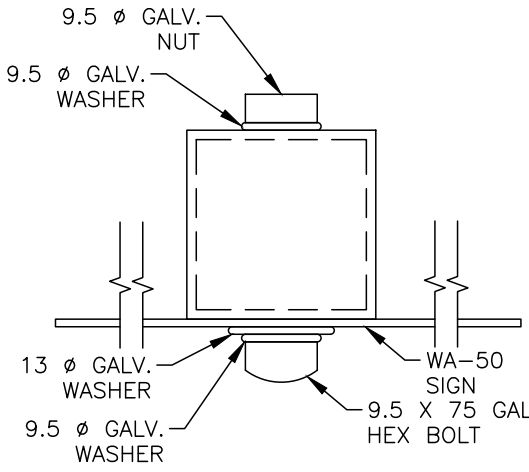
HALIFAX

STANDARD DETAIL

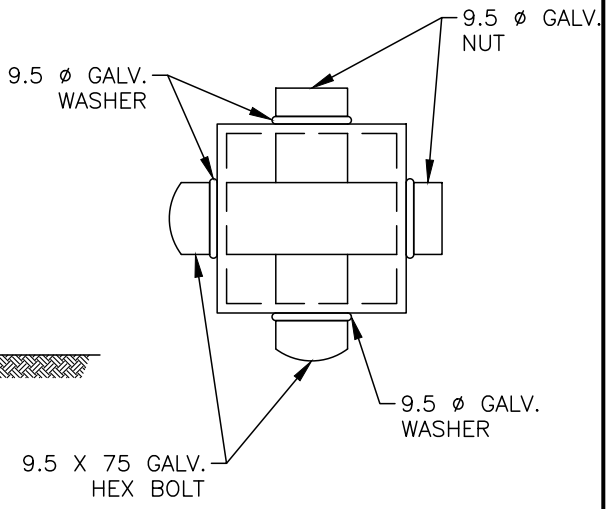
URBAN TRAFFIC SIGN INSTALLATION

DATE: 2024	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 129





SIGN CONNECTION



TWO HEX BOLT LOCK

NOTES:

1. SIGN POST AND SLEEVE AS PER STANDARD DETAIL HRM 39
2. HRM TO SUPPLY APPROPRIATE SIGNS
3. CONTRACTOR TO USE 9.5 DIA. X 75MM LAG SCREW, COMPLETE WITH 13 DIA. GALV. AND 9.5 DIA. GALV. WASHERS WHEN INSTALLING SIGN TO UTILITY POLE.
4. ALL DIMENSIONS ARE IN MILLIMETRES

HALIFAX

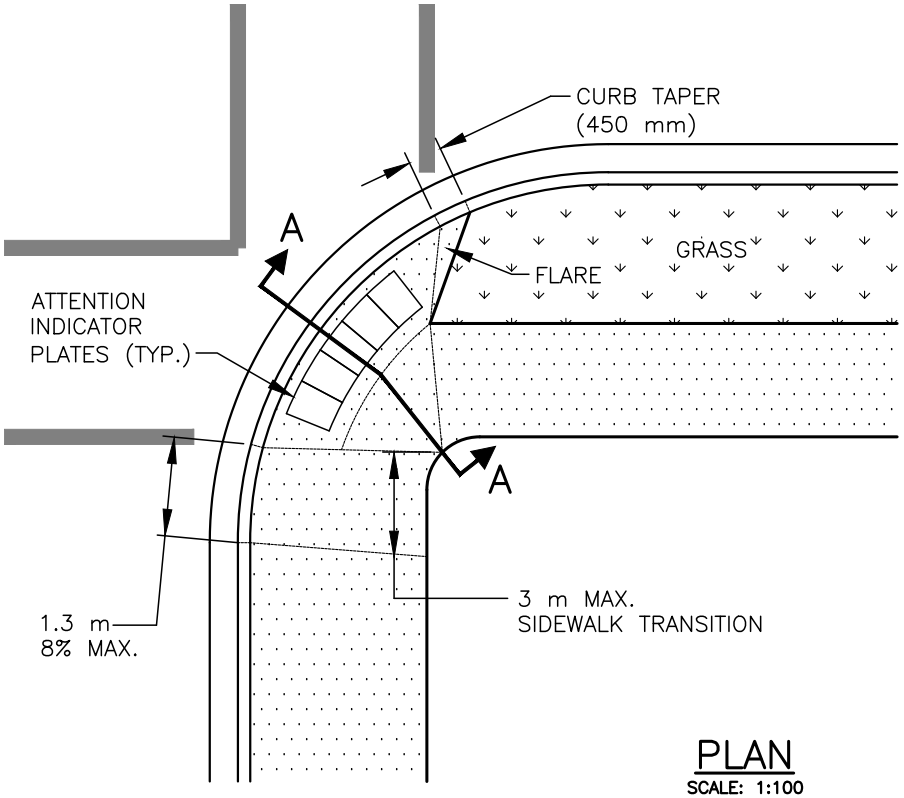
STANDARD DETAIL

RURAL TRAFFIC SIGN INSTALLATION

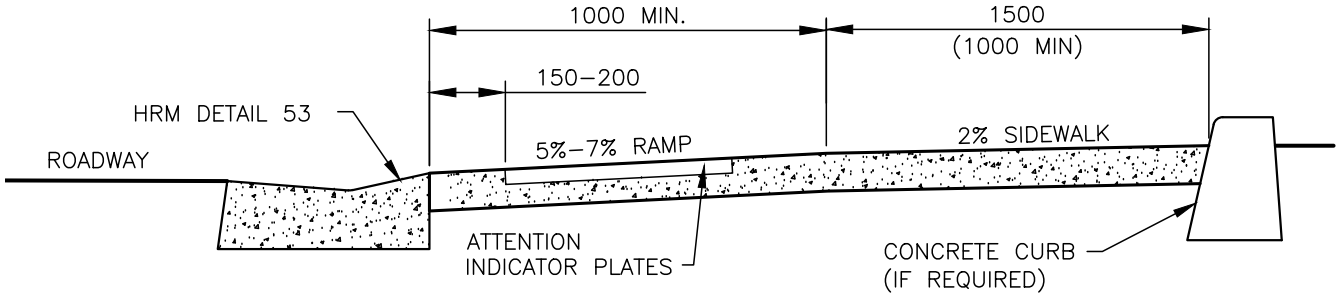
DATE: 2025	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 130

NOTES:

1. NATURAL CAST IRON ATTENTION TWSI (TACTILE WALKING SURFACE INDICATOR) PLATES, TO CSA B651, AND AS INDICATED IN THE PROJECT DOCUMENTS.
2. NO GAP BETWEEN ADJACENT PLATES.
3. MAXIMUM DISTANCE FROM CURB TAPER TO BE 100mm.
4. PLATES SHALL BE PLACED WITH THE TOP OF THE BASE PLATE (BOTTOM OF DOMES) LEVEL WITH CONCRETE SURFACE.
5. ALL PLATES TO BE 610mm LONG.
6. TO BE READ IN CONJUNCTION WITH HRM DETAIL 49 PEDESTRIAN RAMP ALIGNMENT.
7. SIZE AND SHAPE OF PLATES TO MANUFACTURER'S SPECIFICATION.
8. CONCRETE THICKNESS AT PEDESTRIAN RAMPS TO BE 150 mm.
9. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.



PLAN
SCALE: 1:100



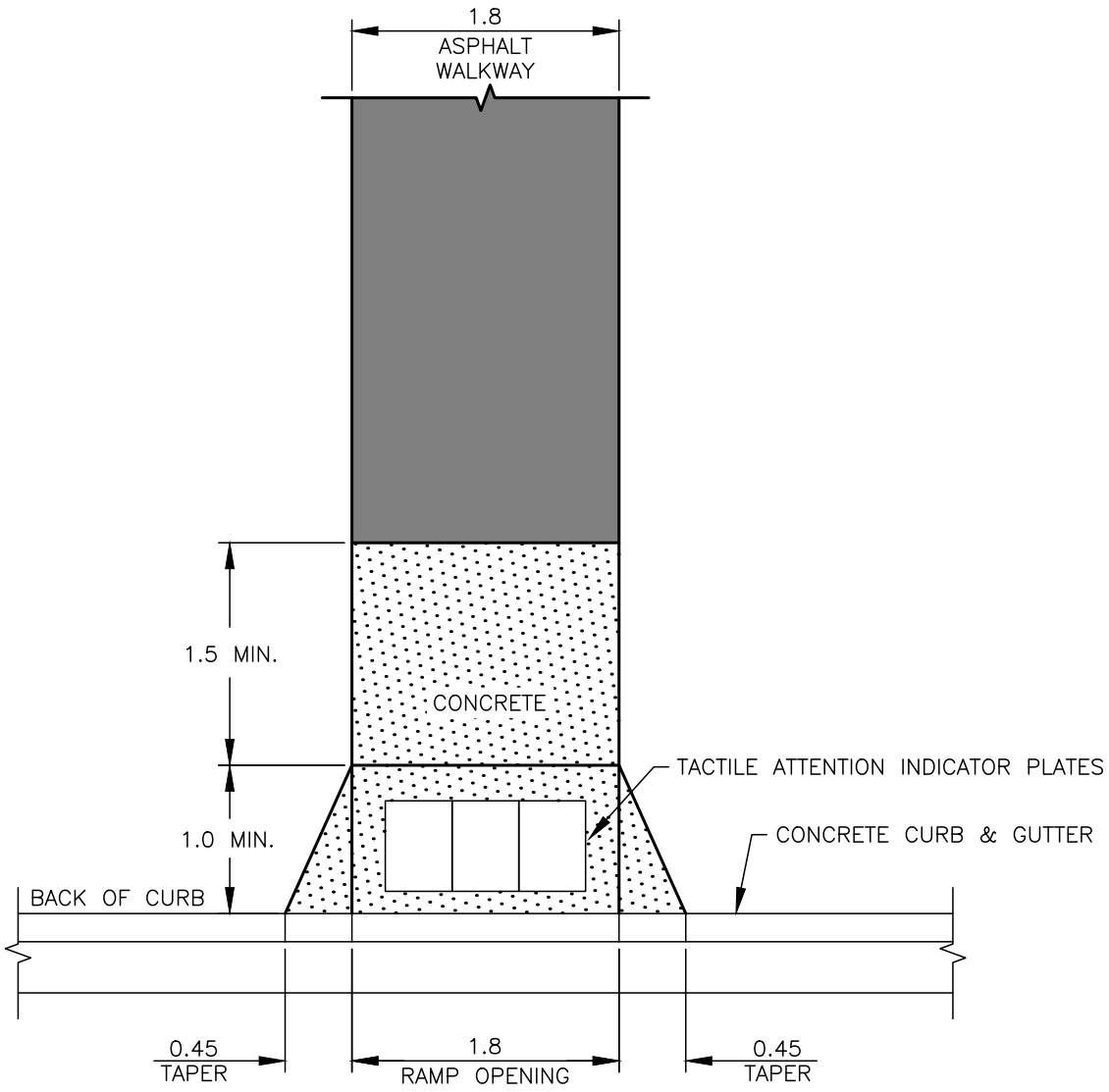
CROSS SECTION A–A
SCALE 1:20

HALIFAX

STANDARD DETAIL

TACTILE ATTENTION INDICATOR PLATE PLACEMENT

DATE: 2025	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 131



NOTES:

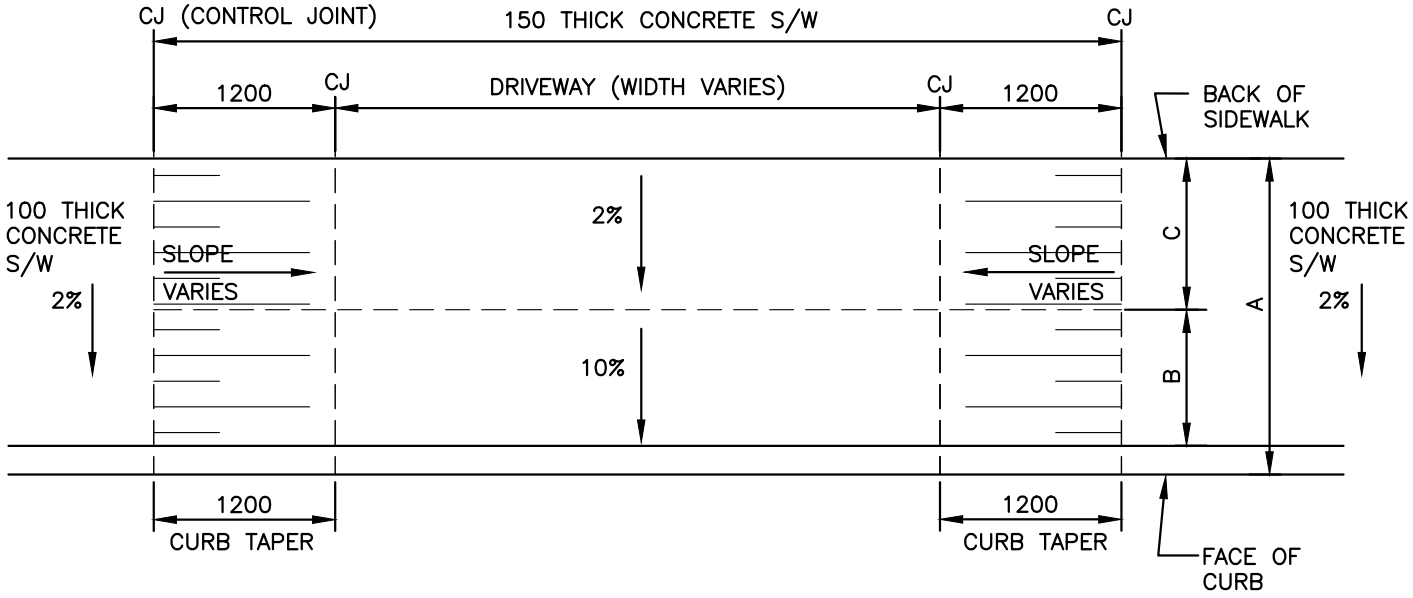
1. CONCRETE PEDESTRIAN RAMP TO HRM DETAIL 49.
2. CONCRETE CURB & GUTTER TO HRM DETAIL 53.
3. TACTILE ATTENTION INDICATOR PLATES (TWSI) TO HRM DETAIL 131.
4. ASPHALT WALKWAY TO HRM DETAIL 40.

HALIFAX

STANDARD DETAIL

WALKWAY WITH PEDESTRIAN RAMP

DATE: 2025	REFERENCE	APPROVED
SCALE: 1:50		FIG No.: HRM 132



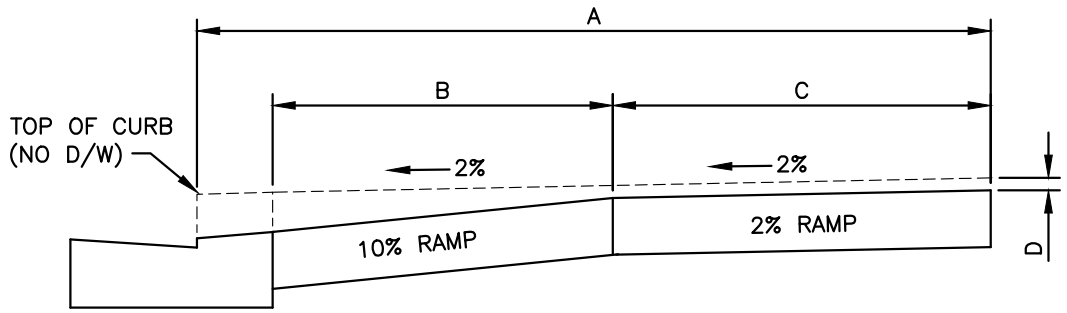
PLAN

SCALE 1:50

A	B	C	D
1800	600	1000	57
1900	700	1000	49
2000	800	1000	41
2100	900	1000	33
2200	900	1100	33
2300	900	1200	33
2400	900	1300	33
2500	900	1400	33
2600	900	1500	33
2700	1000	1500	24
2800	1100	1500	16
2900	1200	1500	8
3000	1300	1500	0

NOTES;

1. WHEN ADJACENT DRIVEWAYS ARE LESS THAN 2.4 METERS APART, DO NOT TAPER CURB AND SIDEWALK BETWEEN DRIVEWAYS.
2. AREA BEHIND DROPPED S/W MAY REQUIRE BUILD UP WITH PAVEMENT OR CURB TO PREVENT ENTRY OF STORM WATER DURING MAJOR STORM.



℄ DRIVEWAY CROSS SECTION

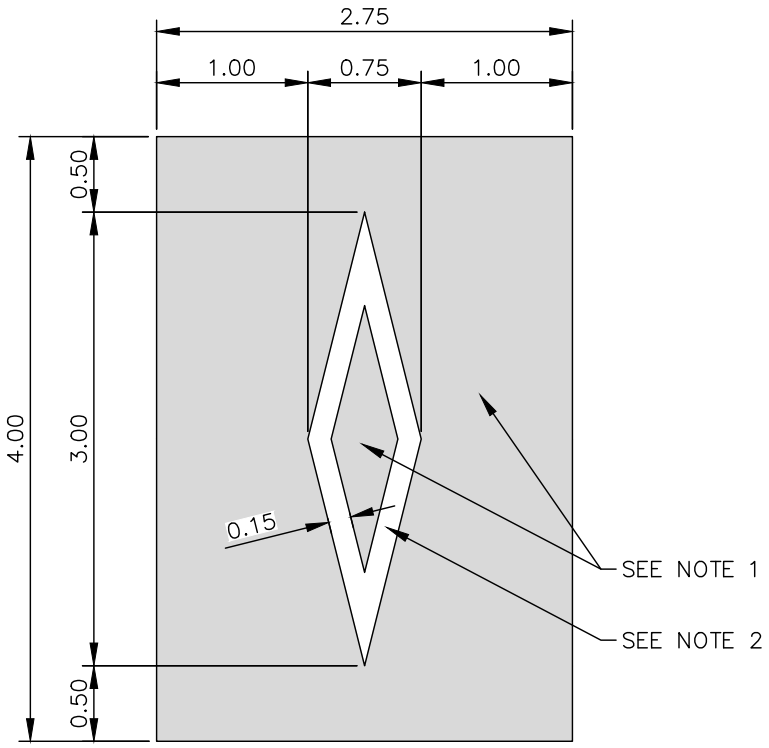
SCALE 1:20

HALIFAX

STANDARD DETAIL

CONCRETE SIDEWALK ADJACENT CURB

DATE: 2021	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 133



NOTE:

1. PERMANENT PAVEMENT MARKING FOR IN–LAY SHALL BE RED.
2. PERMANENT PAVEMENT MARKING FOR RESERVED LANE SYMBOL SHALL BE WHITE.
3. DIMENSIONS ARE IN METRES.

HALIFAX

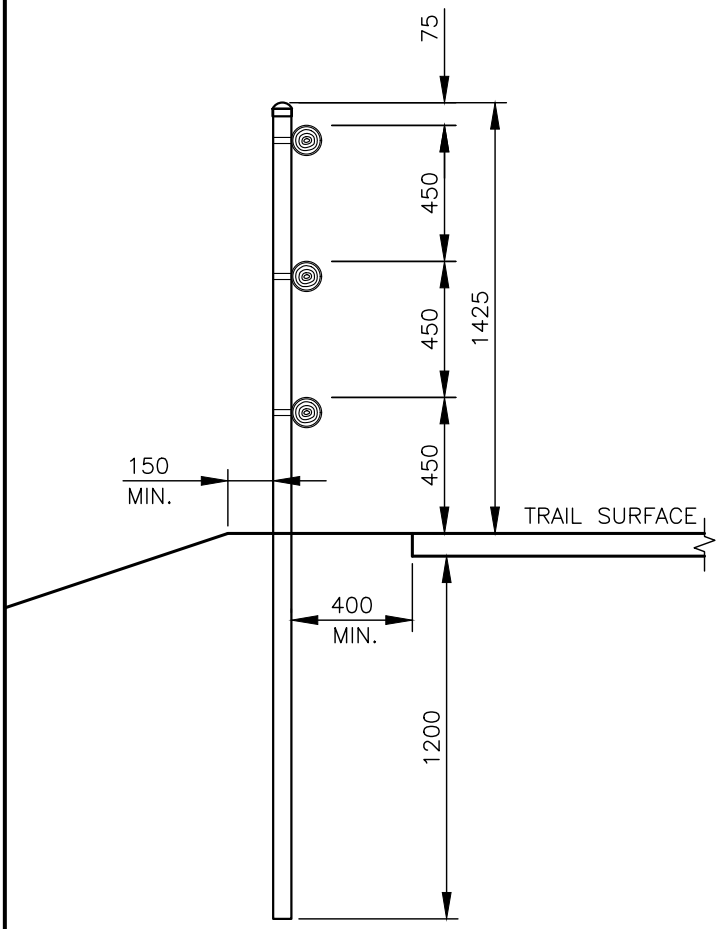
STANDARD DETAIL

RED IN–LAY RESERVED LANE

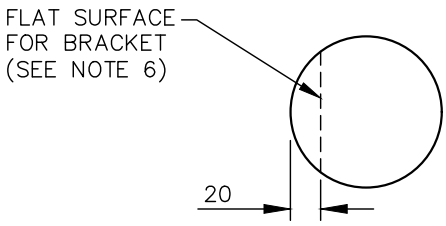
DATE: 2021	REFERENCE	APPROVED
SCALE: 1:50		FIG. NO. HRM 134

NOTES:

1. POSTS 60 mm O.D. HOT DIPPED GALVANIZED COLD ROLLED STEEL (ASTM A53 GRADE A, SCHEDULE 40), ZINC–COATED AT MINIMUM 550 G/SM.
2. UNLESS OTHERWISE APPROVED BY ENGINEER, DRILL POST HOLES WITH 125 mm MAXIMUM DIAMETER BIT. STABILIZE GROUND AROUND POSTS WITH CEMENT GROUT AND MECHANICAL COMPACTOR.
3. THERE SHALL BE NO EXPOSED (NON–GALVANIZED) STEEL, EXCEPT THE TOP OF THE POSTS (PRIOR TO PLACEMENT OF CAPS).
4. POST SPACING OF 2.4 m EXCEPT LESS ON TIGHT TURNS TO MAINTAIN TRAIL WIDTH.
5. GALVANIZED STEEL CAPS TO BE SET SECURELY OVER TOP OF POSTS (WELDING NOT PERMITTED).
6. RAILS 95–115 mm DIAMETER SMOOTH UNTREATED HEMLOCK WOOD (NO CHECKS, SPLITS OR WIND SHAKES). OUTSIDE EDGES OF ABUTTING ENDS OF RAILS SHALL BE FLUSH (WITHIN 5 mm). PROVIDE FLAT SURFACE FOR FASTENERS 20 mm FROM BACK OF RAILS WHICH CAN BE THE FULL LENGTH OF THE RAILS.
7. ENDS OF RAILS SHALL LINE UP WITH CENTRE OF POSTS EXCEPT AT END POSTS WHERE THE RAILS SHALL EXTEND 100 mm PAST THE CENTRE OF POSTS.
8. FENCE BRACKETS TO BE GALVANIZED STEEL AND DESIGNED TO ATTACH WOODEN FENCE RAILS WITH A FLAT FASTENING SURFACE TO 60 mm O.D. FENCE POSTS. BRACKETS TO HAVE A BASE AND STRAP. BRACKETS TO HAVE 8 mm LAG SCREWS (38 mm LONG) FOR FASTENING BRACKET BASE TO WOOD RAIL, AND 8 mm CARRIAGE BOLTS WITH NUTS FOR FASTENING BRACKET BASE AND STRAP AROUND POST. BASE TO BE BENDABLE TO ALLOW FOR VARIED HORIZONTAL ANGLES BETWEEN SUCCESSIVE RAILS.
9. PRE–DRILL WOODEN RAILS FOR INSTALLATION OF BRACKETS.
10. BEND FLANGES OF BRACKETS TO ANGLE REQUIRED WHEN FENCE IS ON A HORIZONTAL CURVE.
11. MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST REVISIONS OF THE NOVA SCOTIA BUILDING CODE REGULATIONS AND THE NATIONAL BUILDING CODE OF CANADA.
12. DIMENSIONS ARE IN MILLIMETRES.



FENCE SECTION



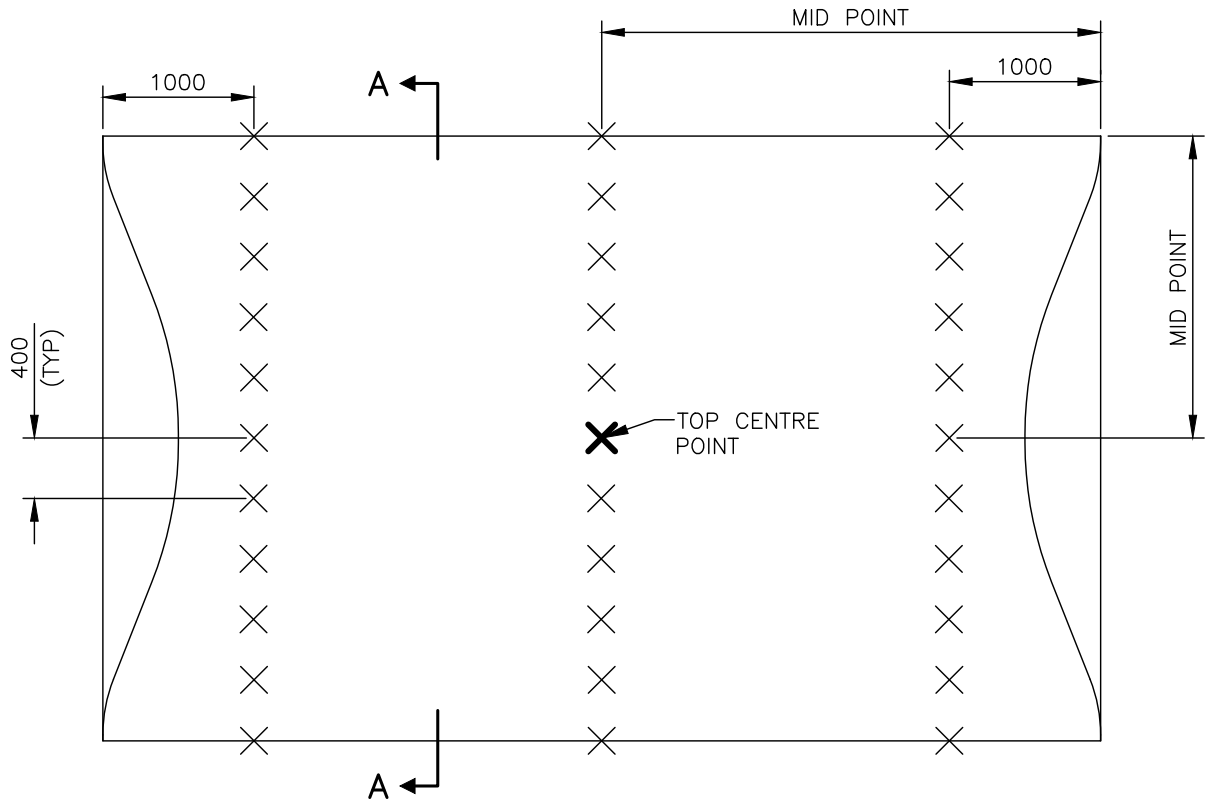
WOODEN RAIL SECTION AT POST

HALIFAX

STANDARD DETAIL

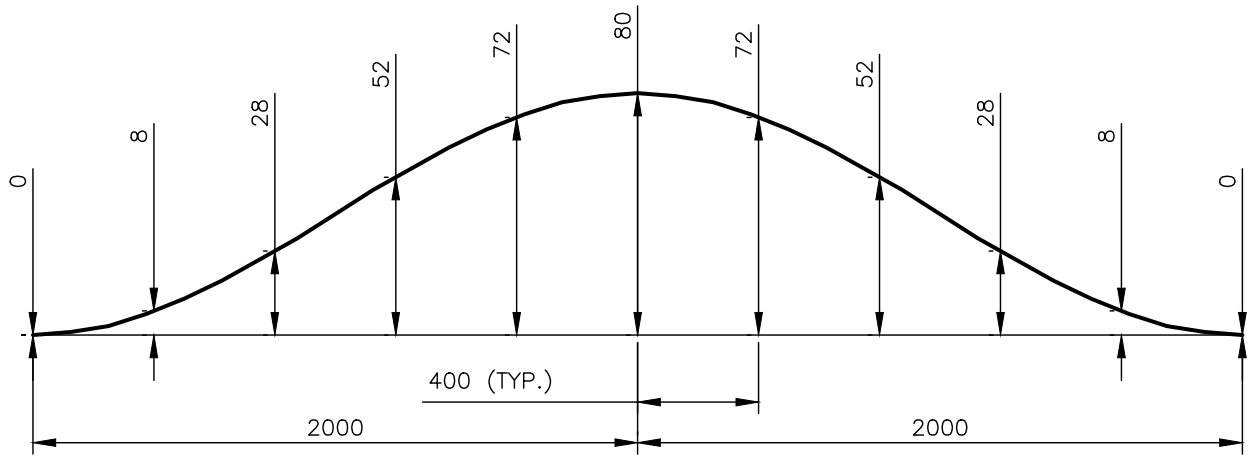
FENCE DETAIL (ROUND WOODEN RAILS & STEEL POSTS)

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG. NO. HRM 135



SPEED HUMP

SCALE: 1:50



SECTION A–A

SCALE: Horz. 1:25
Vert. 1:2.5

NOTES:

1. 33 SURVEY SHOTS ELEVATION REQUIRED.
2. COORDINATES REQUIRED AT THE TOP CENTRE OF THE SPEED HUMP.
3. DIMENSIONS ARE IN MILLIMETRES.

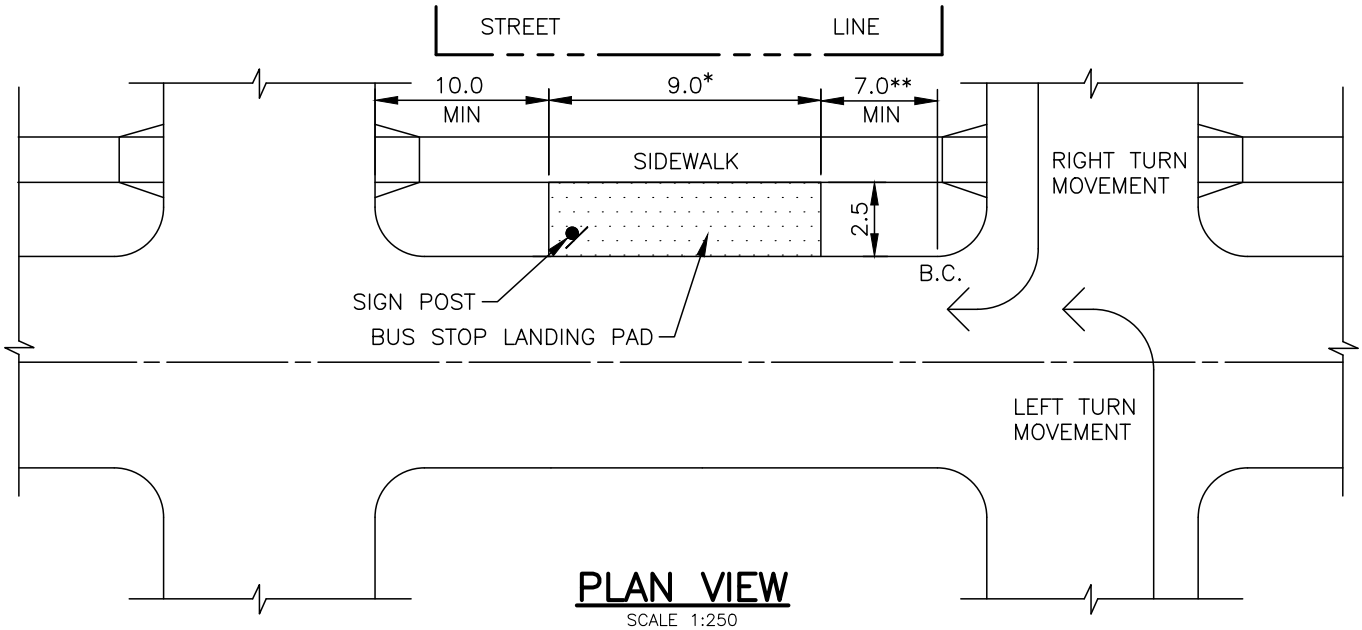
TOP CENTRE POINT COORDINATES:
NORTHING: .....
EASTING: .....

HALIFAX

STANDARD DETAIL

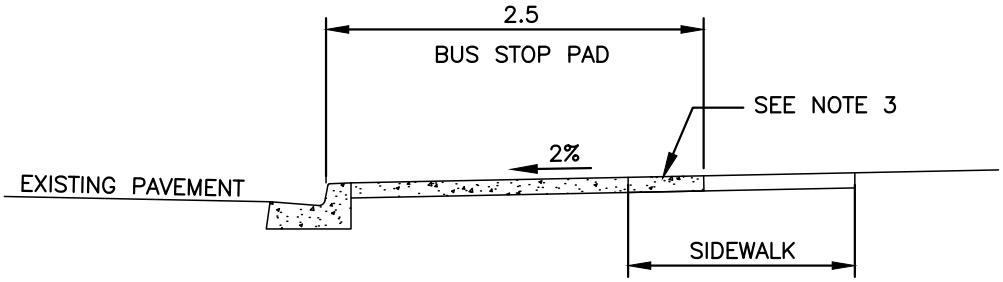
SPEED HUMP SURVEY VERIFICATION

DATE: 2021	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 136



PLAN VIEW

SCALE 1:250



CROSS SECTION

SCALE 1:50

NOTES:

* 1. FOR LOW VOLUME BUS ROUTES ON LOCAL STREETS –DECREASE PAD LENGTH TO 4.0 m.

* 2. FOR ARTICULATED BUS ROUTES –INCREASE PAD LENGTH TO 14.5 m.

3. THE 2.5 m WIDE BUS STOP LANDING PAD MAY INCLUDE A PORTION OF THE SIDEWALK AS REQUIRED.

4. BUS STOP LANDING PAD WIDTH SHALL NOT OVERLAP THE THROUGH WIDTH OF ADUTTING FACILITIES SUCH AS MULTI–USE PATHWAY OR BIKE LANES.

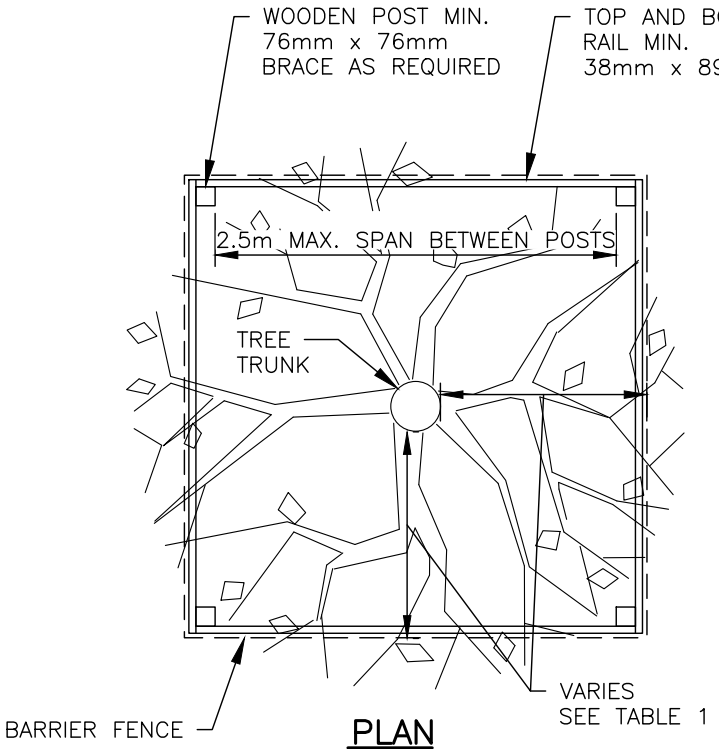
** 5. THE CLEARANCE DISTANCE BETWEEN THE CURB RADIUS AND THE START OF BUS PAD IS TO BE A MINIMUM 7.0 m FOR A BUS MAKING THE THROUGH MOVEMENT AND 14.0 m FOR A BUS MAKING THE LEFT–TURN OR RIGHT–TURN MOVEMENT

HALIFAX

STANDARD DETAIL

CONCRETE BUS STOP LANDING PAD (WITH SIDEWALK)

DATE: 2025	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 138

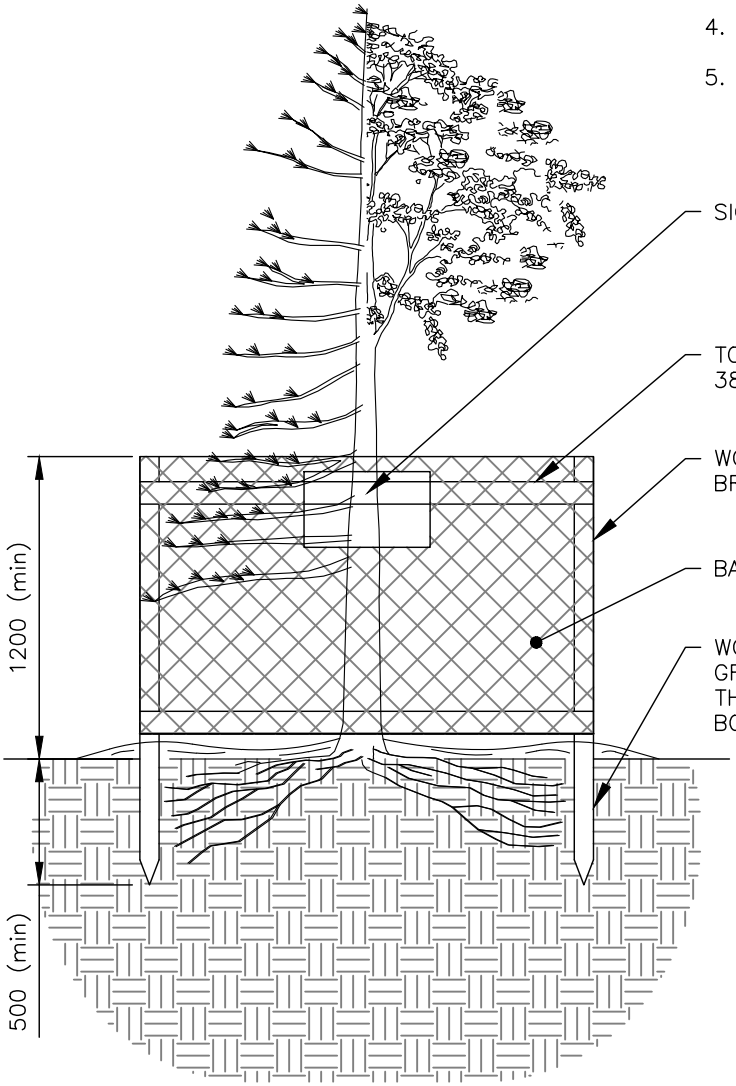


PLAN

TABLE 1

TREE PROTECTION ZONE CALCULATION TABLE	
TRUNK DIAMETER (DBH)	MINIMUM PROTECTION DISTANCE REQUIRED (MEASURE FROM THE OUTSIDE EDGE OF TREE TRUNK)
10 CM & UNDER	1.2 METERS
11 – 30 CM	2.0 METERS
31 – 40 CM	3.4 METERS
41 – 50 CM	4.6 METERS
51 – 60 CM	6.0 METERS
61 – 70 CM	7.0 METERS
71 – 80 CM	8.0 METERS
>80 CM	9.0 METERS

NOTES:
1. WOOD POST: (MIN. 76mm WIDTH) INSTALLED TO A DEPTH OF 500mm. TOP AND BOTTOM RAIL: (MIN. 38 x 89mm CONSTRUCTION, MAX. SPAN 2.5m), CROSS BRACING AS REQUIRED.
2. NO GROUND DISTURBANCE WITHIN 1.2 METER OF THE TREE TRUNK (I.E. POST INSTALLATION)
3. POSTS SET BACK FROM SIDEWALK AND CURB: MIN 300mm
4. FENCE MATERIAL: MINIMUM ORANGE BARRIER FENCE OR METAL CHAIN LINK FENCE
5. ATTACH A SIGN ON TWO SIDES OF THE TREE "PROTECTION ZONE DO NOT REMOVE FENCE DURING CONSTRUCTION"



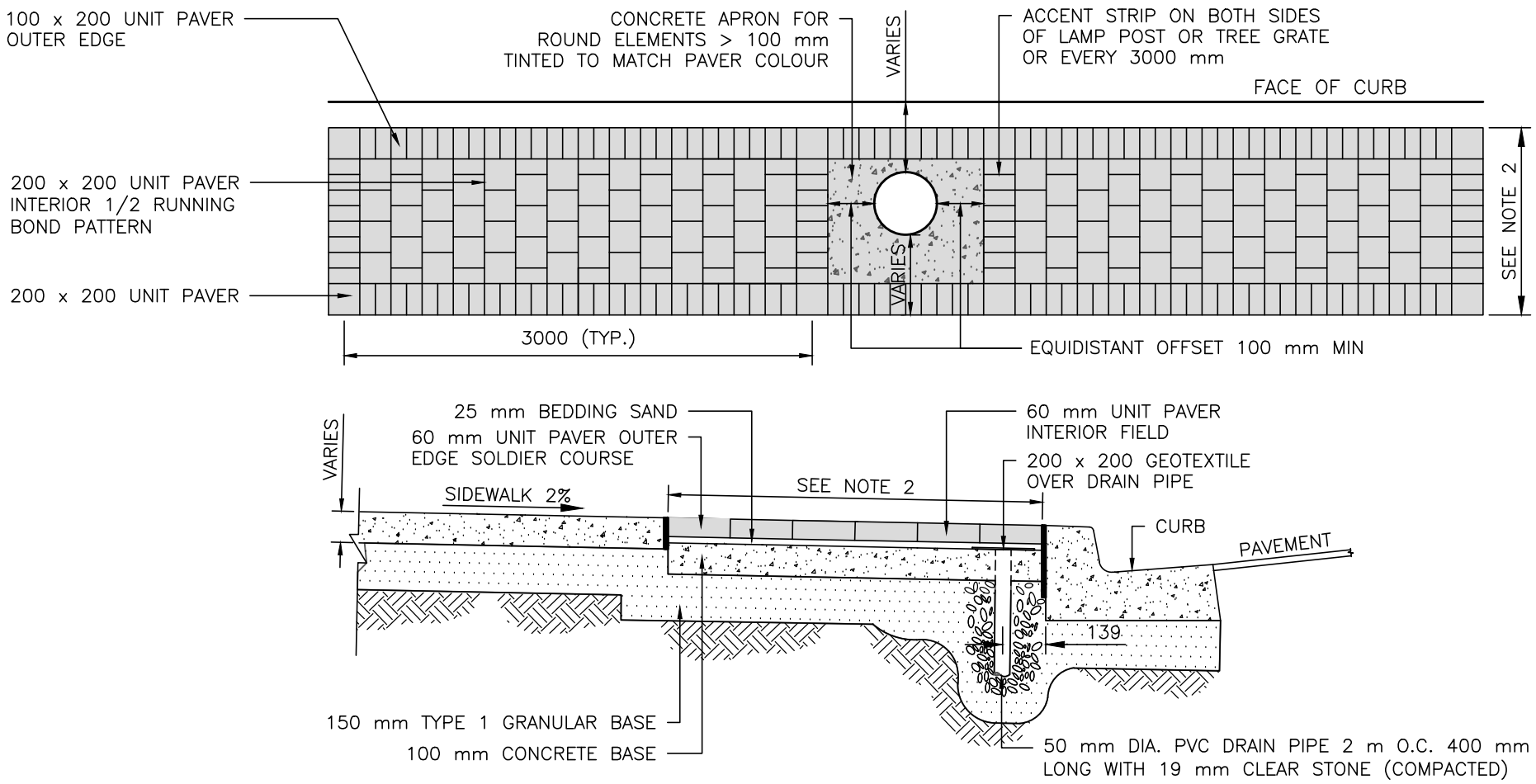
PROFILE

HALIFAX

STANDARD DETAIL

TREE PROTECTION ZONE & BARRIER

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 140



NOTES:

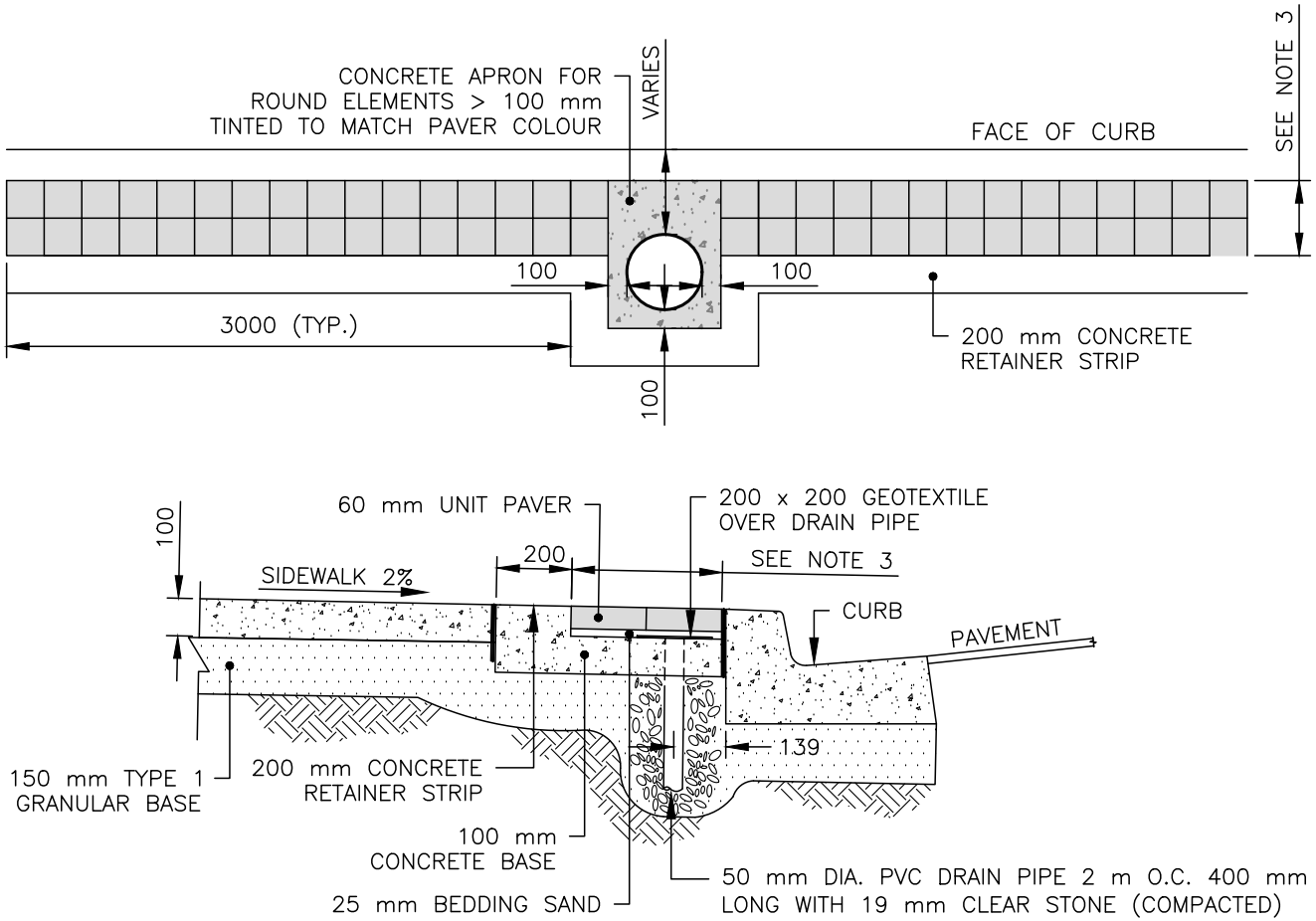
1. INSTALL PAVER EDGE IN LIEU OF GRASS BOULEVARD WHERE SHOWN ON FIGURE B–5 (MUNICIPAL DESIGN GUIDELINES PART 1), OR AS DIRECTED BY ENGINEER
2. PAVER EDGE SHALL NOT REDUCE THE CLEAR SIDEWALK WIDTH TO LESS THAN 2.1m AND SHALL CONSIST OF AN EVEN MULTIPLE OF UNIT PAVERS TO A MAXIMUM OF 1.2 m WIDE.
3. PAVER COLOUR DEFINED ON FIGURE B–5 (MUNICIPAL DESIGN GUIDELINES PART 1), OR AS DIRECTED BY ENGINEER.
4. TERMINATE PAVER EDGE TREATMENT AT START OF CORNER RADIUS AND BEFORE DRIVEWAY RAMP
5. ALL PAVERS TO BE PRECAST CONCRETE 60mm THICK.
6. SET PAVERS 3–6 mm ABOVE SURROUNDING CONCRETE SURFACES TO ACCOMMODATE FUTURE SETTLEMENT
7. STREET FURNITURE LOCATIONS MUST BE APPROVED BY ENGINEER (E.G. BICYCLE RACKS, BENCHES, WASTE RECEPTACLES, ETC.), AND BOLTED TO CONCRETE BELOW PAVERS.
8. FILL VOID BETWEEN PAVERS WITH POLYMERIC SAND.
9. CONCRETE APRON REQUIRED FOR ROUND ELEMENTS >100mm DIAMETER (E.G. UTILITY POLES, LIGHT POLES, MANHOLE COVERS, VALVE COVERS, ETC) TINTED TO MATCH INTERIOR FIELD PAVER COLOUR
10. FOR ROUND ELEMENTS < 100MM DIAMETER OMIT CONCRETE APRON.
11. VOIDS BETWEEN PAVERS (JOINT SPACE) SHALL BE 2 mm (MIN) TO 5 mm (MAX).

HALIFAX

STANDARD DETAIL

DECORATIVE PAVER EDGE

DATE: 2025	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 141



NOTES:

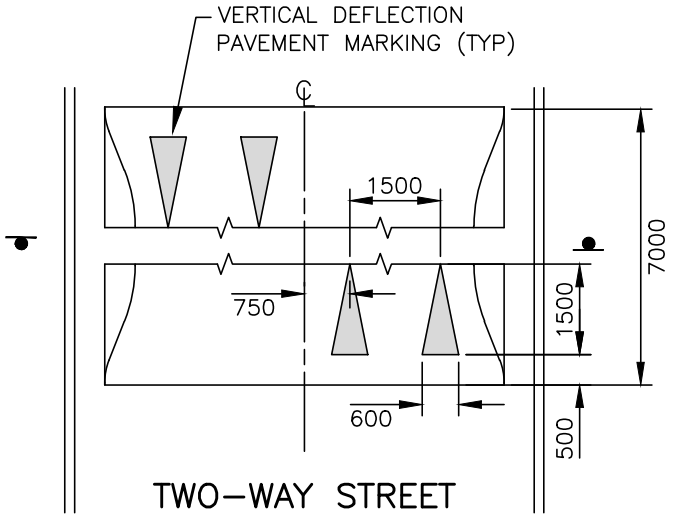
1. INSTALL PAVER EDGE IN LIEU OF GRASS BOULEVARD WHERE SHOWN ON FIGURE B–5 (MUNICIPAL DESIGN GUIDELINES PART 1), OR WHEN DIRECTED BY ENGINEER
2. OMIT PAVER EDGE IF CLEAR WIDTH OF REMAINING SIDEWALK IS LESS THAN 2.1m, UNLESS OTHERWISE DIRECTED BY ENGINEER
3. PAVER EDGE SHALL CONSIST OF 2 COMPLETE ROWS OF BRICKS IN A STACK BOND PATTERN. NO CUT PAVERS.
4. PAVER COLOUR DEFINED ON FIGURE B–5 (MUNICIPAL DESIGN GUIDELINES PART 1) OR AS DIRECTED BY ENGINEER
5. TERMINATE PAVER EDGE TREATMENT AT START OF CORNER RADIUS AND BEFORE DRIVEWAY RAMP
6. ALL PAVERS TO BE PRECAST CONCRETE 60mm THICK
7. SET PAVERS 3–6 mm ABOVE SURROUNDING CONCRETE SURFACES TO ACCOMMODATE FUTURE SETTLEMENT
8. STREET FURNITURE LOCATIONS MUST BE APPROVED BY ENGINEER (E.G. BICYCLE RACKS, BENCHES, WASTE RECEPTACLES, ETC.), AND BOLTED TO CONCRETE RETAINER STRIP OR TO CONCRETE BELOW PAVERS
9. FILL VOID BETWEEN PAVERS WITH POLYMERIC SAND
10. CONCRETE APRON REQUIRED FOR ROUND ELEMENTS >100mm DIAMETER (E.G. UTILITY POLES, LIGHT POLES, MANHOLE COVERS, VALVE COVERS, ETC) TINTED TO MATCH INTERIOR FIELD PAVER COLOUR
11. OFFSET CONCRETE APRON MINIMUM 100mm
12. FOR ROUND ELEMENTS < 100 mm DIAMETER OMIT CONCRETE APRON
13. VOIDS BETWEEN PAVERS (JOINT SPACE) SHALL BE 2 mm (MIN) TO 5 mm (MAX)

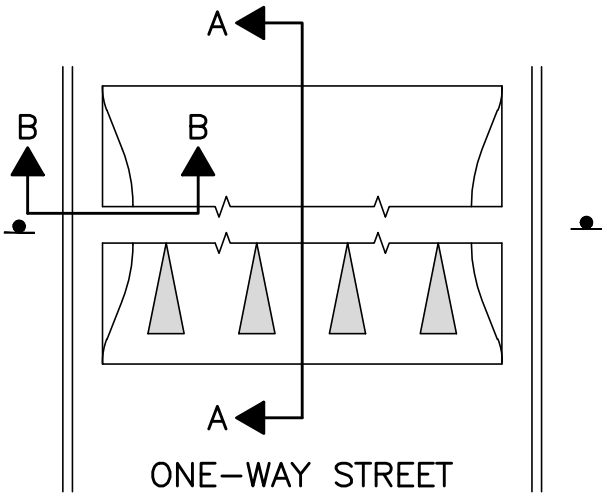
HALIFAX

STANDARD DETAIL

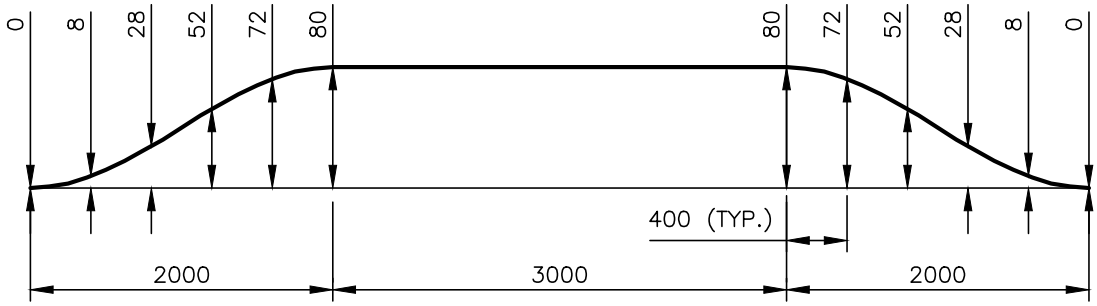
NARROW DECORATIVE PAVER EDGE

DATE: 2025	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 142

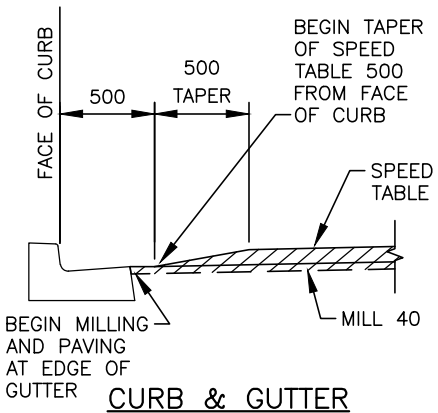




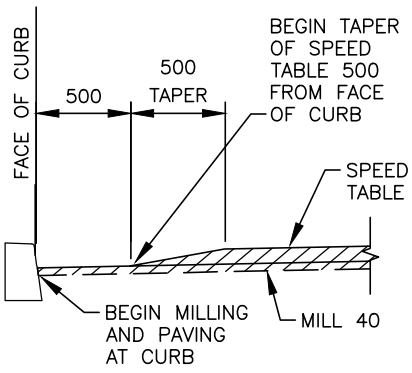
SPEED TABLE
SCALE: 1:125



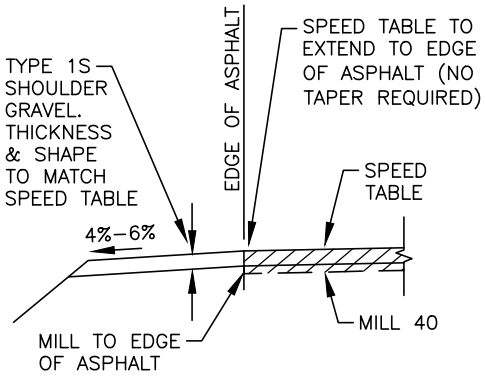
SECTION A–A
SCALE: Horz. 1:50 , Vert. 1:5



CURB & GUTTER SECTION B–B
SCALE: 1:40



CURB ONLY SECTION B–B
SCALE: 1:40



RURAL–GRAVEL SHOULDER SECTION B–B
SCALE: 1:40

NOTES:

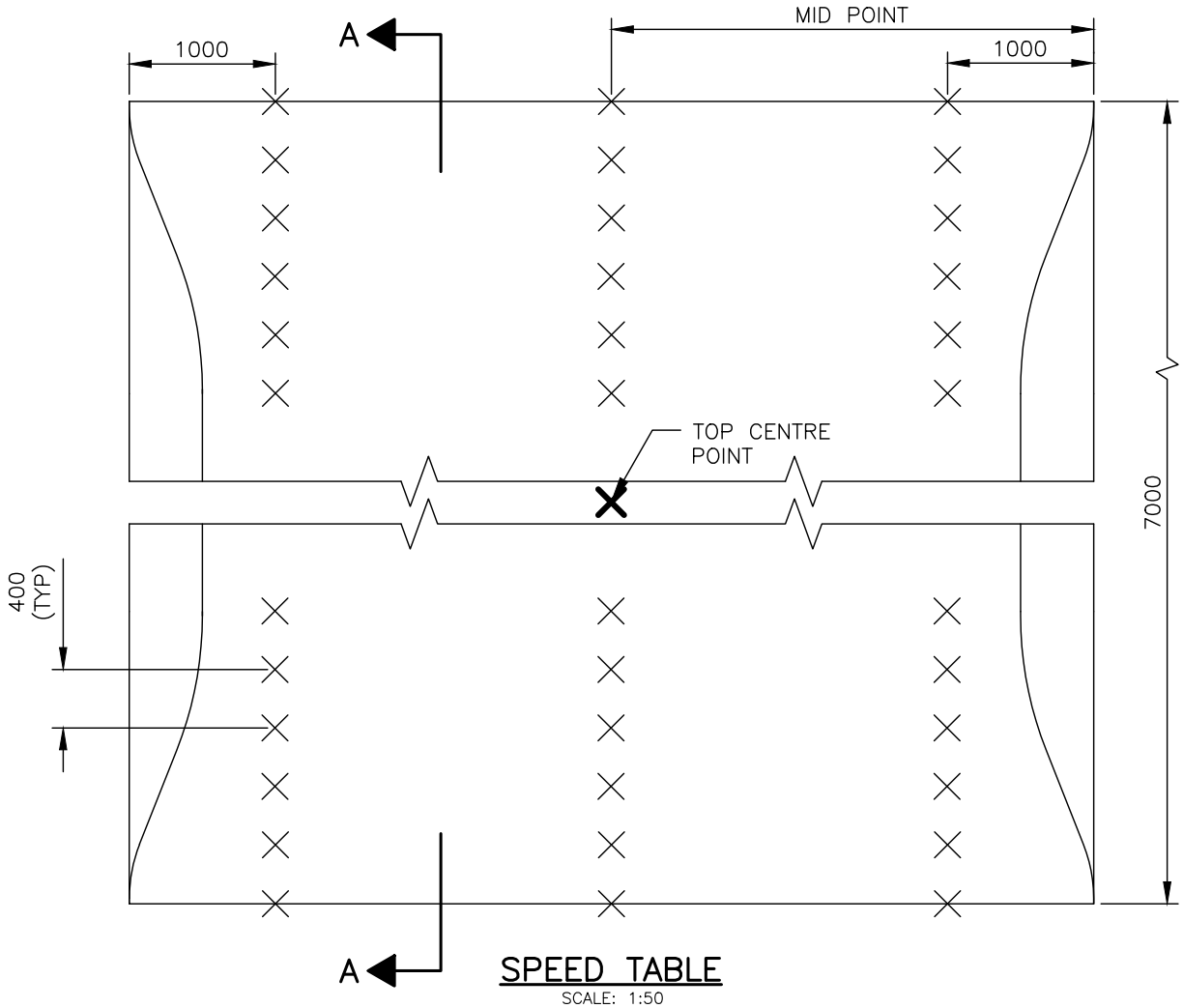
1. TOLERANCE FOR CONSTRUCTION IS +/– 10mm RELATIVE TO THE CURVE.
2. THE EXISTING ASPHALT SURFACE TO BE MILLED TO A DEPTH OF 40mm WHEN RETROFITTING.
3. SPEED TABLES TO BE CONSTRUCTED USING TYPE D–HF ASPHALT (UNLESS OTHERWISE APPROVED BY HRM).
4. WHERE SPECIFIED, EXISTING UTILITY POLE OR EXISTING SIGN POSTS MAY BE USED FOR SIGNAGE.
5. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

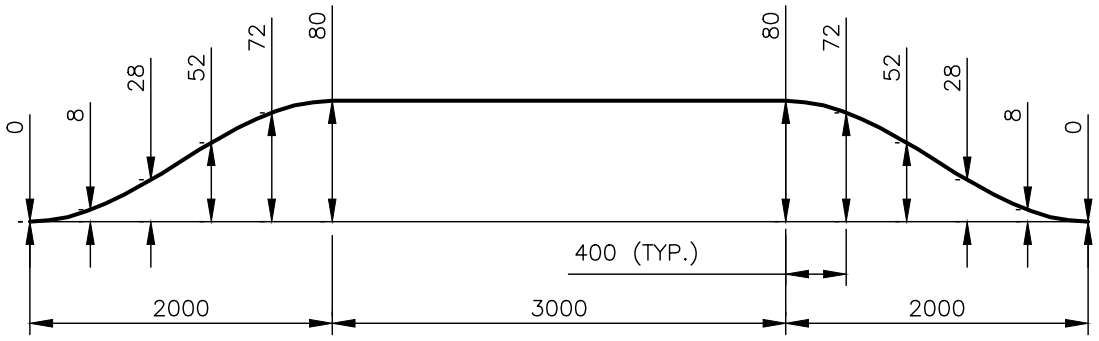
SPEED TABLE

DATE: 2023	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 143



SPEED TABLE

SCALE: 1:50



SECTION A–A

SCALE: Horz. 1:50
Vert. 1:5

NOTES:

1. 36 SURVEY SHOTS ELEVATION REQUIRED.
2. COORDINATES REQUIRED AT THE TOP CENTRE OF THE SPEED TABLE.
3. DIMENSIONS ARE IN MILLIMETRES.

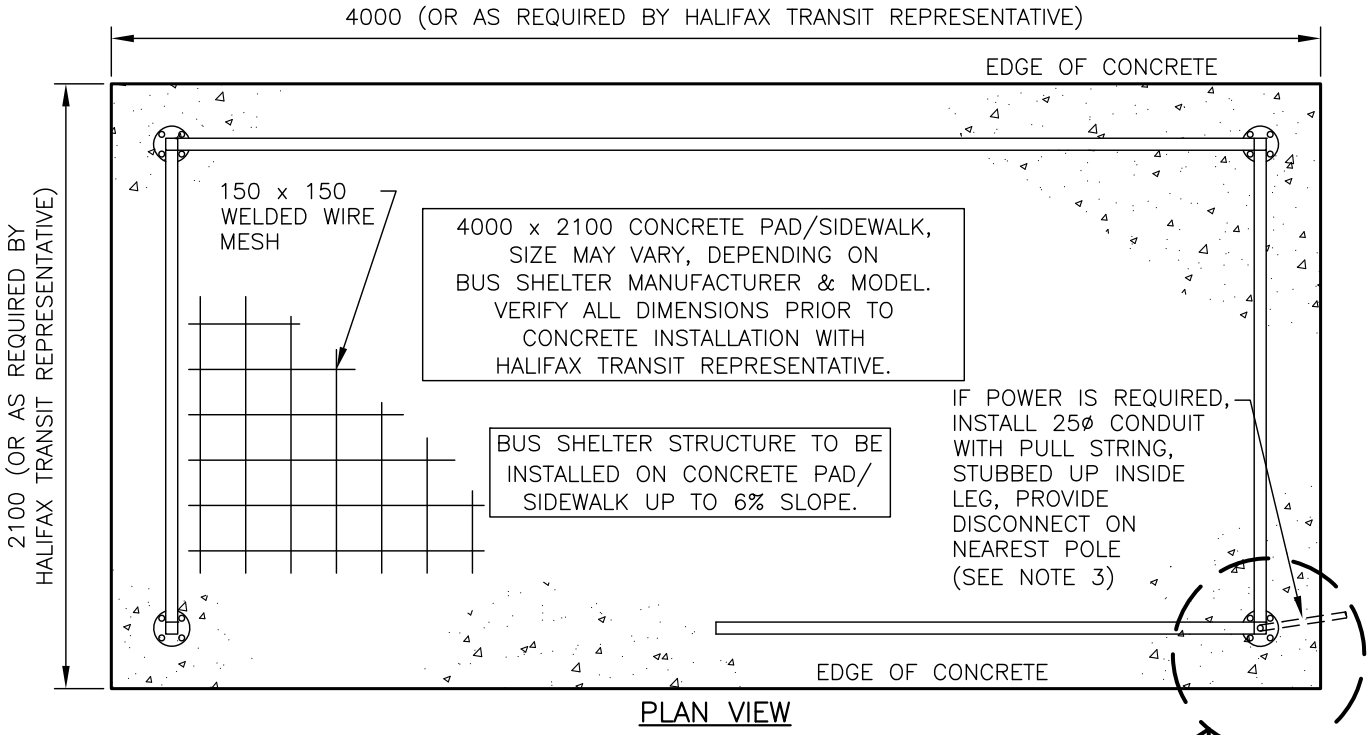
TOP CENTRE POINT COORDINATES:
NORTHING: .....
EASTING: .....

HALIFAX

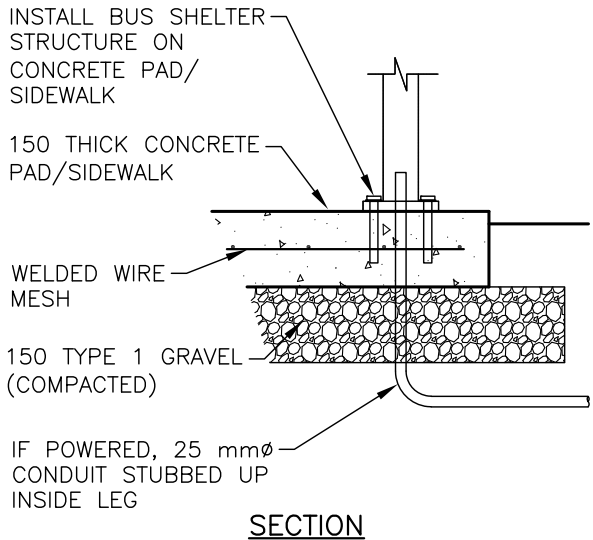
STANDARD DETAIL

SPEED TABLE SURVEY VERIFICATION

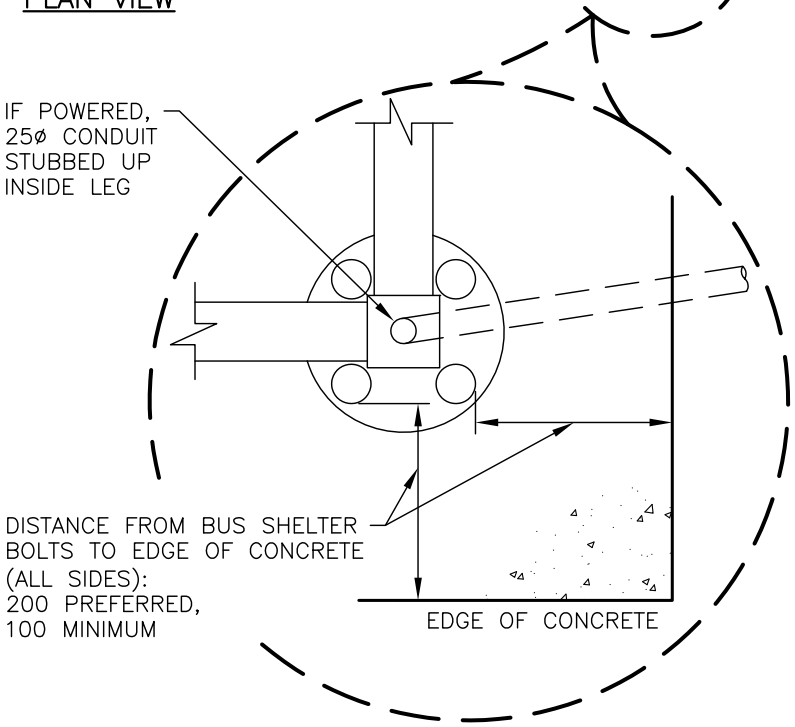
DATE: 2021	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 144



PLAN VIEW



SECTION



NOTES:

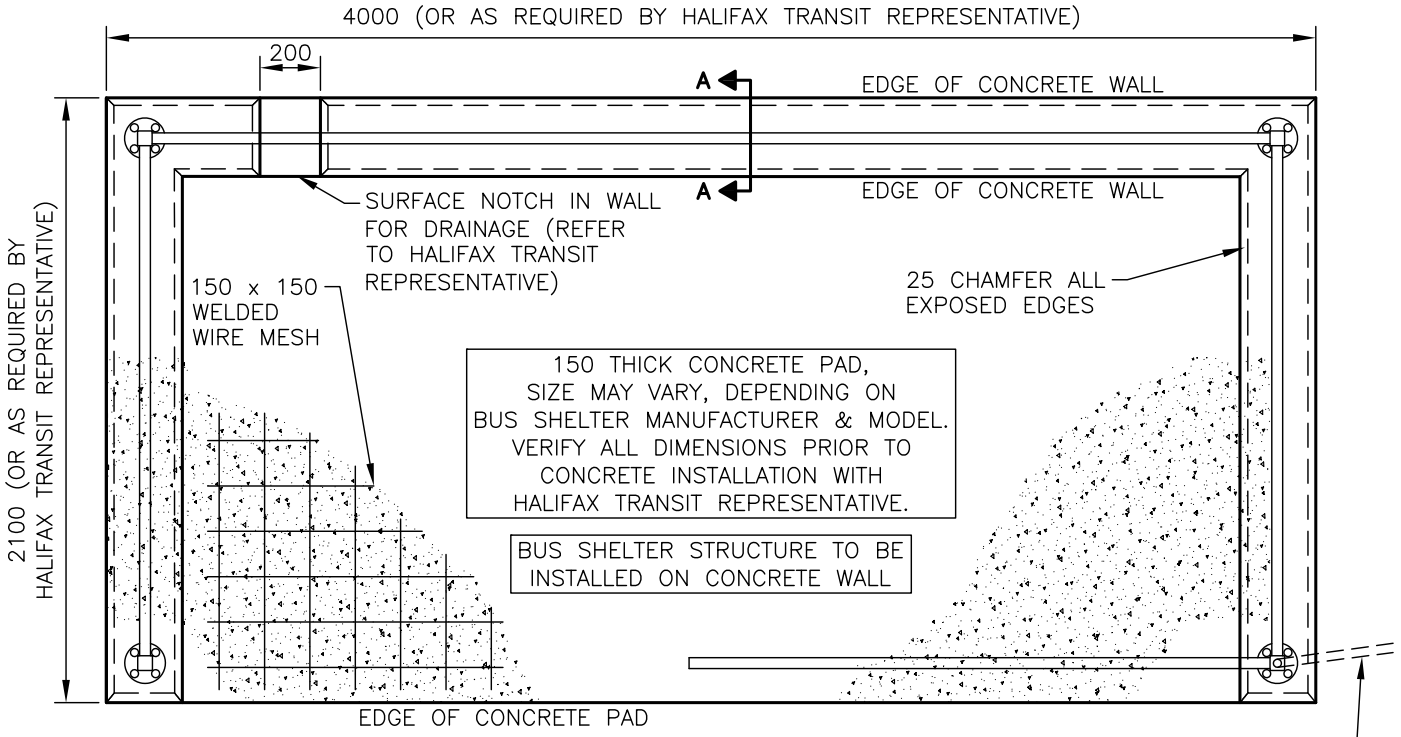
1. BEFORE ORDERING MATERIALS AND PRIOR TO CONSTRUCTION, VERIFY ALL EQUIPMENT AND SHELTER PLACEMENT/REQUIREMENTS WITH HALIFAX TRANSIT REPRESENTATIVE.
2. FOR INSTALLATION OF BUS SHELTER STRUCTURE FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. POWER CAN BE RUN INTO ANY OF THE SHELTER LEGS – CONTACT TRANSIT TO CONFIRM.
4. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

BUS STOP SHELTER ON CONCRETE SIDEWALK

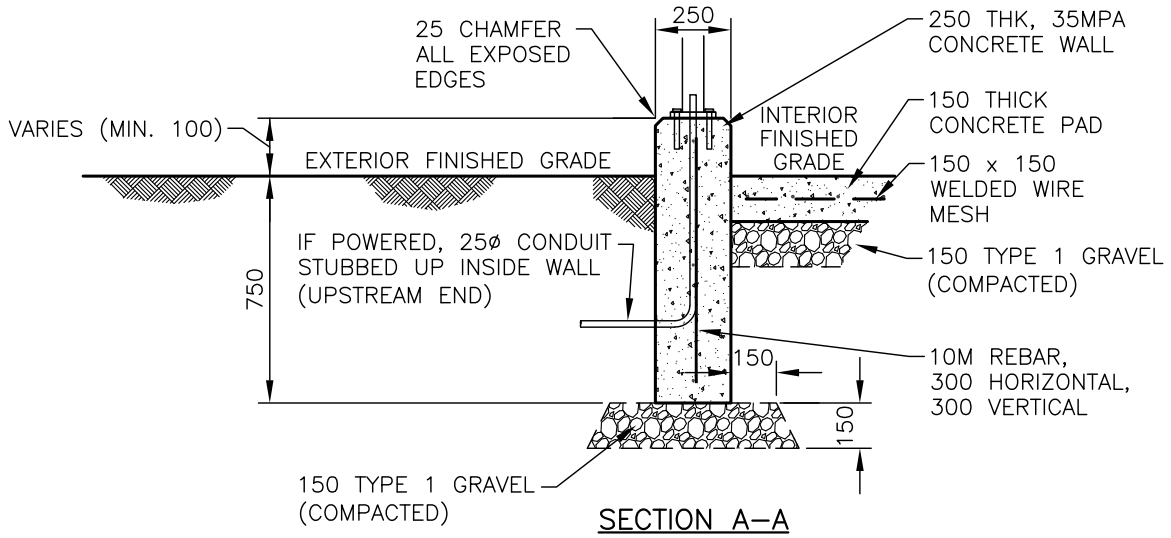
DATE: 2024	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 153



NOTE: ENSURE WALL IS CENTERED ON SHELTER BRACKETS

PLAN VIEW

IF POWER IS REQUIRED, INSTALL 25ø CONDUIT WITH PULL STRING, STUBBED UP INSIDE WALL THRU LEG, PROVIDE DISCONNECT ON NEAREST POLE (SEE NOTE 3)



SECTION A–A

NOTES:

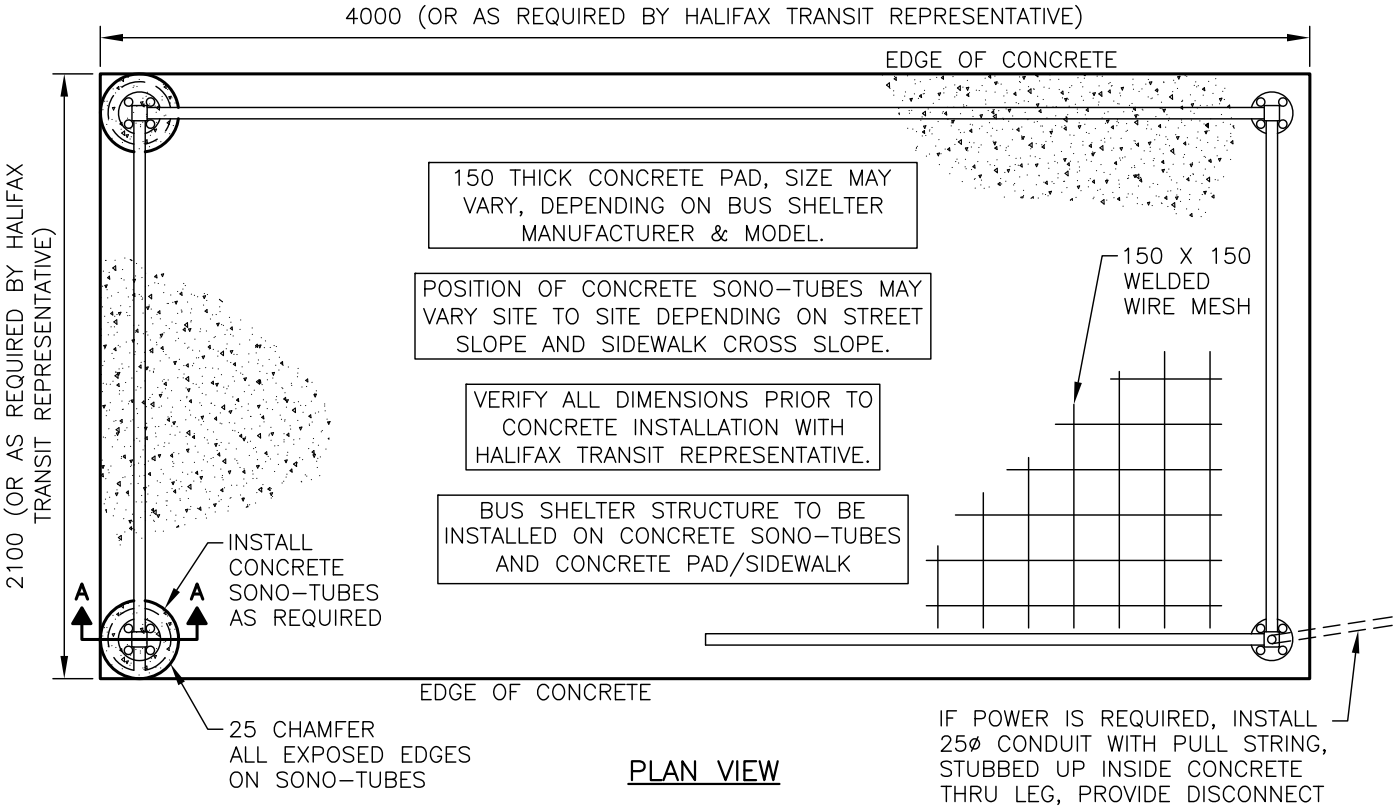
1. BEFORE ORDERING MATERIALS AND PRIOR TO CONSTRUCTION, VERIFY ALL EQUIPMENT AND SHELTER PLACEMENT/REQUIREMENTS WITH HALIFAX TRANSIT REPRESENTATIVE.
2. FOR INSTALLATION OF BUS SHELTER STRUCTURE FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. POWER CAN BE RUN INTO ANY OF THE SHELTER LEGS – CONTACT TRANSIT TO CONFIRM.
4. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

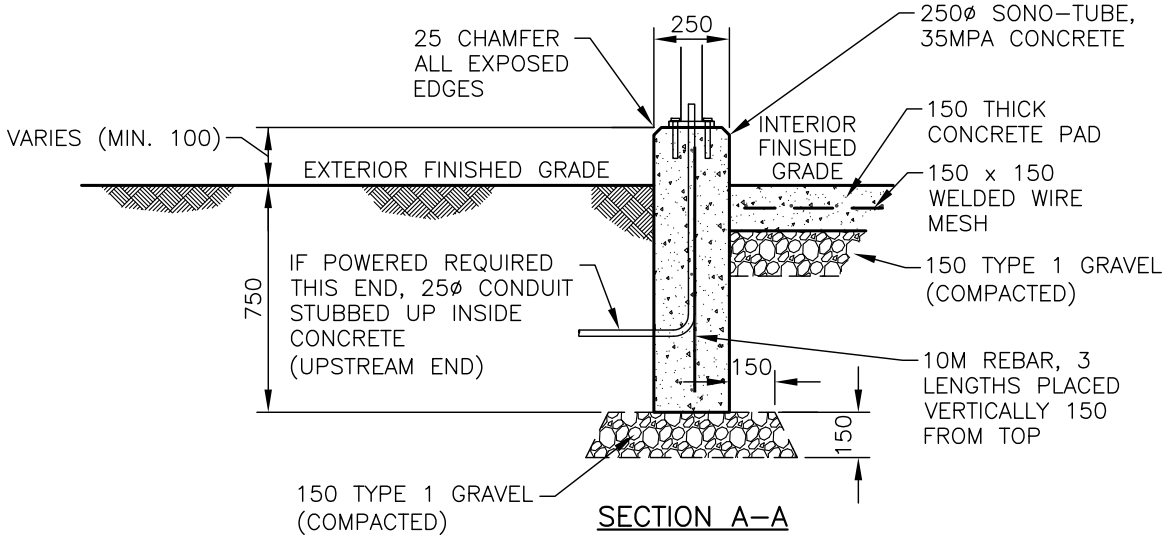
BUS STOP SHELTER ON CONCRETE WALL

DATE: 2024	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 155



PLAN VIEW

NOTE: ENSURE SONO-TUBE IS CENTERED ON SHELTER BRACKETS



SECTION A–A

NOTES:

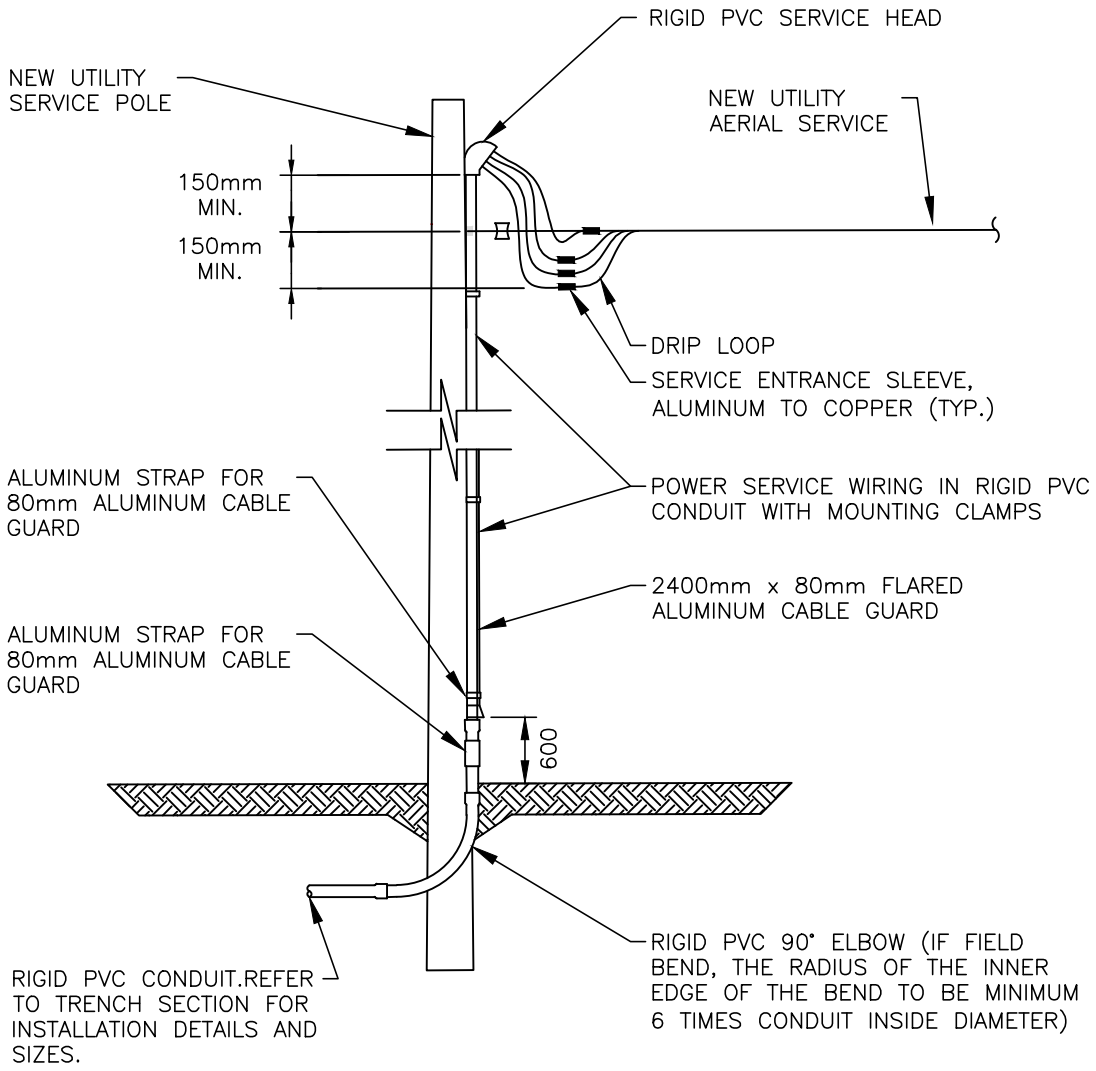
1. BEFORE ORDERING MATERIALS AND PRIOR TO CONSTRUCTION, VERIFY ALL EQUIPMENT AND SHELTER PLACEMENT/REQUIREMENTS WITH HALIFAX TRANSIT REPRESENTATIVE.
2. FOR INSTALLATION OF BUS SHELTER STRUCTURE FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. POWER CAN BE RUN INTO ANY OF THE SHELTER LEGS – CONTACT TRANSIT TO CONFIRM.
4. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

BUS STOP SHELTER ON CONCRETE SONO-TUBES

DATE: 2024	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 156



NOTES:

1. BREAKER MUST BE A DOUBLE POLE, NO SPARE SERVICE WIRES ARE ALLOWED.
2. CIRCUITS RATED AT MORE THAN 15Amps REQUIRE A CONTACTOR.
3. ALL WORK MUST BE IN COMPLIANCE WITH THE LATEST EDITION OF THE CANADIAN ELECTRICAL CODE AND INSPECTED BY NSPI
4. UNDERGROUND SERVICE CONDUIT AND GROUND MUST BE PROTECTED BY A U-GUARD AND BONDED AS PER CEC.
5. ALL SCREWS IN THE SERVICE SWITCH ARE TO BE NEVER SEIZED, AND MOUNTING SCREWS ARE TO BE STAINLESS STEEL ONLY.

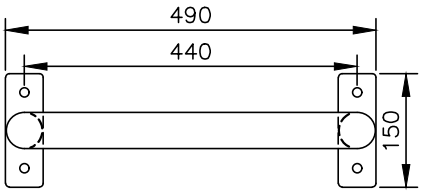
HALIFAX

STANDARD DETAIL

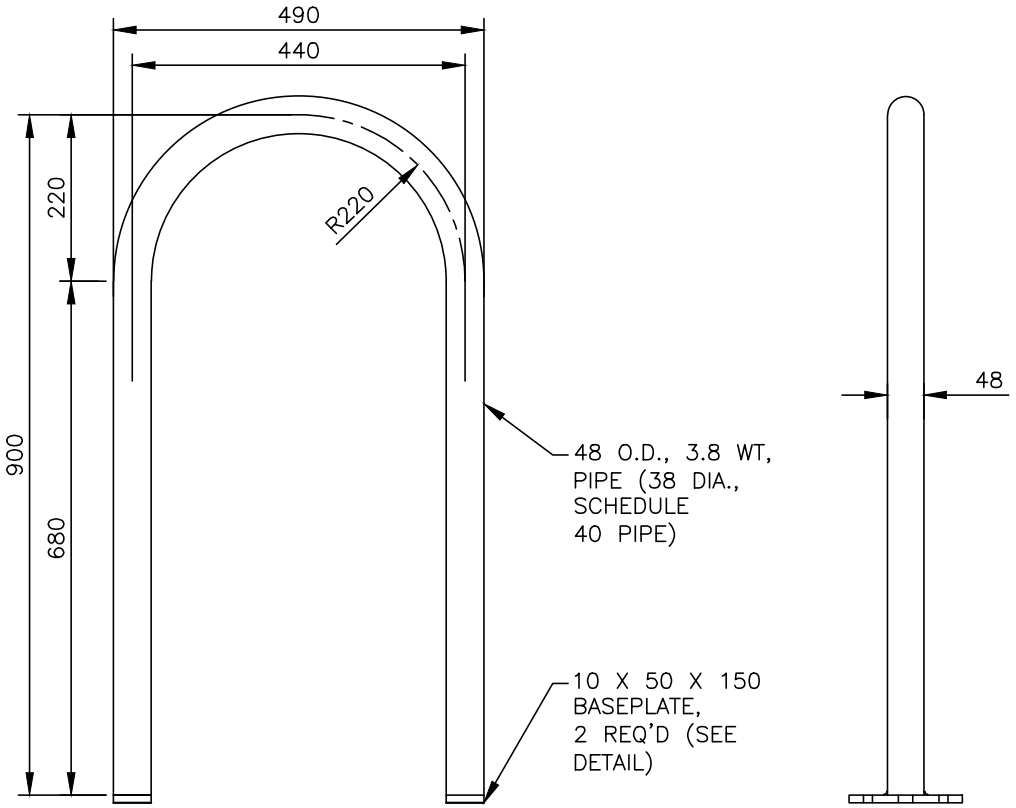
UTILITY POLE SERVICE DETAIL

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 160

HOT–DIPPED GALVANIZED STEEL OR
HOT–DIPPED GALVANIZED STEEL
WITH BLACK POWDER COAT



PLAN VIEW

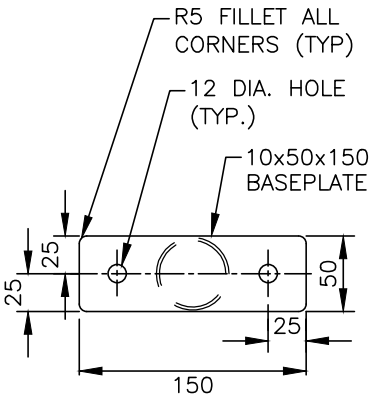


PROFILE VIEW

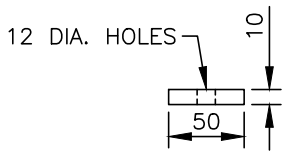
SECTION

NOTES:

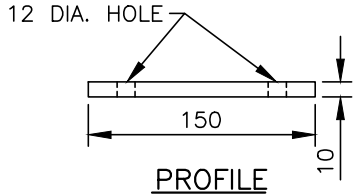
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. VARIATION OF THE DIMENSIONS PROVIDED ARE PERMITTED, BUT MUST BE SHOWN ON SUBMITTED DRAWINGS.
3. BIKE RACKS TO BE ANCHORED TO POURED IN PLACE CONCRETE SURFACE WITH 10 mmø X 125 mm EPOXY EXPANSION BOLTS (100 mm EMBEDMENT) OR APPROVED EQUIVALENT.



PLAN



SECTION



PROFILE

BASEPLATE DETAIL

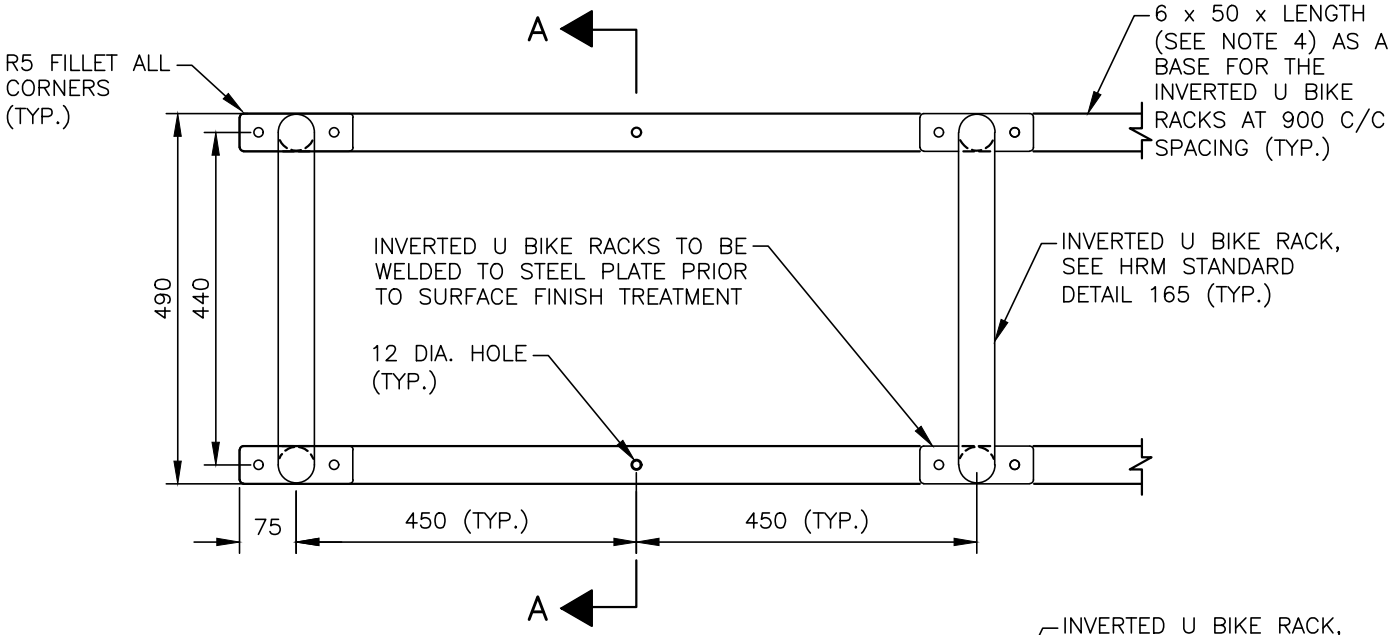
HALIFAX

STANDARD DETAIL

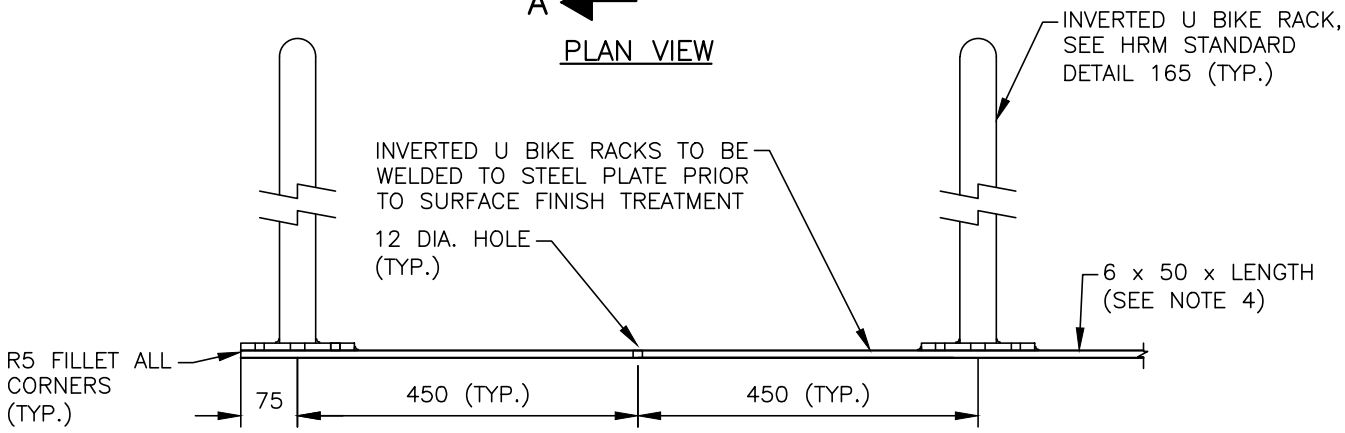
INVERTED U BIKE RACK

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 165

HOT–DIPPED GALVANIZED STEEL OR
HOT–DIPPED GALVANIZED STEEL WITH BLACK POWDER COAT



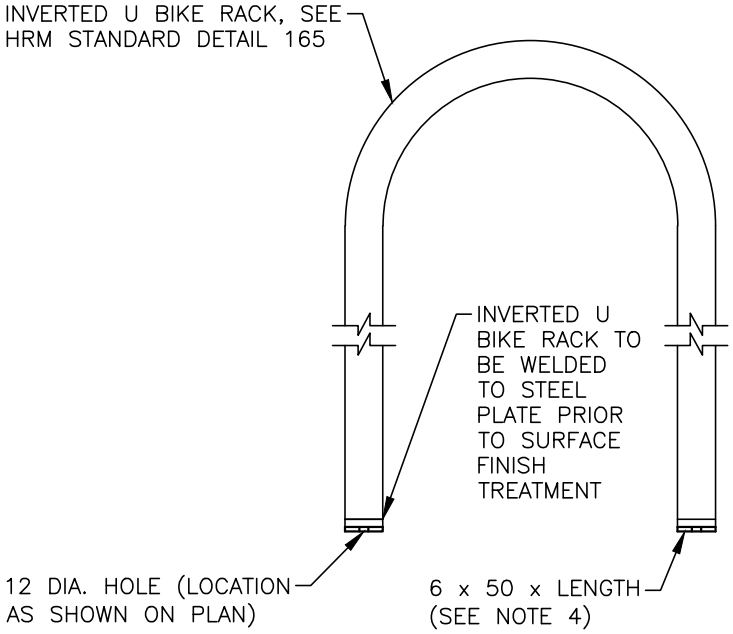
PLAN VIEW



PROFILE VIEW

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. VARIATION OF THE DIMENSIONS PROVIDED ARE PERMITTED, BUT MUST BE SHOWN ON SUBMITTED DRAWINGS.
3. BIKE RACKS TO BE ANCHORED TO POURED IN PLACE CONCRETE SURFACE WITH 10 mmø X 125 mm EPOXY EXPANSION BOLTS (100 mm EMBEDMENT) OR APPROVED EQUIVILANT.
4. MULTI BIKE RACK LENGTH WILL VARY FOR SERIES OF 2 TO 5 INVERTED U BIKE RACKS (AS REQUIRED).



SECTION A–A

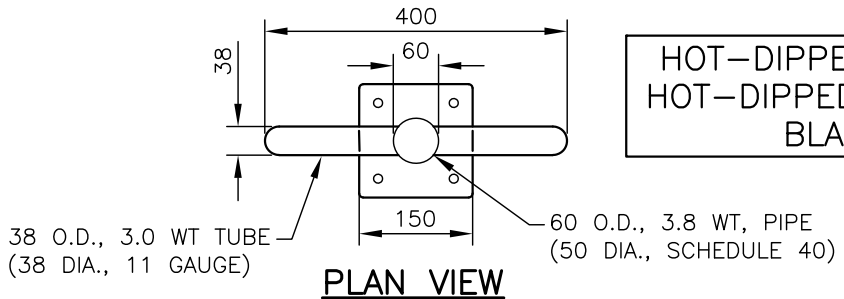
HALIFAX

STANDARD DETAIL

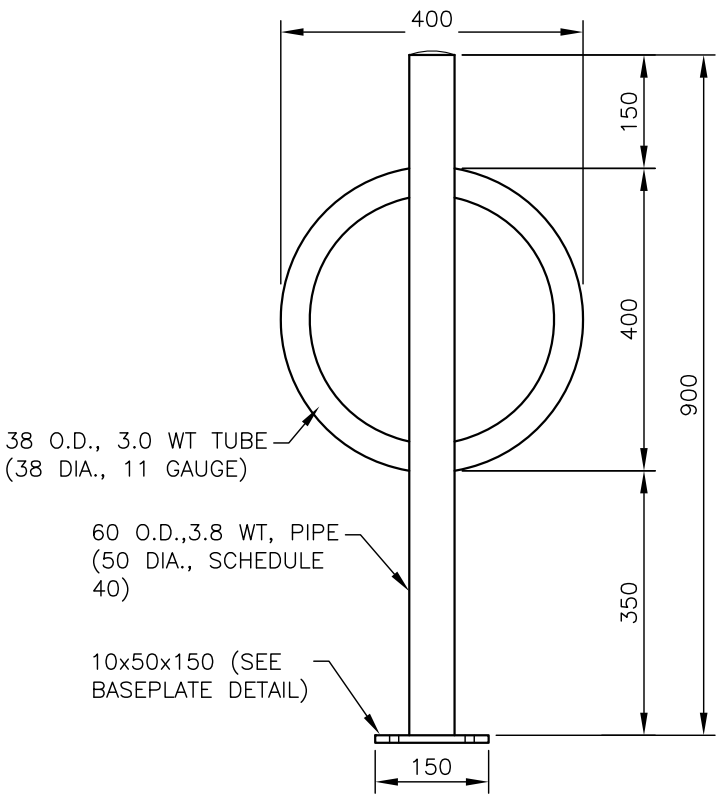
MULTI INVERTED U BIKE RACK

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 166

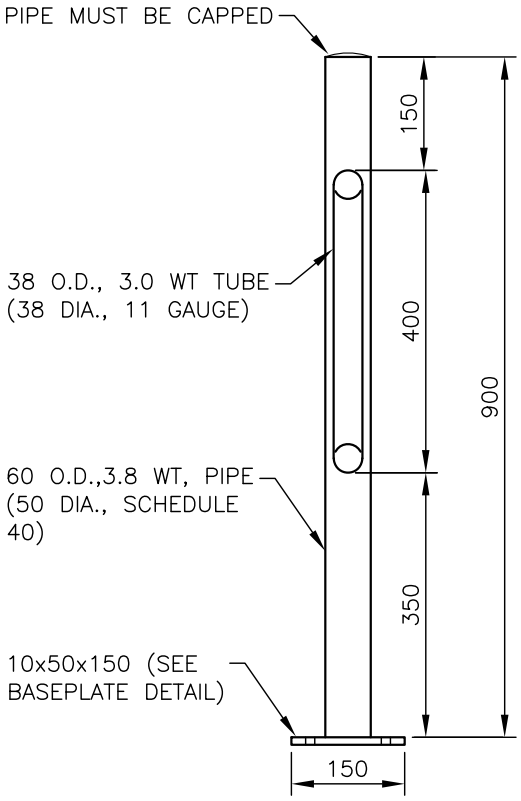
HOT–DIPPED GALVANIZED STEEL OR
HOT–DIPPED GALVANIZED STEEL WITH
BLACK POWDER COAT



PLAN VIEW



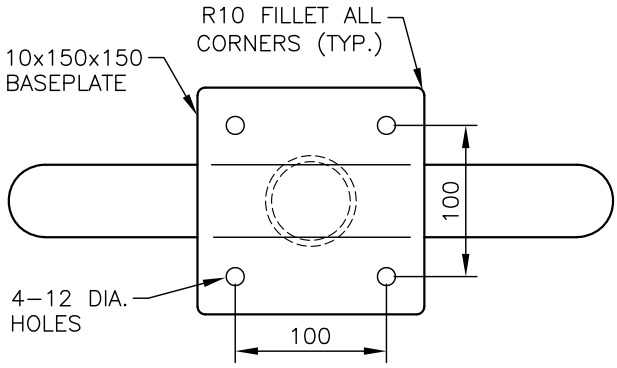
PROFILE VIEW



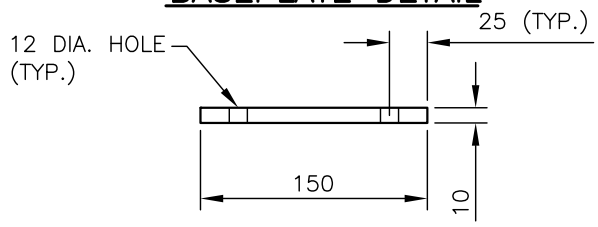
SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. VARIATION OF THE DIMENSIONS PROVIDED ARE PERMITTED, BUT MUST BE SHOWN ON SUBMITTED DRAWINGS.
3. BIKE RACKS TO BE ANCHORED TO POURED IN PLACE CONCRETE SURFACE WITH 10 mmø X 125 mm EPOXY EXPANSION BOLTS (100 mm EMBEDMENT).
4. IF INSTALLED ON A SLOPE, THE SLOPE SHALL BE SHIMMED TO PROVIDE A LEVEL SURFACE PRIOR TO INSTALLATION.



BASEPLATE DETAIL



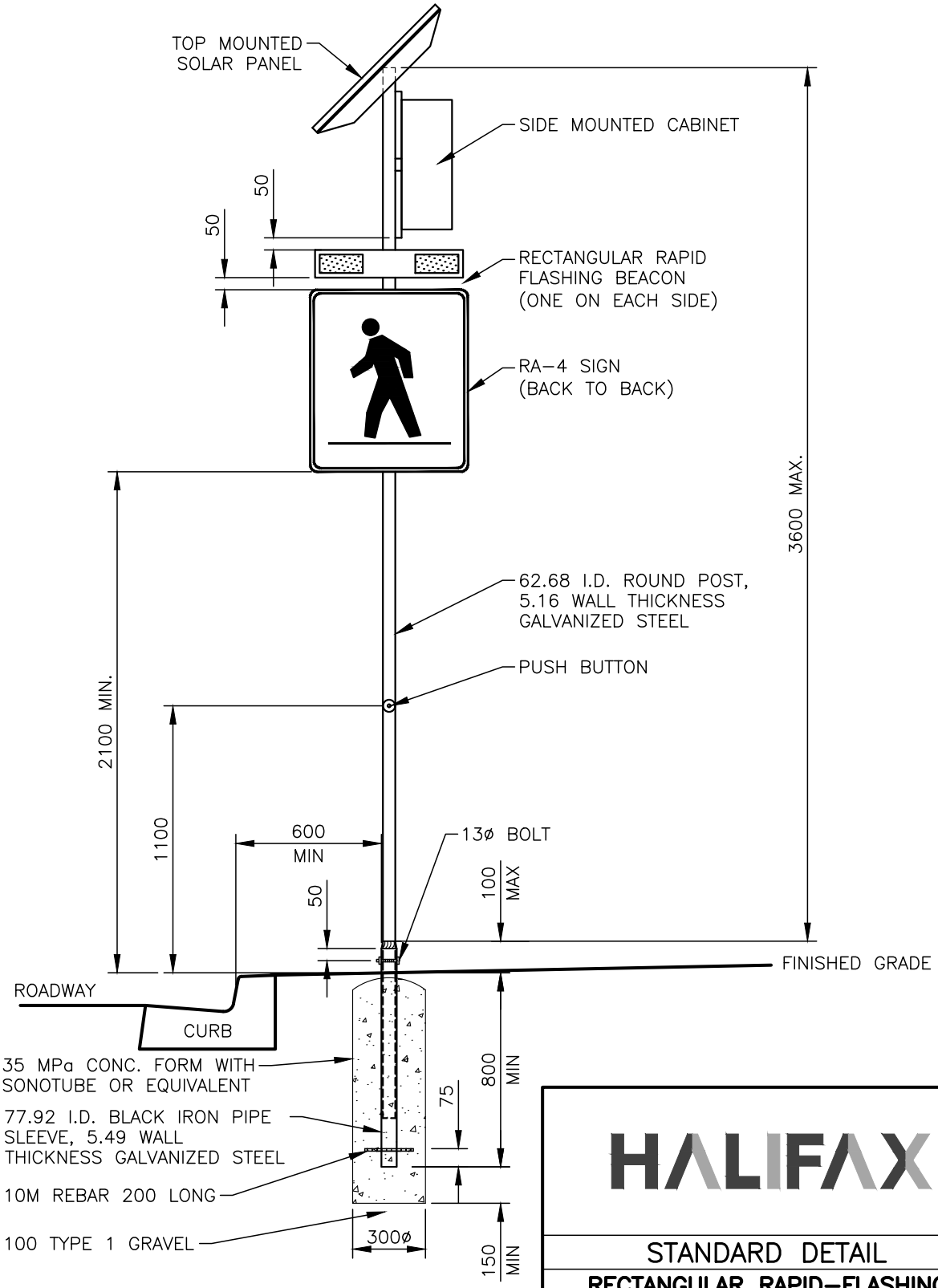
BASEPLATE SECTION

HALIFAX

STANDARD DETAIL

POST & RING BIKE RACK

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 167



NOTE:

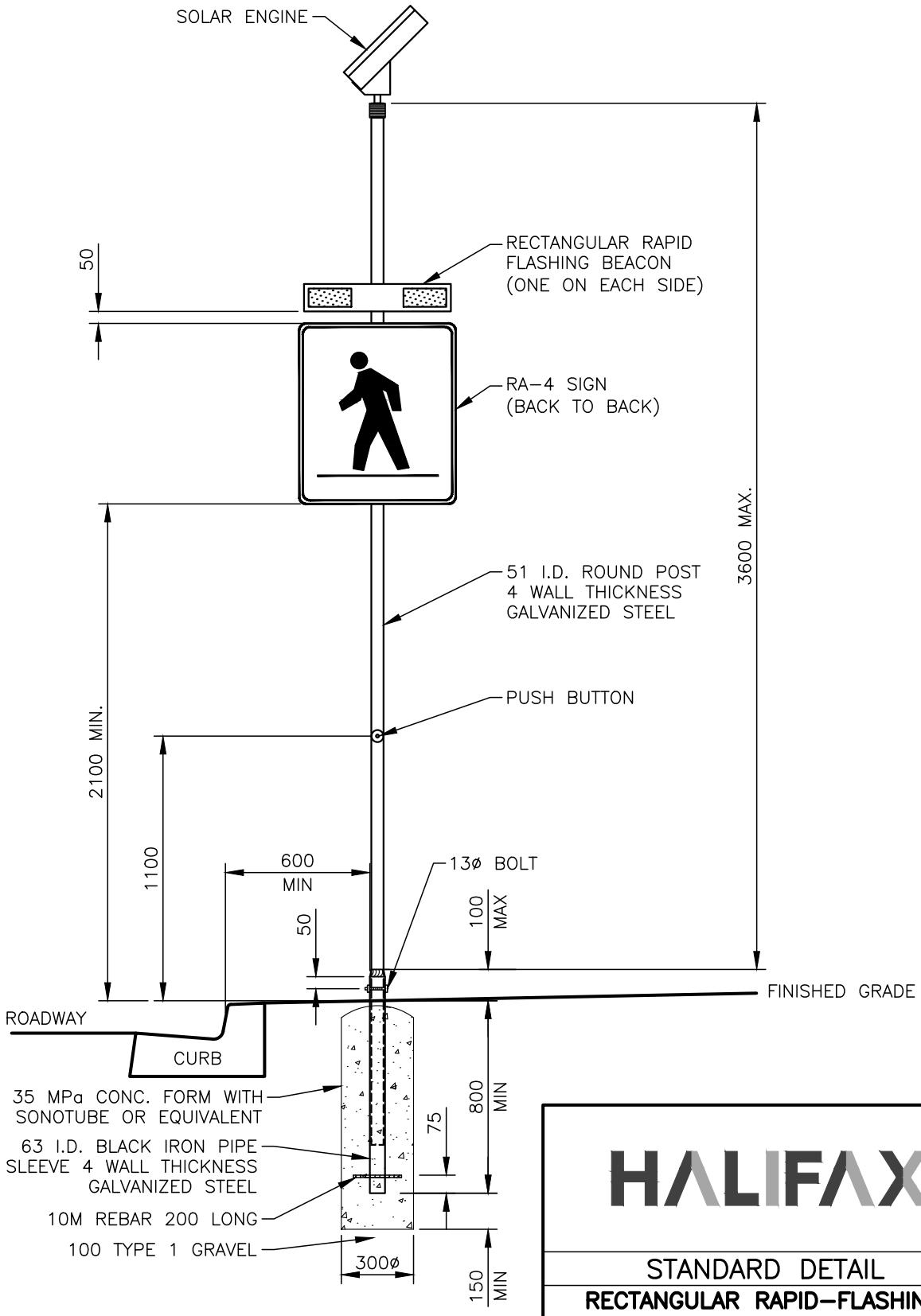
1. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

RECTANGULAR RAPID–FLASHING BEACON SIGNAL CONFIGURATION (SOLAR CABINET–BASED)

DATE: 2025	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 172



NOTE:

1. DIMENSIONS ARE IN MILLIMETRES.

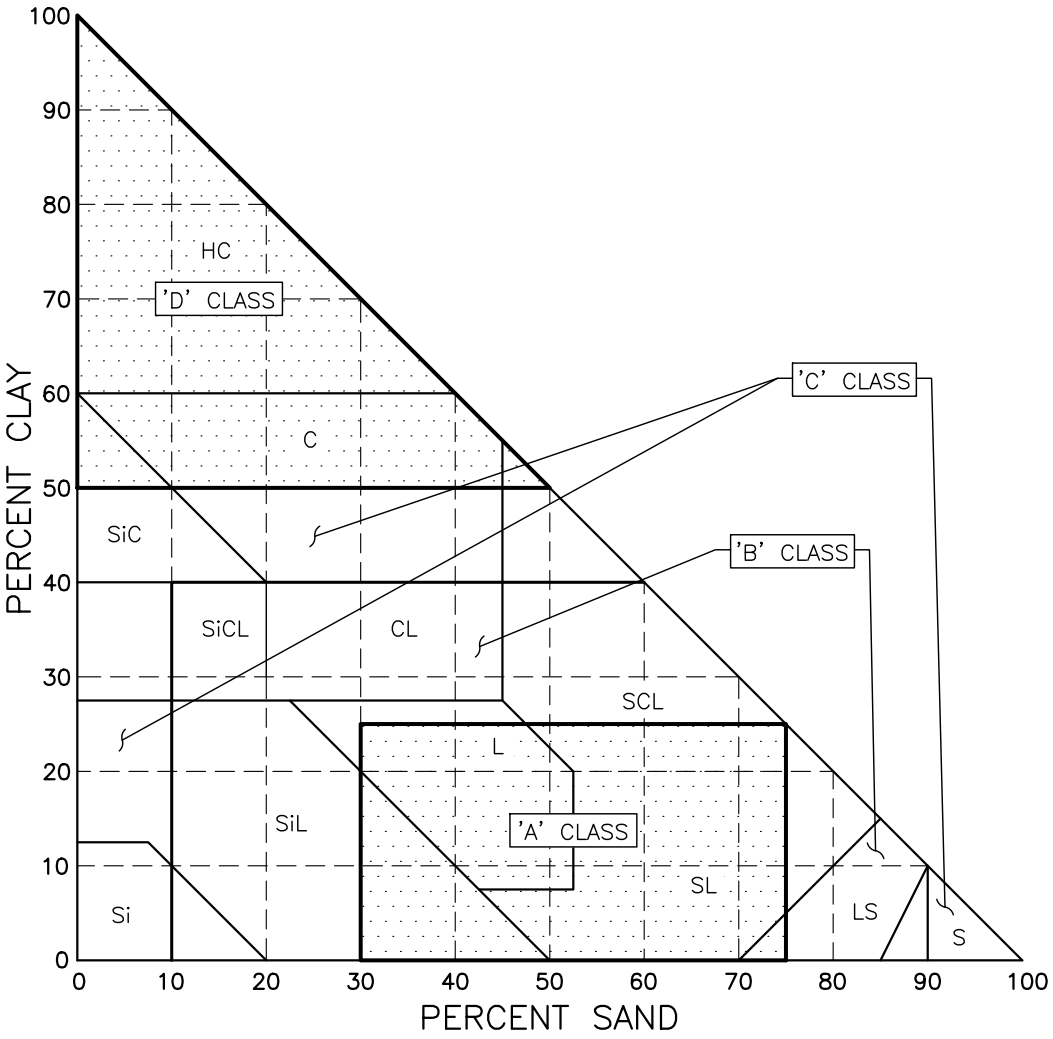
HALIFAX

STANDARD DETAIL

RECTANGULAR RAPID–FLASHING BEACON SIGNAL CONFIGURATION (SOLAR SELF–CONTAINED)

DATE: 2023	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 180

PROPOSED SOIL GROUPINGS



NOTES:

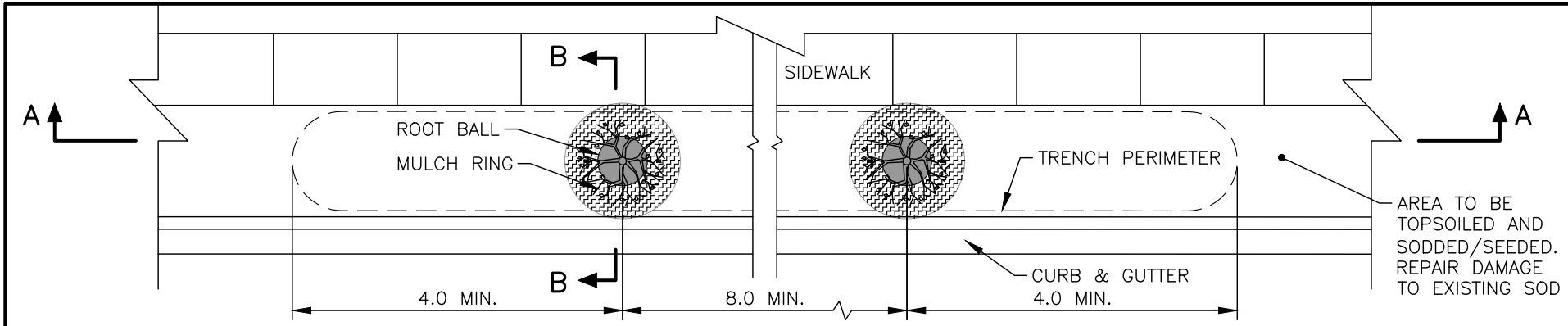
1. SOIL TEXTURE CLASSES. PERCENTAGES OF CLAY AND SAND IN THE MAIN TEXTURAL CLASSES OF SOIL; THE REMAINDER OF EACH CLASS IS SILT.

HALIFAX

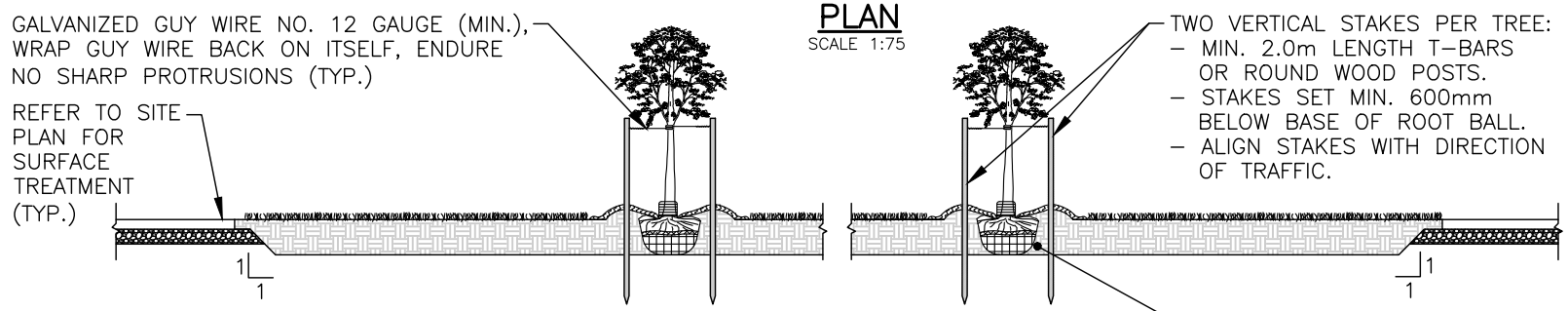
STANDARD DETAIL

SOIL TEXTURE TRIANGLE

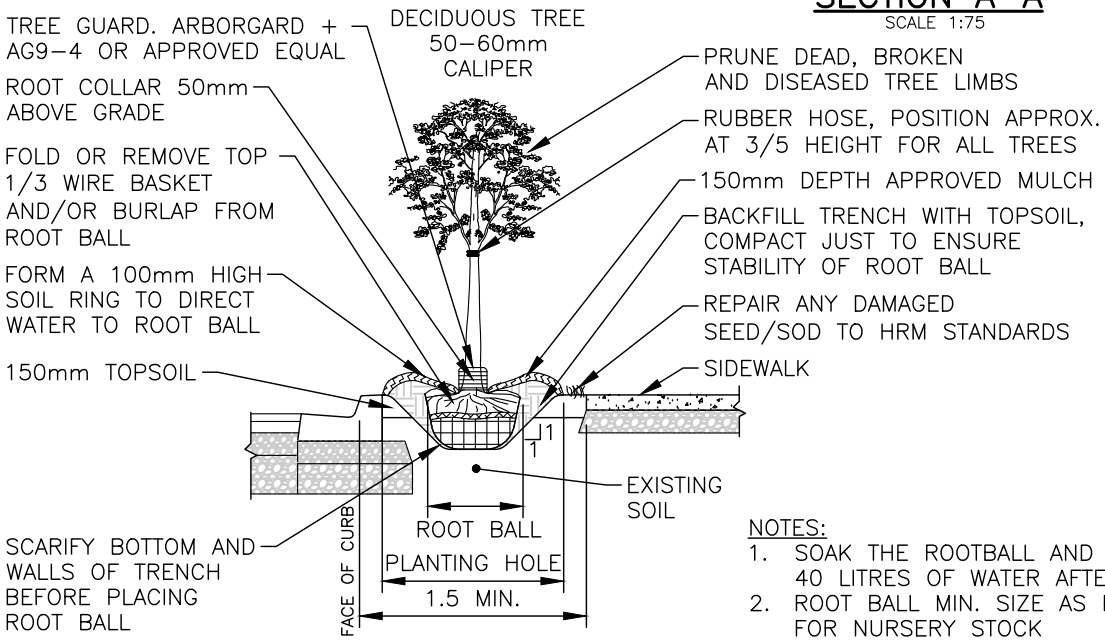
DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 181



PLAN
SCALE 1:75



SECTION A–A
SCALE 1:75



SECTION B–B
SCALE 1:50

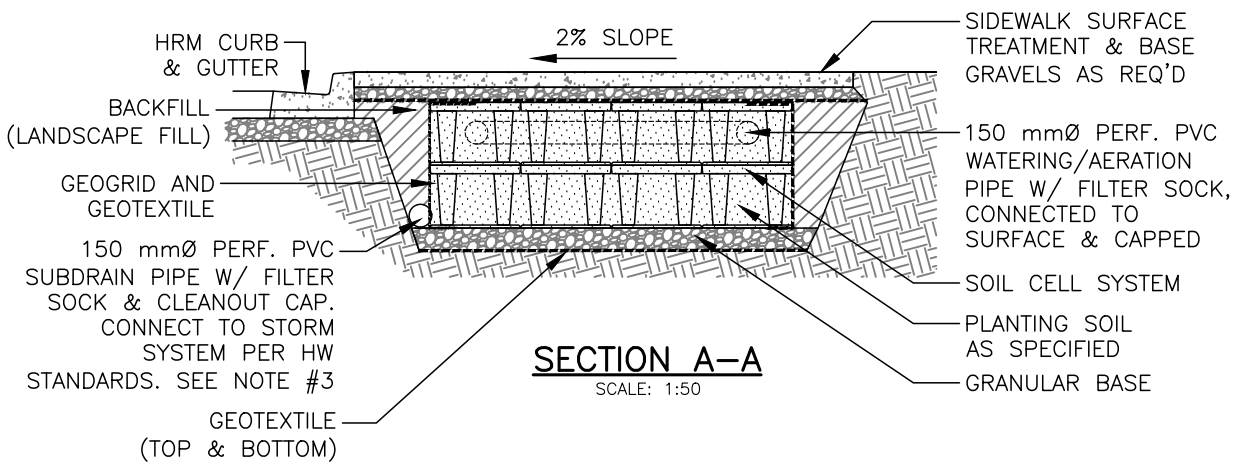
NOTES:
1. SOAK THE ROOTBALL AND BACKFILL AREA WITH 40 LITRES OF WATER AFTER PLANTING
2. ROOT BALL MIN. SIZE AS PER CNLA STANDARDS FOR NURSERY STOCK
3. MINIMUM TRENCH LENGTH: 8m PER TREE UNLESS APPROVED BY URBAN FORESTER

HALIFAX

STANDARD DETAIL

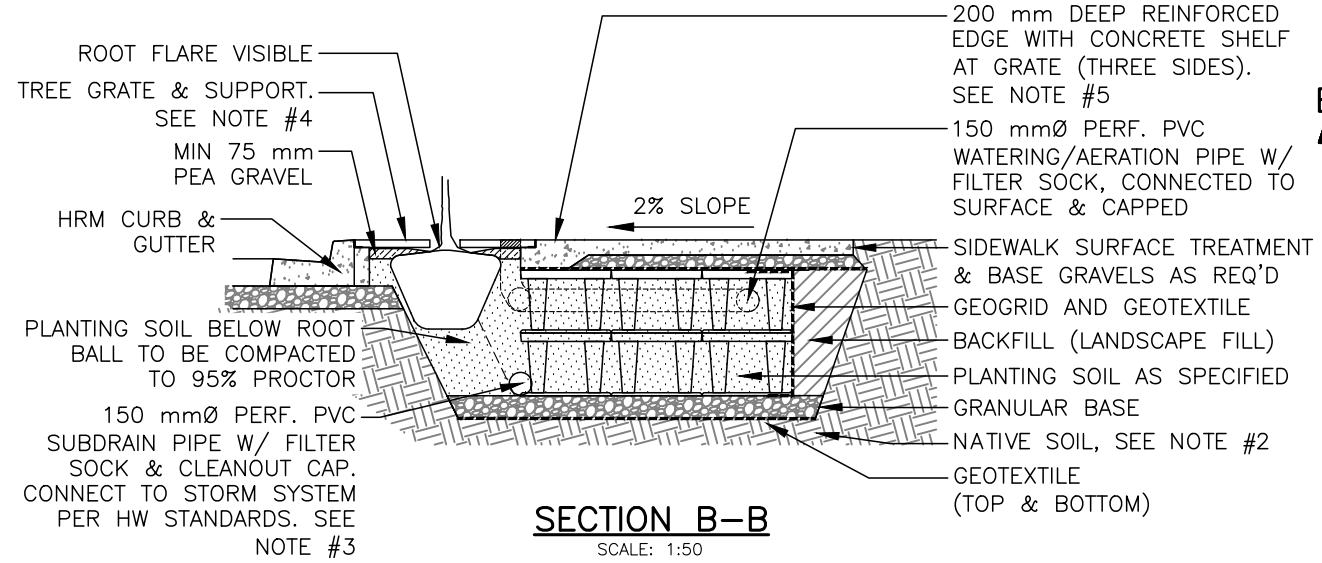
TREE PLANTING IN SOD BOULEVARD

DATE: 2021	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 182



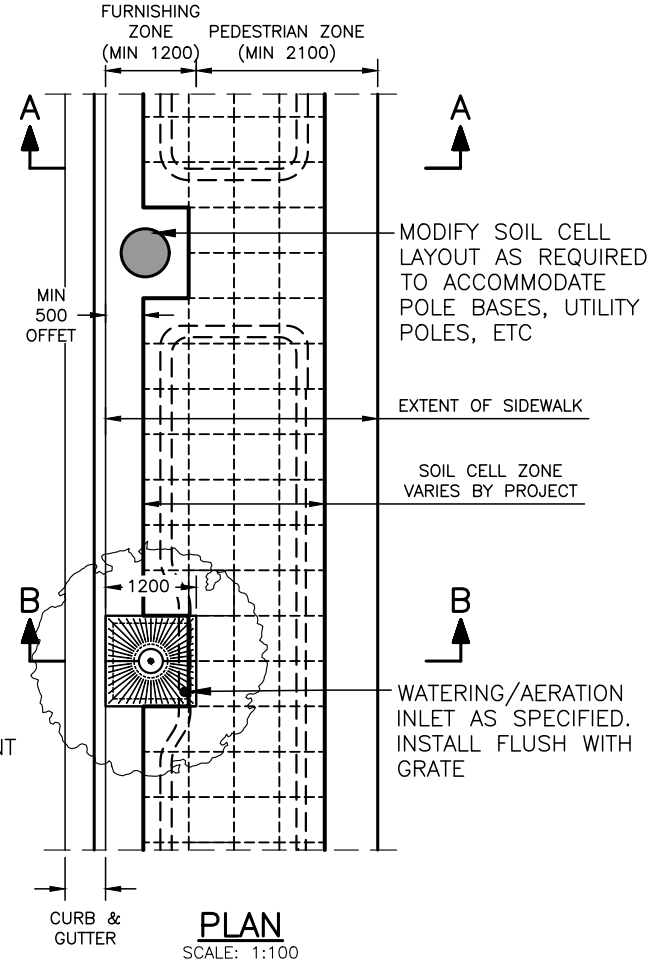
SECTION A–A

SCALE: 1:50



SECTION B–B

SCALE: 1:50



PLAN

SCALE: 1:100

NOTES:

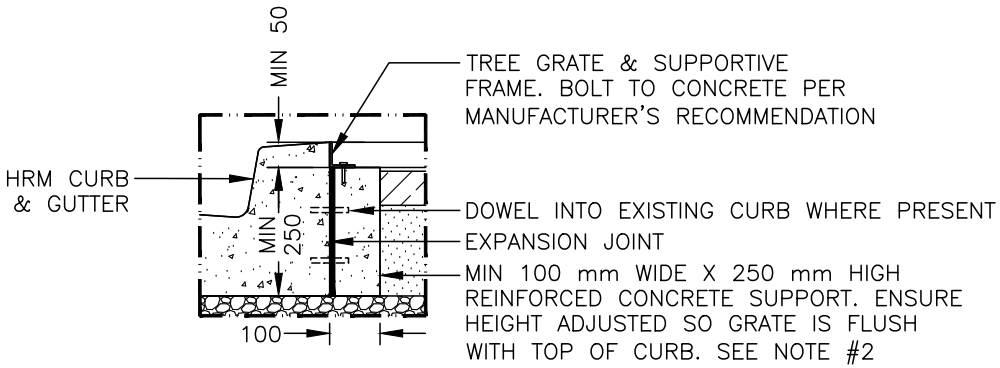
1. SOIL CELL SYSTEM, GEOTEXTILE, GEOGRID, AND GRANULAR BASE TO BE INSTALLED PER MANUFACTURER'S SPECIFICATION. SUBMIT SHOP DRAWINGS FOR EACH PROJECT PER REQUIREMENTS OF SPECIFICATION
2. NATIVE SOIL SHALL BE INSPECTED AND APPROVED PER REQUIREMENTS OF THE SPECIFICATION BY A QUALIFIED GEOTECHNICAL ENGINEER, PRIOR TO PLACING AND COMPACTING GRANULAR BASE
3. SUBDRAIN REQUIRED WHERE THE NATIVE INFILTRATION RATE IS LESS THAN 15MM/HR (STANDARD ASSUMPTION) UNLESS SHOWN OTHERWISE THROUGH AN APPROVED TESTING METHOD – TYPICALLY GUELPH PERMEAMETER
4. TREE GRATE PER HRM DETAIL & SPECIFICATION
5. SOIL CELL SYSTEM AND SURROUNDING PAVEMENT DESIGN MUST BE SIGNED AND SEALED BY THE ENGINEER OF RECORD, LICENSED IN THE PROVINCE OF NOVA SCOTIA AS A PROFESSIONAL ENGINEER IN GOOD STANDING
6. WORK WITHIN 2 m OF UTILITY POLES REQUIRES ENGINEER STAMPED NON–DESTRUCTIVE HOLDING PLANS
7. REFER TO SECTION A: MUNICIPAL DESIGN GUIDELINES FOR SOIL VOLUME REQUIREMENTS
8. DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

HALIFAX

STANDARD DETAIL

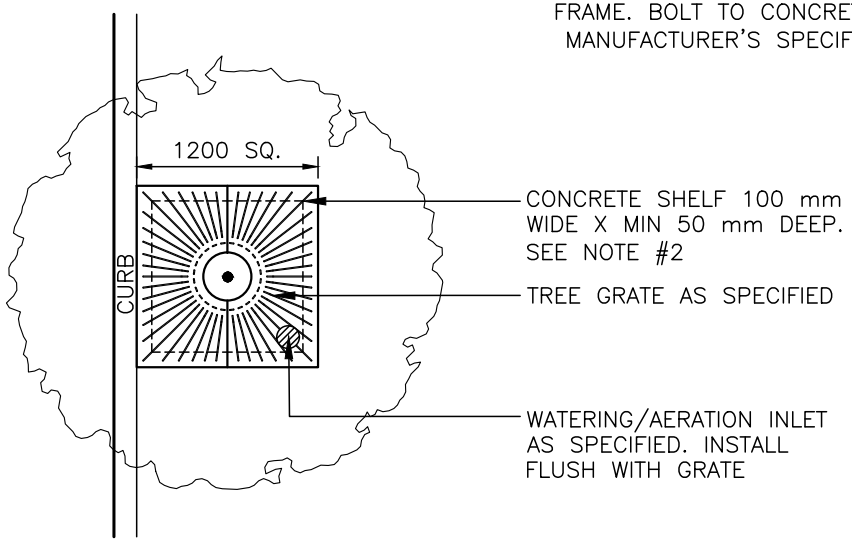
TREE IN HARDSCAPE WITH SOIL CELLS

DATE: 2025	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 186



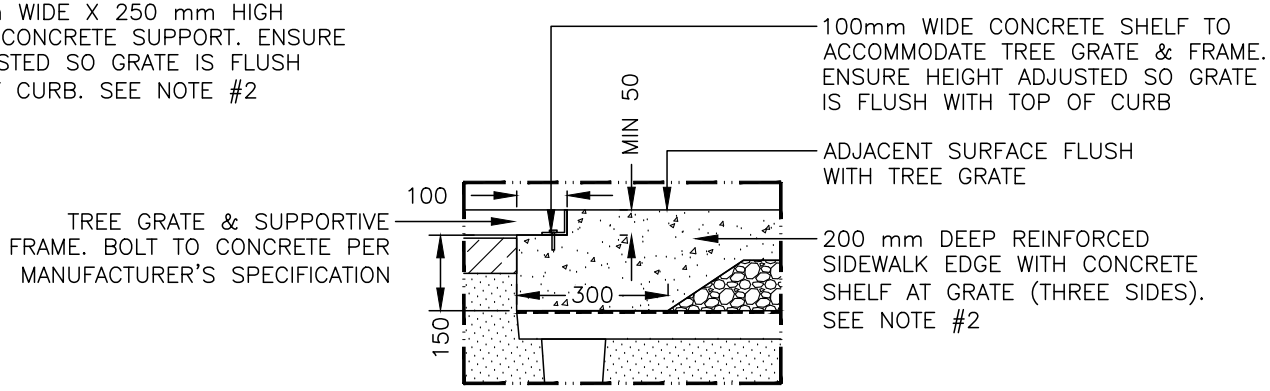
SECTION – TREE GRATE AT CURB

SCALE: 1:15



PLAN – ACCESSIBLE TREE GRATE

SCALE: 1:50



SECTION – TREE GRATE AT PROP. CAST–IN–PLACE CONCRETE

SCALE: 1:15

NOTES:

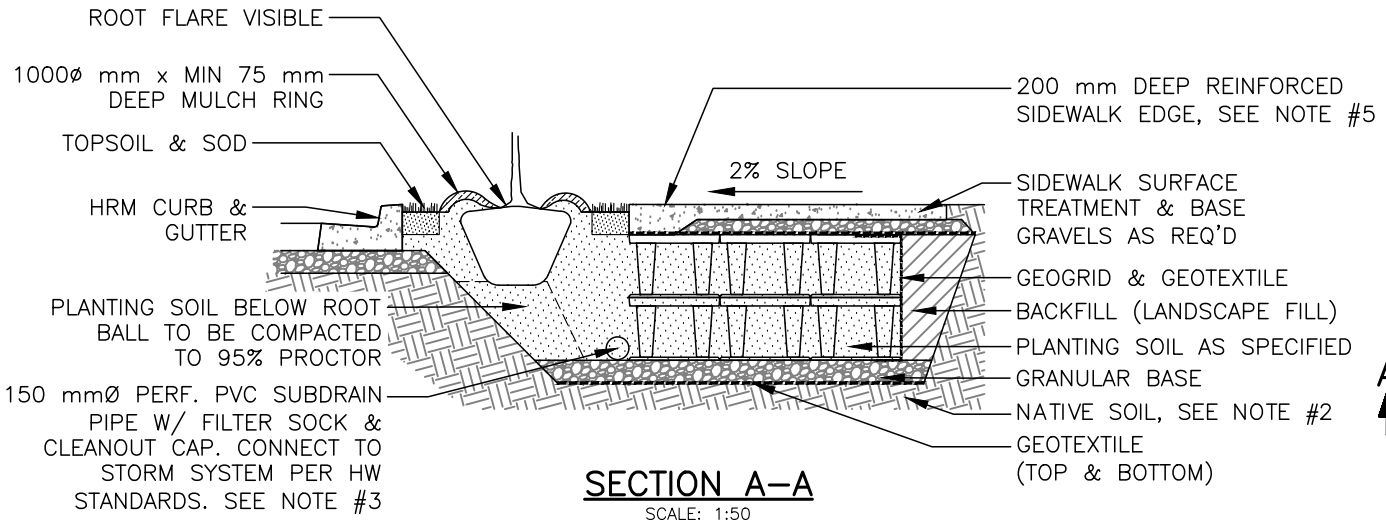
1. TREE GRATE & FRAME SYSTEM TO BE INSTALLED PER MFR SPEC. SUBMIT MANUFACTURER'S SHOP DRAWINGS FOR EACH PROJECT
2. SOIL CELL SYSTEM AND SURROUNDING PAVEMENT DESIGN MUST BE SIGNED AND SEALED BY THE ENGINEER OF RECORD, LICENSED IN THE PROVINCE OF NOVA SCOTIA AS A PROFESSIONAL ENGINEER IN GOOD STANDING
3. DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

HALIFAX

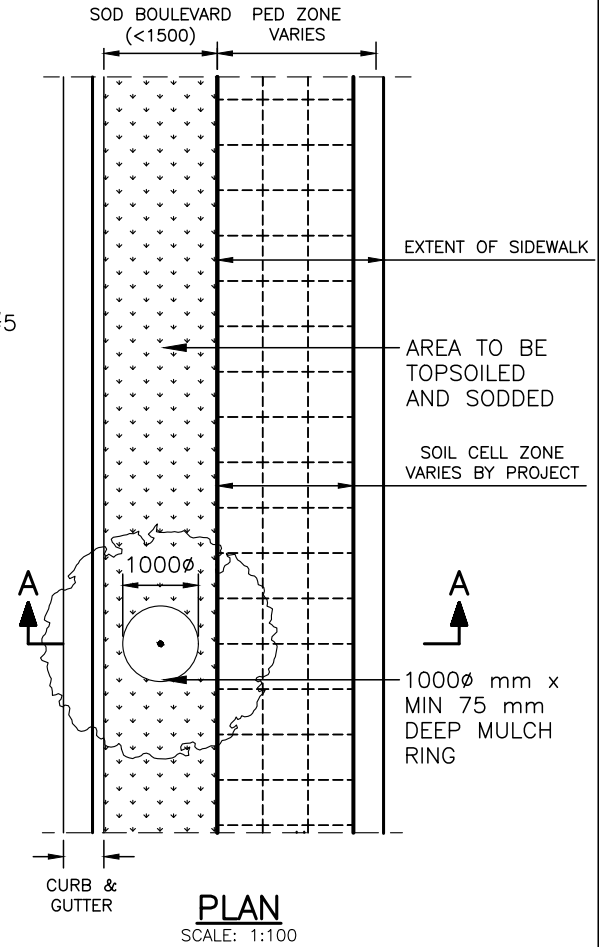
STANDARD DETAIL

TREE GRATE DETAILS

DATE: 2025	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 187



SECTION A–A
SCALE: 1:50



PLAN
SCALE: 1:100

NOTES:

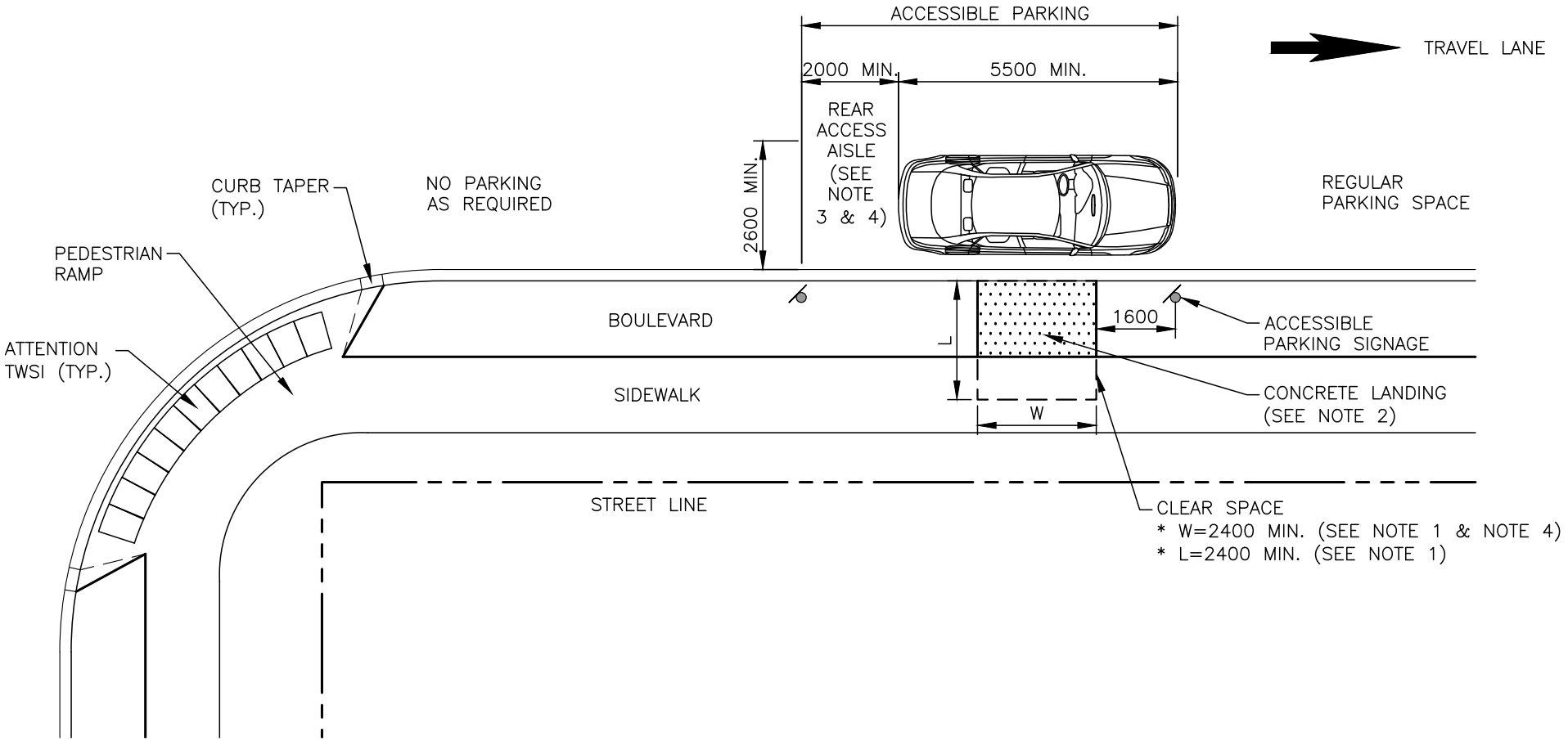
1. SOIL CELL SYSTEM, GEOTEXTILE, GEOGRID, AND GRANULAR BASE TO BE INSTALLED PER MANUFACTURER'S SPECIFCATION. SUBMIT SHOP DRAWINGS FOR EACH PROJECT PER REQUIREMENTS OF SPECIFICATION
2. NATIVE SOIL SHALL BE INSPECTED AND APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO PLACING AND COMPACTING GRANULAR BASE
3. SUBDRAIN REQUIRED WHERE THE NATIVE INFILTRATION RATE IS LESS THAN 15MM/HR (STANDARD ASSUMPTION) UNLESS SHOWN OTHERWISE THROUGH AN APPROVED TESTING METHOD – TYPICALLY GUELPH PERMEAMETER
4. WORK WITHIN 2 m OF UTILITY POLES REQUIRES ENGINEER STAMPED NON–DESTRUCTIVE HOLDING PLANS
5. SOIL CELL SYSTEM AND SURROUNDING PAVEMENT DESIGN MUST BE SIGNED AND SEALED BY THE ENGINEER OF RECORD, LICENSED IN THE PROVINCE OF NOVA SCOTIA AS A PROFESSIONAL ENGINEER IN GOOD STANDING
6. REFER TO SECTION A: MUNICIPAL DESIGN GUIDELINES FOR SOIL VOLUME REQUIREMENTS
7. DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

HALIFAX

STANDARD DETAIL

TREE IN SOD BOULEVARD WITH SOIL CELLS

DATE: 2025	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 188



NOTES:

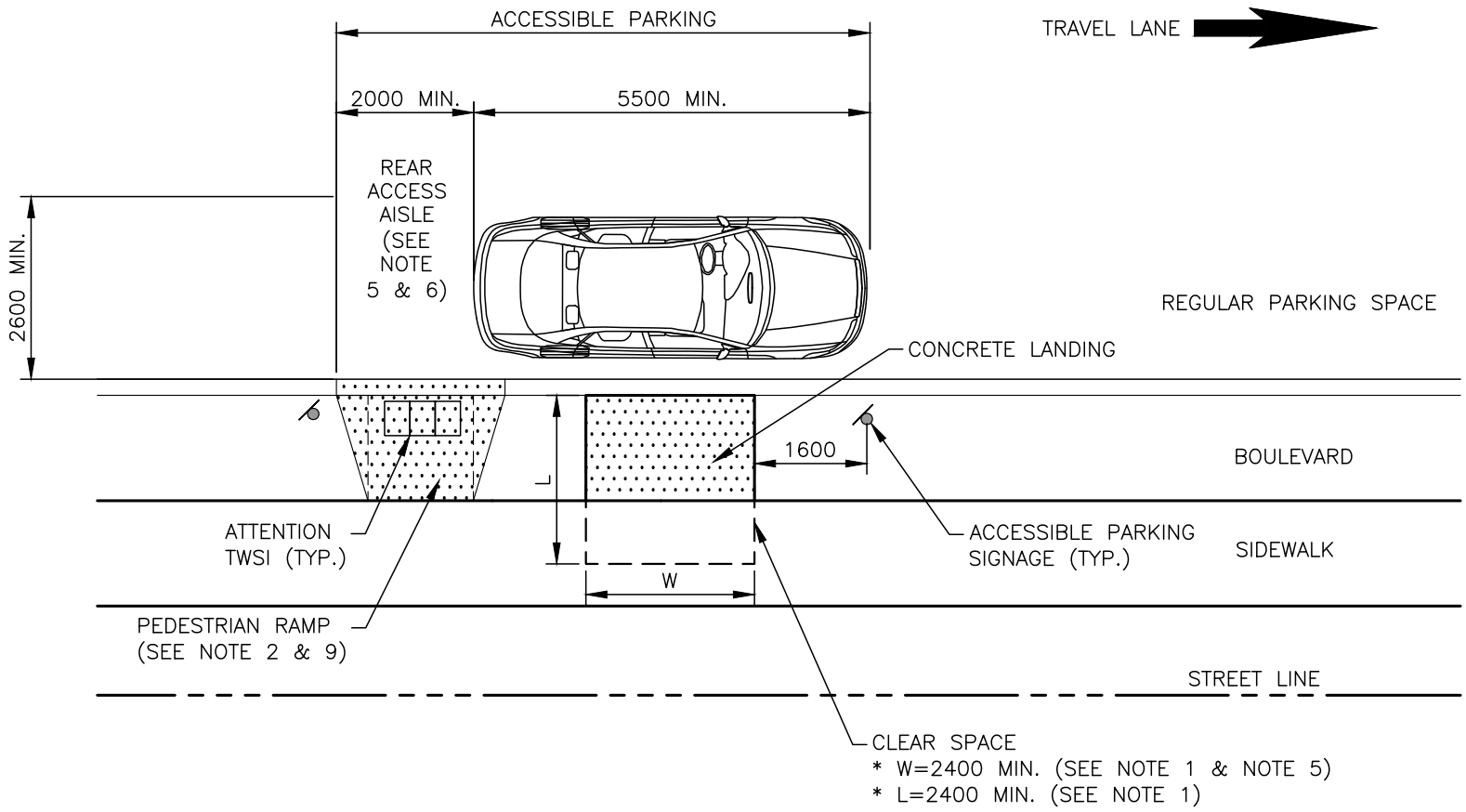
1. CLEAR SPACE SHALL BE PROVIDED WITH NO OBSTRUCTIONS AT PASSENGER SIDE DOOR LOCATIONS.
2. CONCRETE LANDING SHALL BE INSTALLED WITH NEW CONSTRUCTION, STREET/SIDEWALK REHABILITATION WHEN GRASS BOULEVARD SEPARATES PARKING AND ADJACENT SIDEWALK.
3. IN ABSENCE OF SIGN POST INSTALLATION, UNMARKED REAR ACCESS AISLE CAN BE REDUCED TO 1500 MIN WHERE 2000 MIN. IS NOT FEASIBLE.
4. IN RETROFIT SITUATIONS WHERE IT IS NOT TECHNICALLY FEASIBLE TO PROVIDE THE REQUIRED WIDTH FOR THE REAR ACCESS AISLE OR CLEAR SPACE LENGTH DUE TO TREE OR UTILITY POLE LOCATIONS, WIDTH MAY BE REDUCED TO 1500 MIN.
5. WHERE SIDEWALK ABUTS THE CURB THE ADJACENT SIDEWALK SHALL BE 2400 MINIMUM WIDTH.
6. FOR USE ONLY WITHIN 20 METRES OF AN ACCESSIBLE PEDESTRIAN RAMP, AT THE DIRECTION OF THE ENGINEER.
7. ALL DIMENSION ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

ACCESSIBLE PARALLEL PARKING BEGINNING OF BLOCK

DATE: 2025	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 193



NOTES:

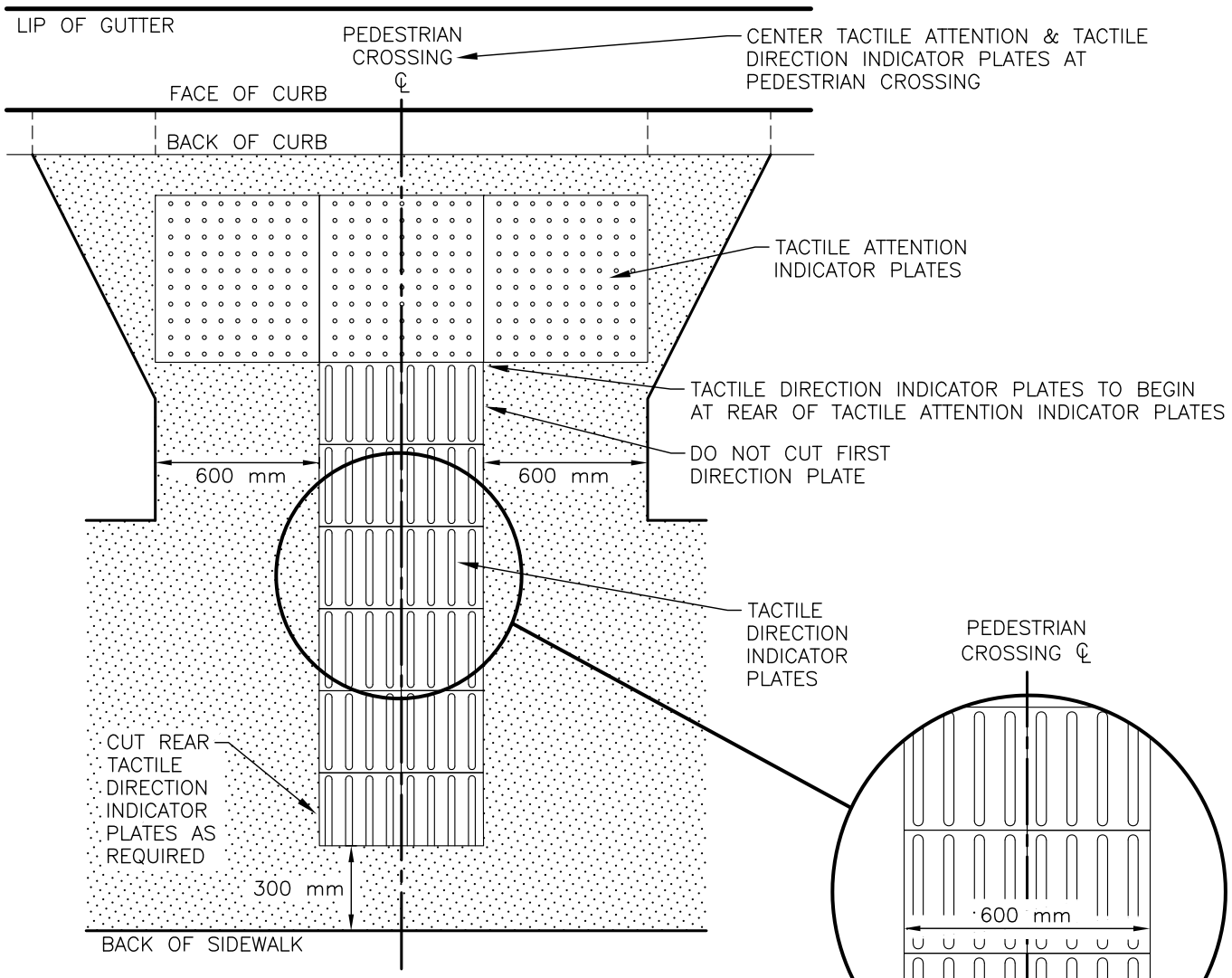
1. CLEAR SPACE SHALL BE PROVIDED WITH NO OBSTRUCTIONS AT PASSENGER SIDE DOOR LOCATIONS.
2. REFER TO HRM DETAIL 49 FOR CURB RAMP DETAILS.
3. TACTILE ATTENTION INDICATOR PLATES (TWSI) REQUIRED AT ALL NEW RAMPS AS PER HRM DETAIL 131.
4. CONCRETE LANDING SHALL BE INSTALLED WITH NEW CONSTRUCTION, STREET/SIDEWALK REHABILITATION WHEN GRASS BOULEVARD SEPARATES PARKING AND ADJACENT SIDEWALK.
5. IN RETROFIT SITUATIONS WHERE IT IS NOT TECHNICALLY FEASIBLE TO PROVIDE THE REQUIRED WIDTH FOR THE REAR ACCESS AISLE OR CLEAR SPACE LENGTH DUE TO TREE OR UTILITY POLE LOCATIONS, WIDTH MAY BE REDUCED TO 1500 MIN.
6. IN ABSENCE OF SIGN POST INSTALLATION, UNMARKED REAR ACCESS AISLE CAN BE REDUCED TO 1500 MIN WHERE 2000 MIN IS NOT FEASIBLE.
7. WHEN DRIVEWAY USED AS SIDEWALK ACCESS INSTEAD OF CURB RAMP, NO TWSI PLATES SHALL BE REQUIRED.
8. WHERE SIDEWALK ABUTS THE CURB THE ADJACENT SIDEWALK SHALL BE 2400 MINIMUM WIDTH.
9. SINGLE PEDESTRIAN RAMP CAN SERVE NO MORE THAN THREE ACCESSIBLE PARKING SPOTS.
10. ALL DIMENSION ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

ACCESSIBLE PARALLEL PARKING MID-BLOCK AND END OF BLOCK

DATE: 2025	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 194



PLAN VIEW

INSET

NOTE:

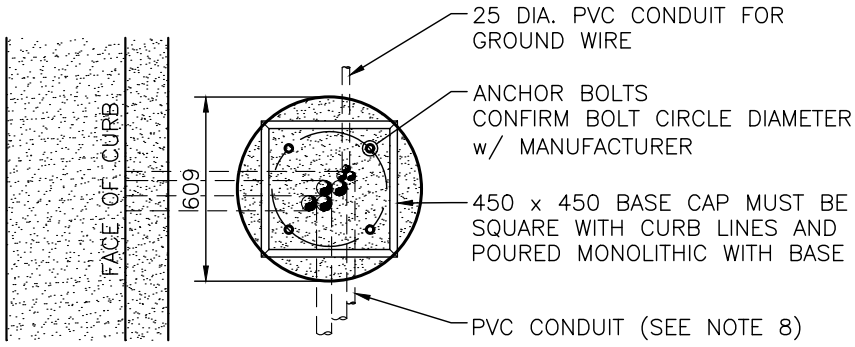
1. NATURAL CAST IRON DIRECTION TWSI (TACTILE WALKING SURFACE INDICATOR) PLATES TO CSA B651 (LATEST EDITION) AND AS INDICATED IN THE PROJECT DOCUMENTS.
2. APPLICATION OF TACTILE DIRECTION INDICATOR PLATES SHALL BE APPROVED BY THE ENGINEER.
3. NO GAP BETWEEN ADJACENT PLATES.
4. PLATES SHALL BE INSTALLED LEVEL TO MATCH THE SLOPE OF THE SURROUNDING CONCRETE SIDEWALK AND WITH THE TOP OF THE BASE PLATE (BOTTOM OF ELONGATED FLAT–TOP BAR SURFACE) AT THE SAME HEIGHT.
5. WHERE PLACED ACROSS FROM AN ACCESSIBLE PATH OF TRAVEL TACTILE DIRECTION INDICATOR PLATES TO BE TOTAL WIDTH OF 600 mm.
6. WHERE PLACED, CONCRETE THICKNESS FOR TACTILE DIRECTION INDICATOR PLATES TO BE 150 mm THICK.
7. TACTILE ATTENTION INDICATOR PLATES AS PER HRM STANDARD DETAIL 131.
8. TACTILE DIRECTION INDICATOR PLATES SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
9. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

HALIFAX

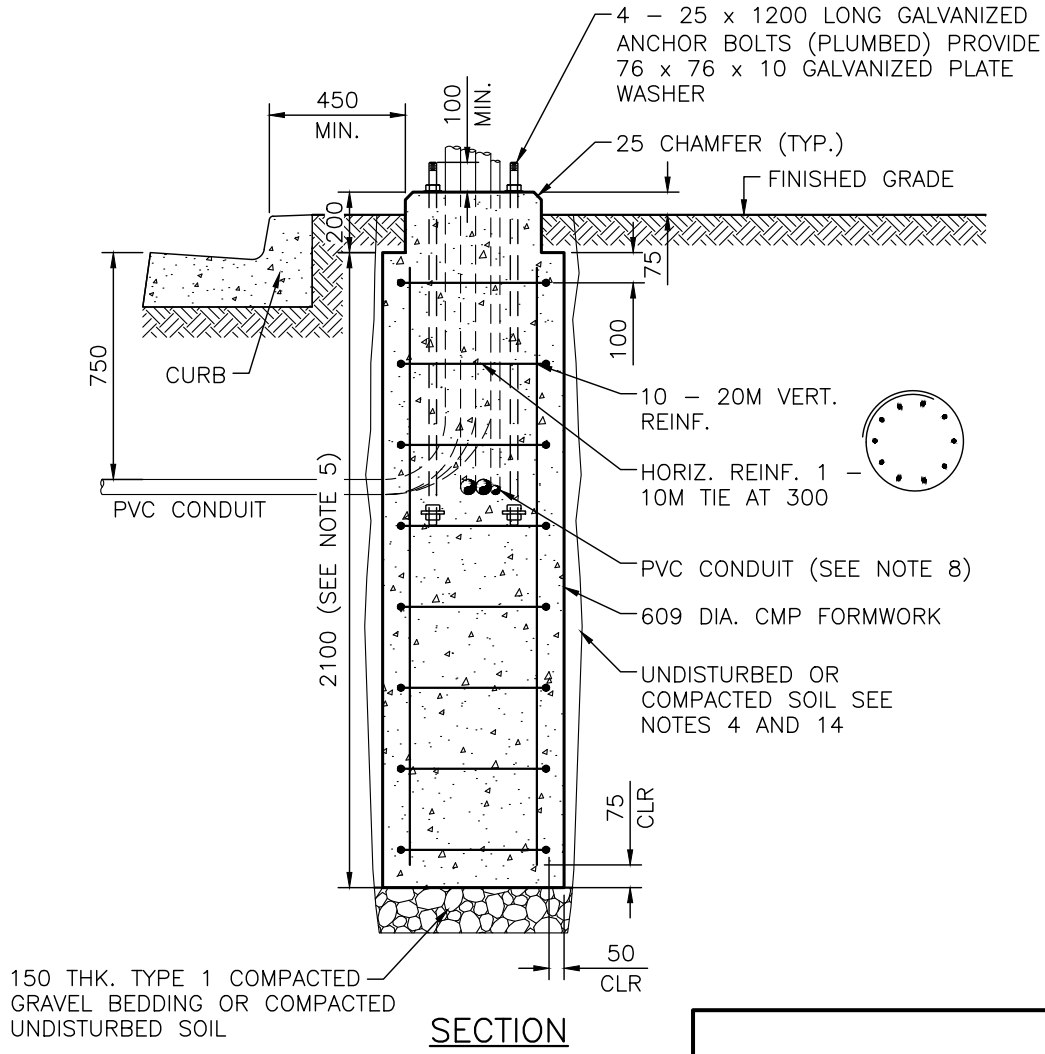
STANDARD DETAIL

TACTILE DIRECTION INDICATOR PLATE PLACEMENT

DATE: 2025	REFERENCE	APPROVED
SCALE: N.T.S.		FIG No.: HRM 199



PLAN



SECTION

NOTES:

1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N1.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION A

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 68

NOTES FOR SHAFT FOUNDATIONS ONLY:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN.

2. CONCRETE 28 DAY STRENGTH TO BE 35 MPa, CLASS OF EXPOSURE 'C1', AIR CONTENT 5 – 8%.

3. ENGINEER TO CONFIRM SOIL PARAMETERS BEFORE PROCEEDING WITH WORK.

4. DESIGN IS FOR DRY SOIL CONDITIONS (NO GROUND WATER TABLE) WITH A MINIMUM γ_{SOIL} = 18 kN/m³, Kp = 3.5, ø = 34°.

5. WHERE SOUND BEDROCK IS ENCOUNTERED, FOUNDATION CONSTRUCTION MAY BE MODIFIED TO USE ROCK ANCHORS DOWELED INTO ROCK. REFER TO DRAWING No. 74B.1 AND 74B.2.

6. ANCHORS TO BE MINIMUM GRADE A307, PLATE WASHERS MINIMUM GRADE 300W.

7. CONTRACTOR TO CONFIRM ANCHOR BOLT DIAMETER, LENGTH AND BOLT CIRCLE PRIOR TO PROCEEDING WITH WORK.

8. PROPOSED PVC CONDUIT SIZE AND CONFIGURATION INDICATED ON DRAWINGS. CONDUITS ARE ASSUMED TO BE "BUNCHED" AND IN CENTRE OF PEDESTAL. FOR PEDESTAL WITH NOMINAL DIAMETER OF D–NOM, DIAMETER OF "BUNCHED" CONDUIT AT TOP OF CONCRETE SHALL BE D–B MAXIMUM. IF "BUNCHED" DIAMETER AT TOP OF CONCRETE IS GREATER THAN D–B, USE D–ADJ DIA. PEDESTAL.

D–NOM	D–B	D–ADJ
609	150	762
762	250	914
914	300	1067

9. CONCRETE MUST BE PLACED IN A SINGLE POUR.

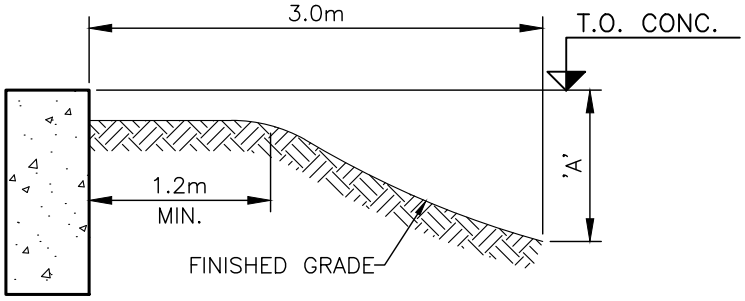
10. EMBEDMENT DEPTH OF THE FOUNDATION WAS DERIVED FROM THE ONTARIO MINISTRY OF TRANSPORTATION ENGINEERING STANDARDS BRANCH – GUIDELINES FOR THE DESIGN OF HIGH MAST POLE FOUNDATIONS, 4TH Ed. 2004.

11. TORSIONAL RESISTANCE OF THE FOUNDATION WAS COMPLETED BASED ON BROM'S TORSION LOADING ANALYSIS OF SHORT SINGLE SHAFT FOUNDATIONS.

12. RESIDUAL FRICTIONAL COEFFICIENT (μ) BETWEEN THE CIRCUMFERENCE OF THE FOUNDATION AND SOIL IS TO BE 0.3.

13. WHERE FINISHED GRADE IS LOWER NEAR POLE BASE, HEIGHT OF FOUNDATION TO BE INCREASED AS FOLLOWS:

- 'A' UP TO 0.3m, NO INCREASE.
- 'A' UP TO 0.6m, INCREASE HEIGHT BY 0.2m.
- 'A' UP TO 1.0m, INCREASE HEIGHT BY 0.4m.



14. ENSURE FULLY COMPACTED SOIL AROUND FOUNDATION.

HALIFAX

STANDARD DETAIL

STANDARD NOTES SHAFT FOUNDATIONS

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 68N1

NOTES FOR SPREAD FOUNDATIONS ONLY:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN.

2. CONCRETE 28 DAY STRENGTH TO BE 35 MPa, CLASS OF EXPOSURE 'C1', AIR CONTENT 5 – 8%.

3. ENGINEER TO CONFIRM SOIL PARAMETERS BEFORE PROCEEDING WITH WORK.

4. DESIGN IS FOR DRY SOIL CONDITIONS (NO GROUND WATER TABLE) WITH A MINIMUM γ_{SOIL} = 18 kN/m^3, Kp = 3.5, ϕ = 34°.

5. WHERE SOUND BEDROCK IS ENCOUNTERED, FOUNDATION CONSTRUCTION MAY BE MODIFIED TO USE ROCK ANCHORS DOWELED INTO ROCK. REFER TO DRAWING No. 74B.1 AND 74B.2.

6. ANCHORS TO BE MINIMUM GRADE A307, PLATE WASHERS MINIMUM GRADE 300W.

7. CONTRACTOR TO CONFIRM ANCHOR BOLT DIAMETER, LENGTH AND BOLT CIRCLE PRIOR TO PROCEEDING WITH WORK.

8. PROPOSED PVC CONDUIT SIZE AND CONFIGURATION INDICATED ON DRAWINGS. CONDUITS ARE ASSUMED TO BE "BUNCHED" AND IN CENTRE OF PEDESTAL. FOR PEDESTAL WITH NOMINAL DIAMETER OF D–NOM, DIAMETER OF "BUNCHED" CONDUIT AT TOP OF CONCRETE SHALL BE D–B MAXIMUM. IF "BUNCHED" DIAMETER AT TOP OF CONCRETE IS GREATER THAN D–B, USE D–ADJ DIA. PEDESTAL.

D–NOM	D–B	D–ADJ
609	150	762
762	250	914
914	300	1067

9. FOOTINGS SHALL BEAR ON UNDISTURBED SOIL, STRUCTURAL FILL OR BEDROCK WITH A MINIMUM SERVICEABILITY LIMIT STATES (SLS) BEARING CAPACITY OF 150kPa AND A MINIMUM ULTIMATE LIMIT STATES (ULS) BEARING CAPACITY OF 250kPa.

10. TORSIONAL RESISTANCE ANALYSIS WAS COMPLETED CONSIDERING PASSIVE SOIL PRESSURE AT THE VERTICAL FACE OF THE FOOTINGS AND A FRICTION (μ) BETWEEN THE UNDERSIDE OF THE FOOTING AND SOIL OF 0.4.

11. FINISHED GRADE ELEVATIONS SHALL NOT VARY MORE THAN 150mm OVER A DISTANCE EQUAL TO TWICE THE EMBEDMENT DEPTH.

12. AFTER CONSTRUCTION, CUT OFF TOP OF CMP FORMWORK TO 150mm BELOW FINISHED GRADE.

HALIFAX

STANDARD DETAIL

STANDARD NOTES SPREAD FOOTINGS

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 68N2

TRAFFIC SIGNAL POLE BASE DESIGN SELECTION GUIDE FOR TYPE OF POLE BASE MAXIMUM DESIGN CRITERIA USED FOR DIFFERENT TYPES OF POLE BASES

CONFIGURATION	POLE TYPE			TRAFFIC SIGNAL EQUIPMENT				PEDESTRIAN HEADS	STREET LIGHTING	SIGNAGE AREA (m^2)	POLE BASE DESIGN TYPE	HRM STANDARD DETAIL NO.
				MAST ARMS			SIGNAL HEADS (PER POLE)					
	MATERIAL	BASE DIA. (mm)	TOTAL HEIGHT (m) (SEE NOTE 4)	NO.	LENGTH (m)	ORIENTATION						
A	ALUM.	203	5.2	0	N.A.	N.A.	2	2	1@0.4	0	1	68
B	ALUM.	203	5.8	1	4.6	N.A.	2	2	NONE	0.7	2	69
C	ALUM.	203	5.8	2	4.6, TOTAL	180°	2	2	NONE	0.7	2	69
D	ALUM.	203	5.8	2	3.1 EACH	90°	2	2	NONE	0.7	2	69
E	ALUM.	254	8.2	0	N.A.	N.A.	0	0	2@1.85	0	2	69
F	ALUM.	254	6.7	1	6.1	N.A.	2	2	NONE	0.7	3	70
G	ALUM.	254	6.7	2	6.1, TOTAL	180°	2	2	NONE	0.7	3	70
H	ALUM.	254	6.7	2	3.6 EACH	90°	2	2	NONE	0.7	3	70
I	ALUM.	254	6.7	1	7.6	N.A.	2	2	NONE	0.7	4	71
J	ALUM.	254	6.7	2	7.6, TOTAL	180°	2	2	NONE	0.7	4	71
K	ALUM.	254	6.7	2	4.6 EACH	90°	2	2	NONE	0.7	4	71
L	ALUM.	254	11.3	0	N.A.	N.A.	3	2	2@1.85	0	4	71
M	ALUM.	254	9.7	1	7.6	N.A.	2	2	1@1.8	0.7	4A	71A
N	STEEL	254	6.1	1	12.2	N.A.	4	2	NONE	0.7	5	72
O	STEEL	254	6.1	2	12.2, TOTAL	180°	5	2	NONE	0.7	5	72
P	STEEL	254	6.1	2	7.6 EACH	90°	5	2	NONE	0.7	5	72
Q	STEEL	343	10.7	1	12.2	N.A.	4	2	2@3.6m	0.7	5A	72A
R	STEEL	343	10.7	2	12.2, TOTAL	180°	5	2	2@3.6m	0.7	5A	72A
S	STEEL	343	10.7	2	7.6 EACH	90°	5	2	2@3.6m	0.7	5A	72A
T	STEEL	343	6.1	1	18.3	N.A.	4	2	NONE	0.7	6	73
U	STEEL	343	6.1	2	18.3, TOTAL	180°	5	2	NONE	0.7	6	73
V	STEEL	343	6.1	2	10.7 EACH	90°	5	2	NONE	0.7	6	73
W	STEEL	343	10.7	1	18.3	N.A.	4	2	2@3.6m	0.7	6A	73A
X	STEEL	343	10.7	2	18.3, TOTAL	180°	5	2	2@3.6m	0.7	6A	73A
Y	STEEL	343	10.7	2	10.7 EACH	90°	5	2	2@3.6m	0.7	6A	73A
Z	STEEL	343	6.1	1	21.3	N.A.	4	2	NONE	0.7	7	74
AA	STEEL	343	6.1	2	21.3, TOTAL	180°	5	2	NONE	0.7	7	74
AB	STEEL	343	6.1	2	12.2 EACH	90°	5	2	NONE	0.7	7	74
AC	STEEL	343	10.7	1	21.3	N.A.	4	2	2@3.6m	0.7	7A	74A
AD	STEEL	343	10.7	2	21.3, TOTAL	180°	5	2	2@3.6m	0.7	7A	74A
AE	STEEL	343	10.7	2	12.2 EACH	90°	5	2	2@3.6m	0.7	7A	74A
AF	ALUM.	254	13.4	0	N.A.	N.A.	0	0	2@3.6m	0.7	8	74X

NOTES

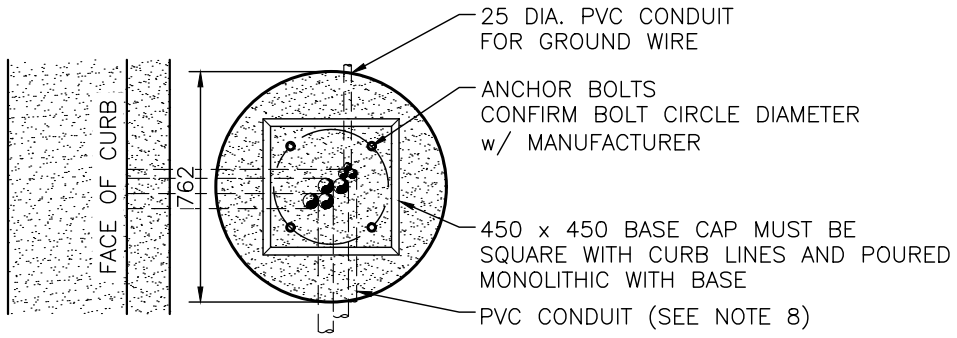
1. REFER TO HALIFAX STANDARD DRAWINGS 68 TO 74X FOR ADDITIONAL NOTES AND DESIGN CRITERIA.
2. SEE STANDARD DRAWING NO. HRM 74B FOR REVISED POLE BASE FOUNDATION DESIGN WHICH MAY BE PERMITTED IN ROCK CONDITIONS.
3. TRAFFIC SIGNAL POLE DESIGN CRITERIA MAY DIFFER FROM THAT AS SHOWN ON THIS TABLE. SHOULD THIS OCCUR, DESIGN ENGINEER SHALL BE CONSULTED FOR INTERPRETATION OF TABLE AND SELECTION OF POLE BASE TYPE, OR ADDITIONAL DESIGN IF REQUIRED.
4. TOTAL POLE HEIGHT INDICATED INCLUDES A 0.61 m HIGH TRANSFORMER BASE.

HALIFAX

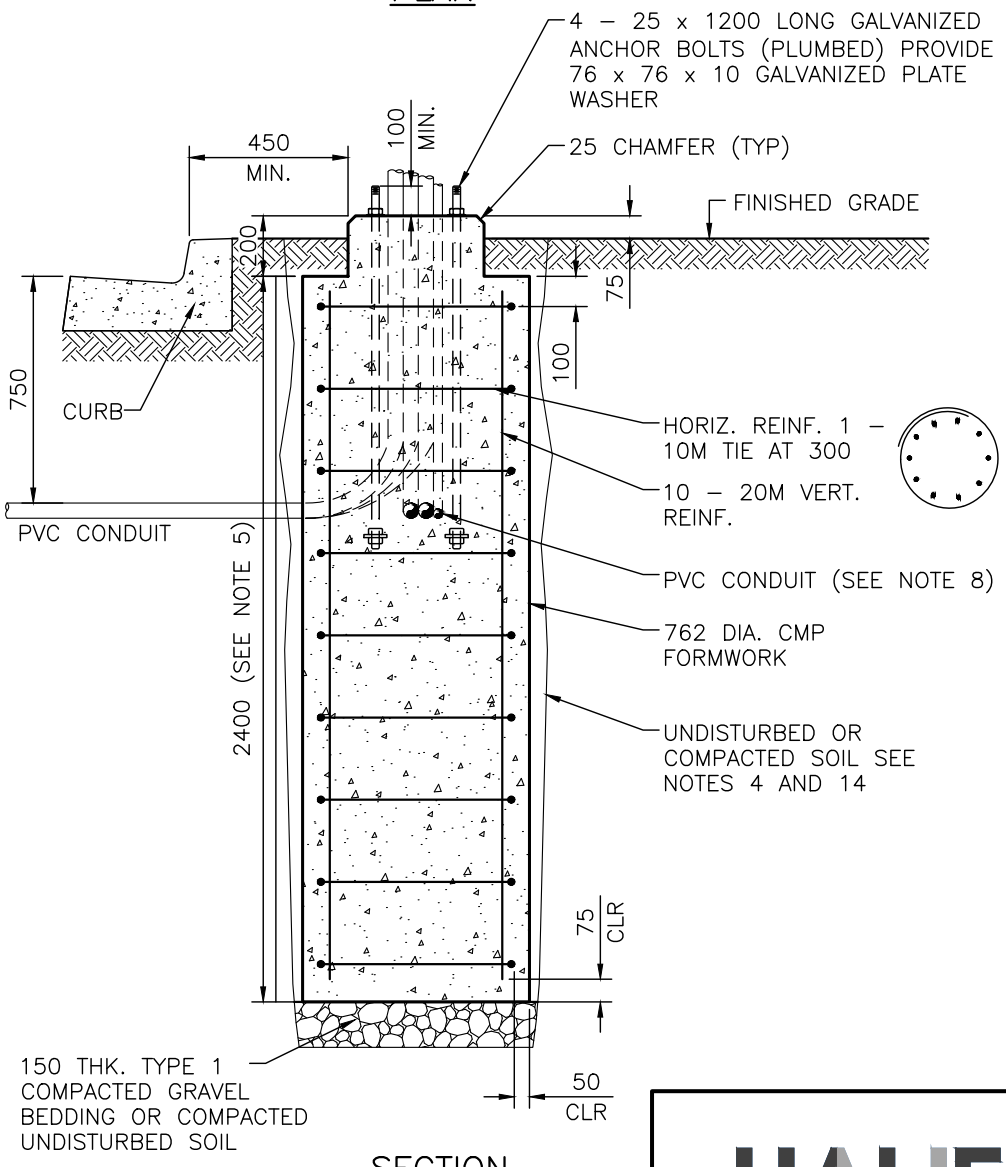
STANDARD DETAIL

POLE BASE SELECTION GUIDE

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 68N3



PLAN



SECTION

NOTES:

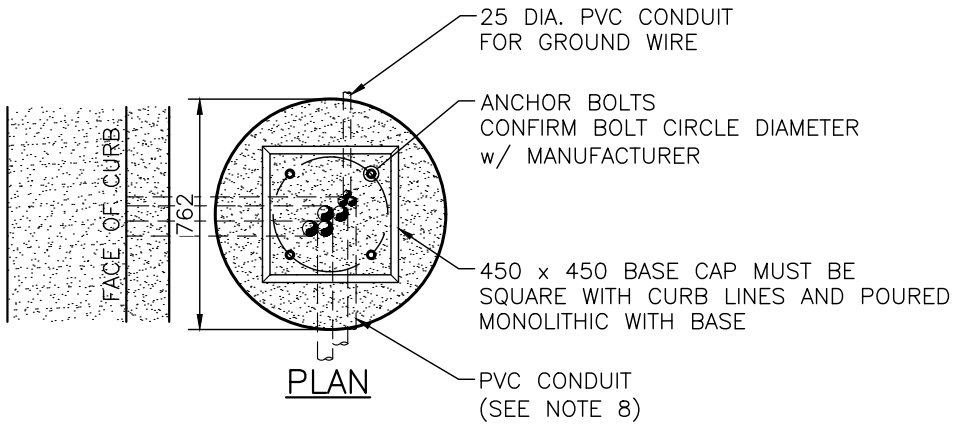
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N1.
3. DIMENSIONS ARE IN MILLIMETRES.

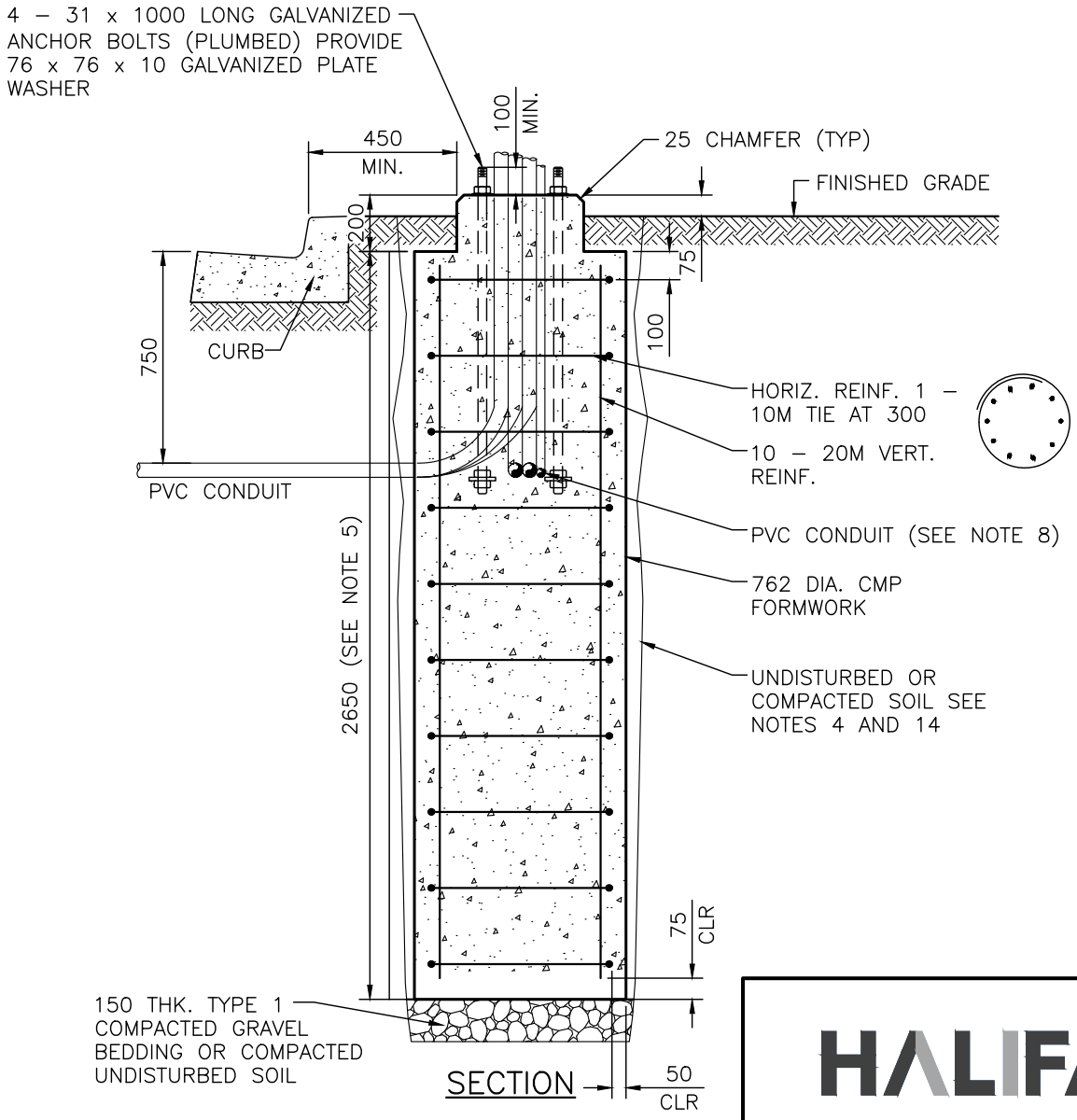
HALIFAX

STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATIONS B, C, D AND E

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 69





NOTES:

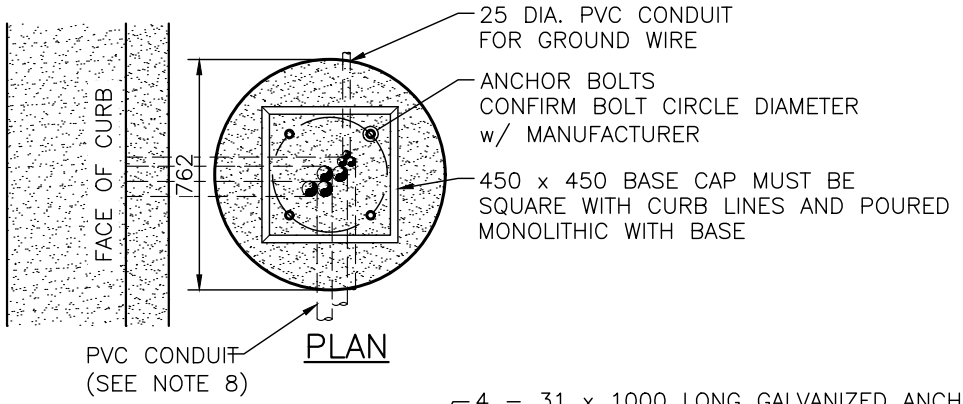
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N1.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

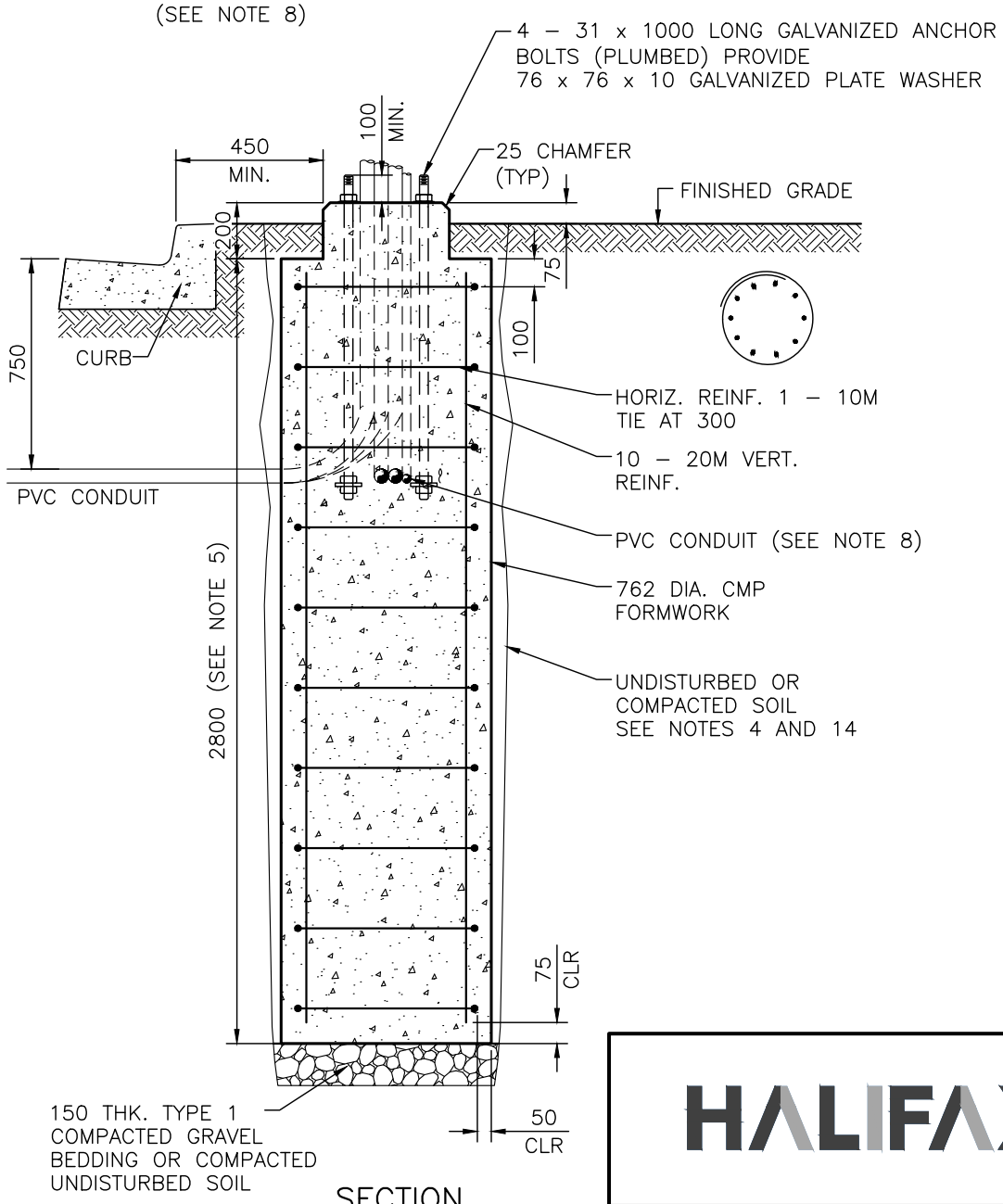
STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATIONS F, G AND H

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 70



PLAN



SECTION

NOTES:

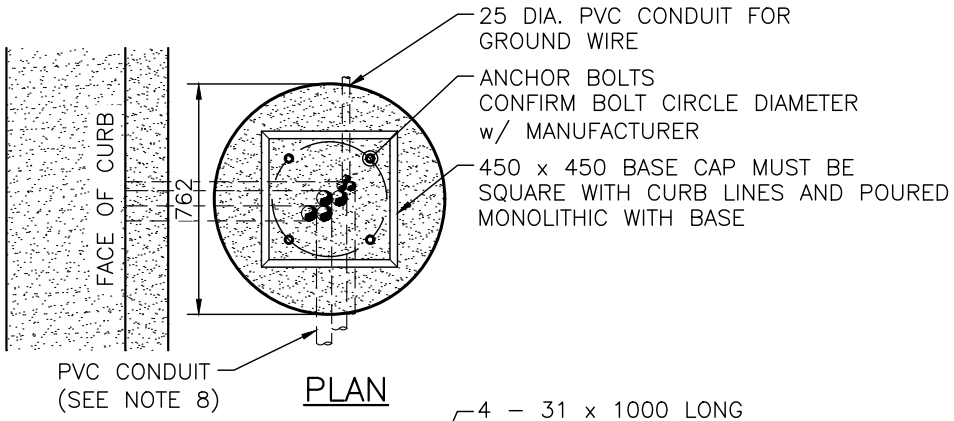
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N1.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

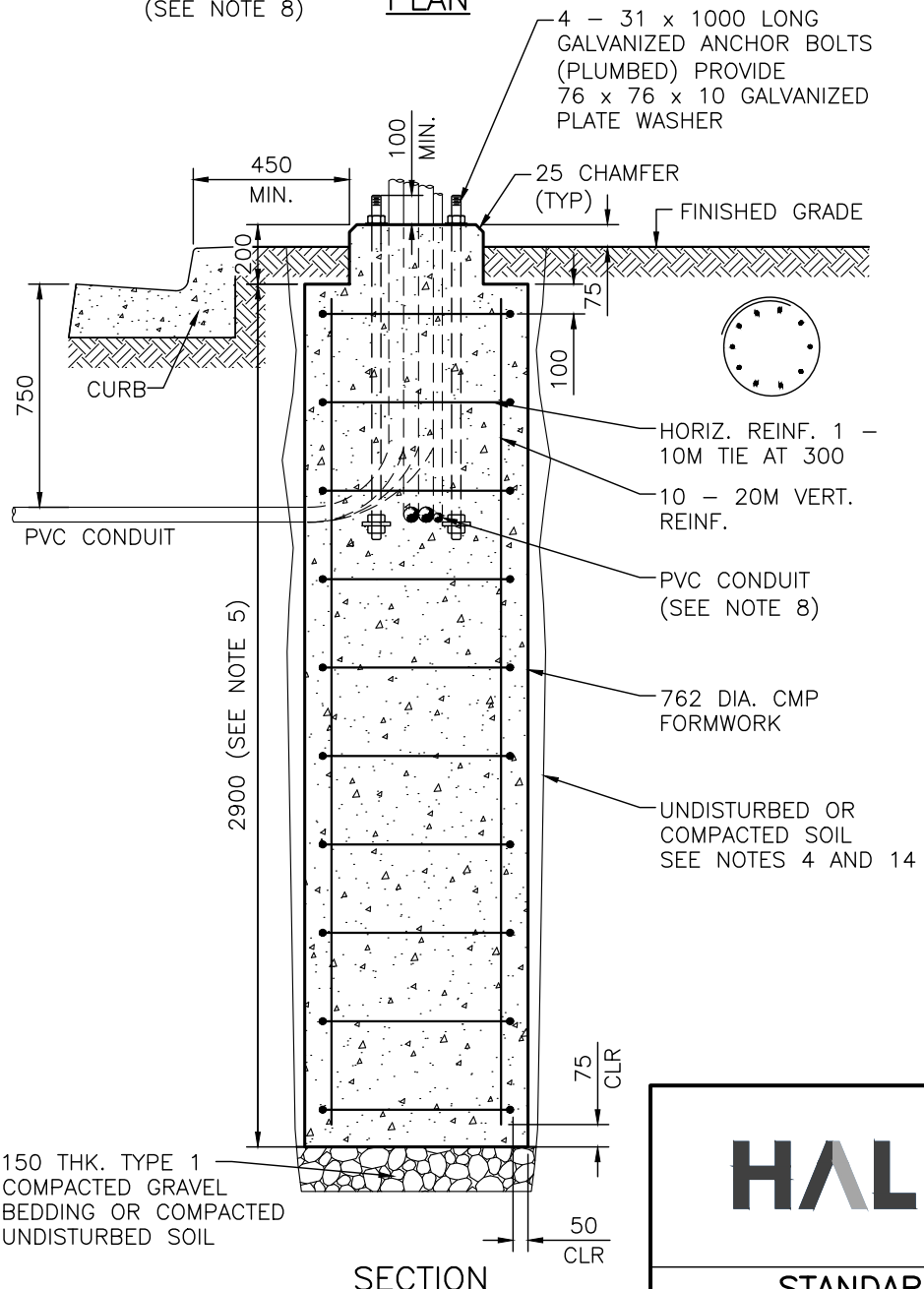
STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION I, J. K AND L

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 71



PLAN



SECTION

NOTES:

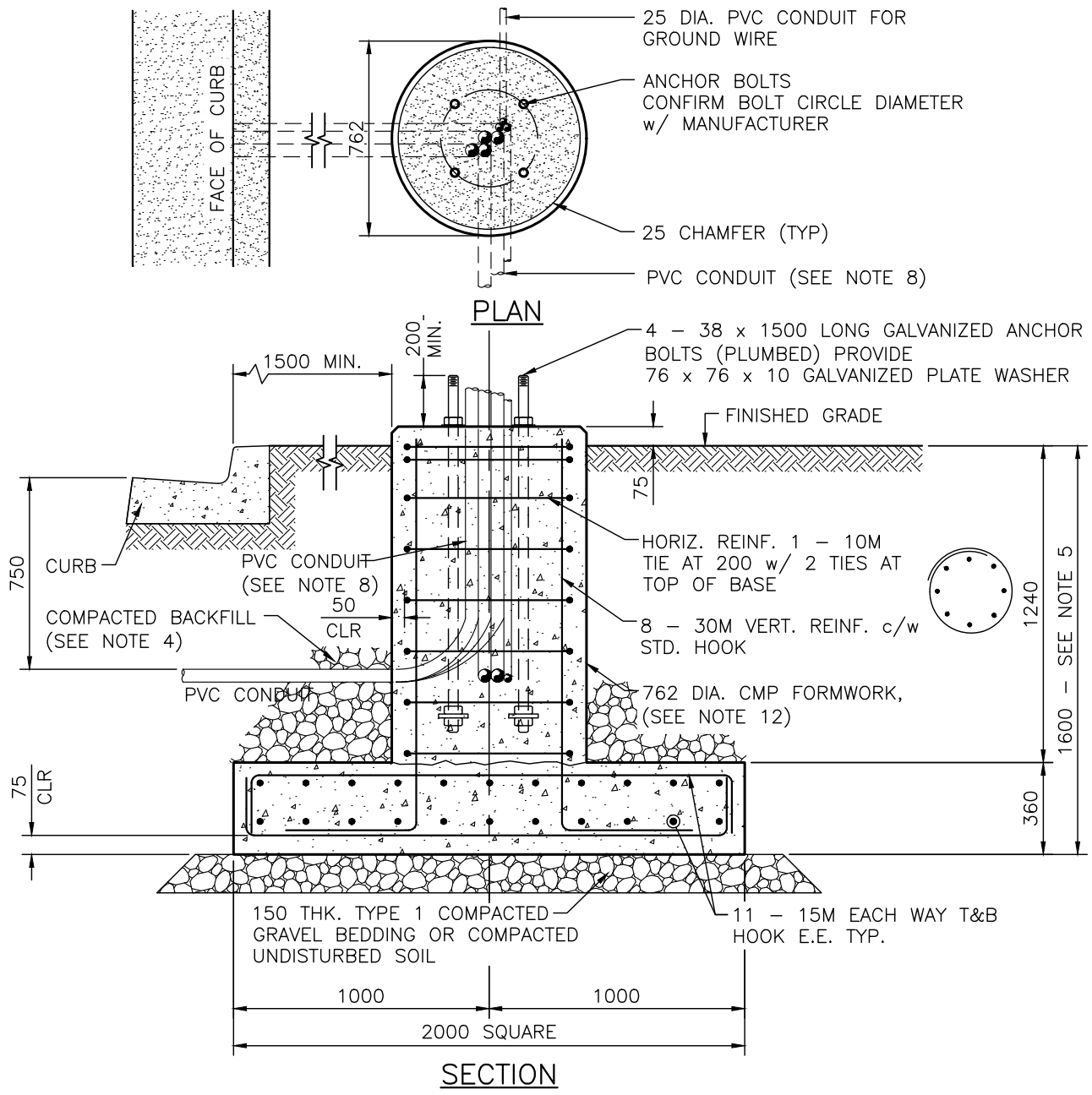
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N1.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION M

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 71A



NOTES:

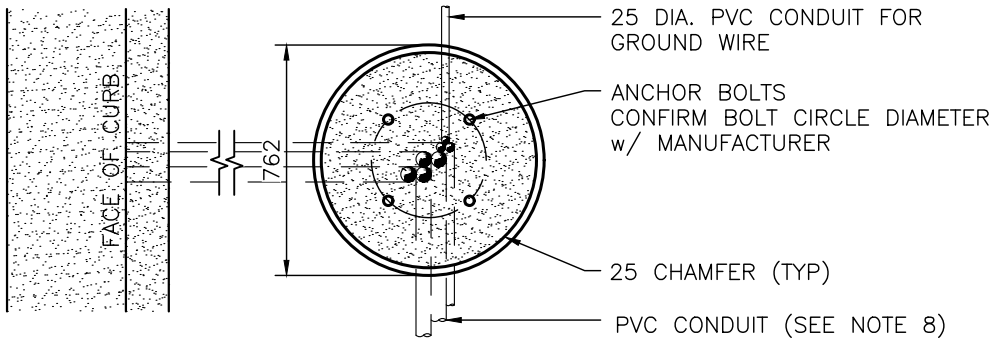
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N2.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

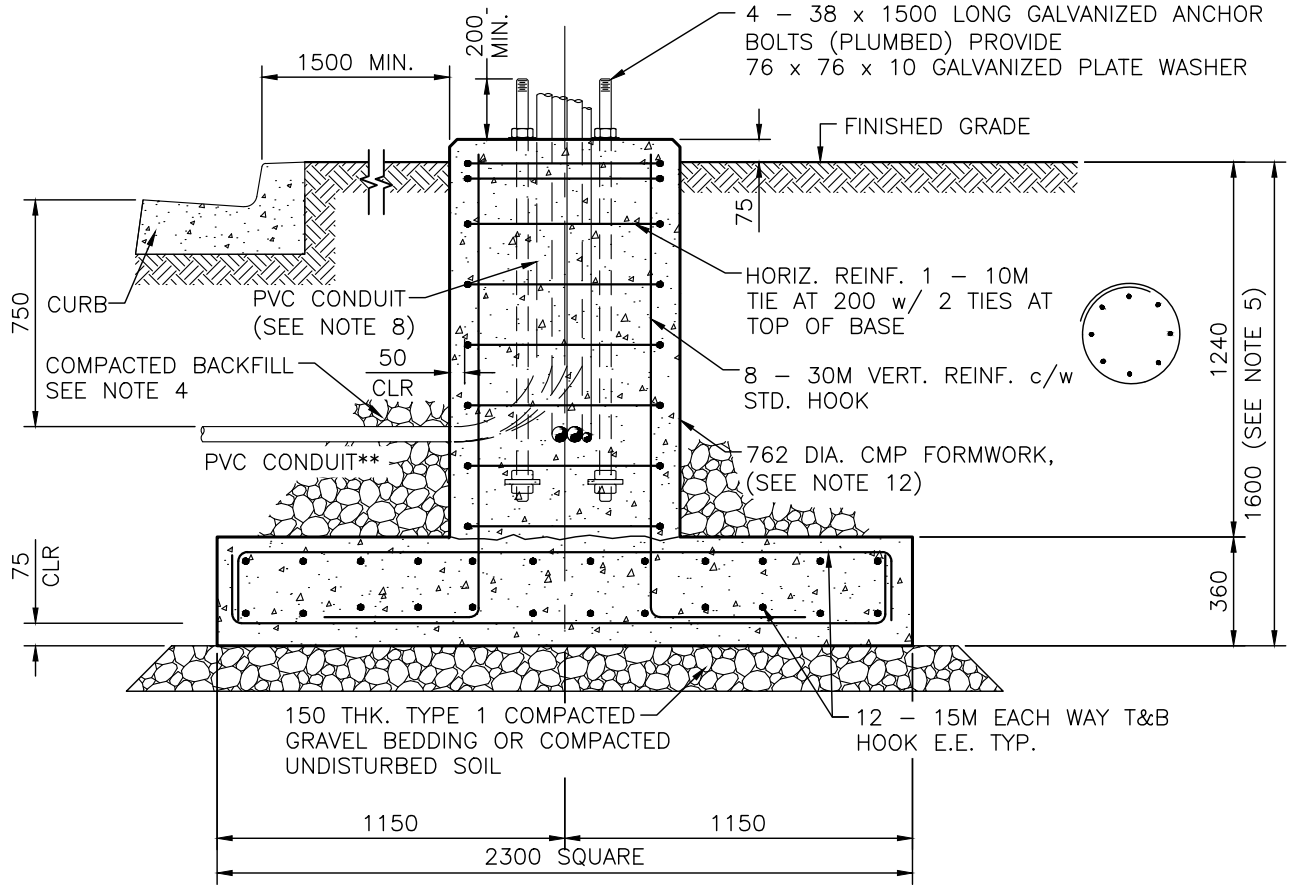
STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION N, O AND P

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 72



PLAN



SECTION

NOTES:

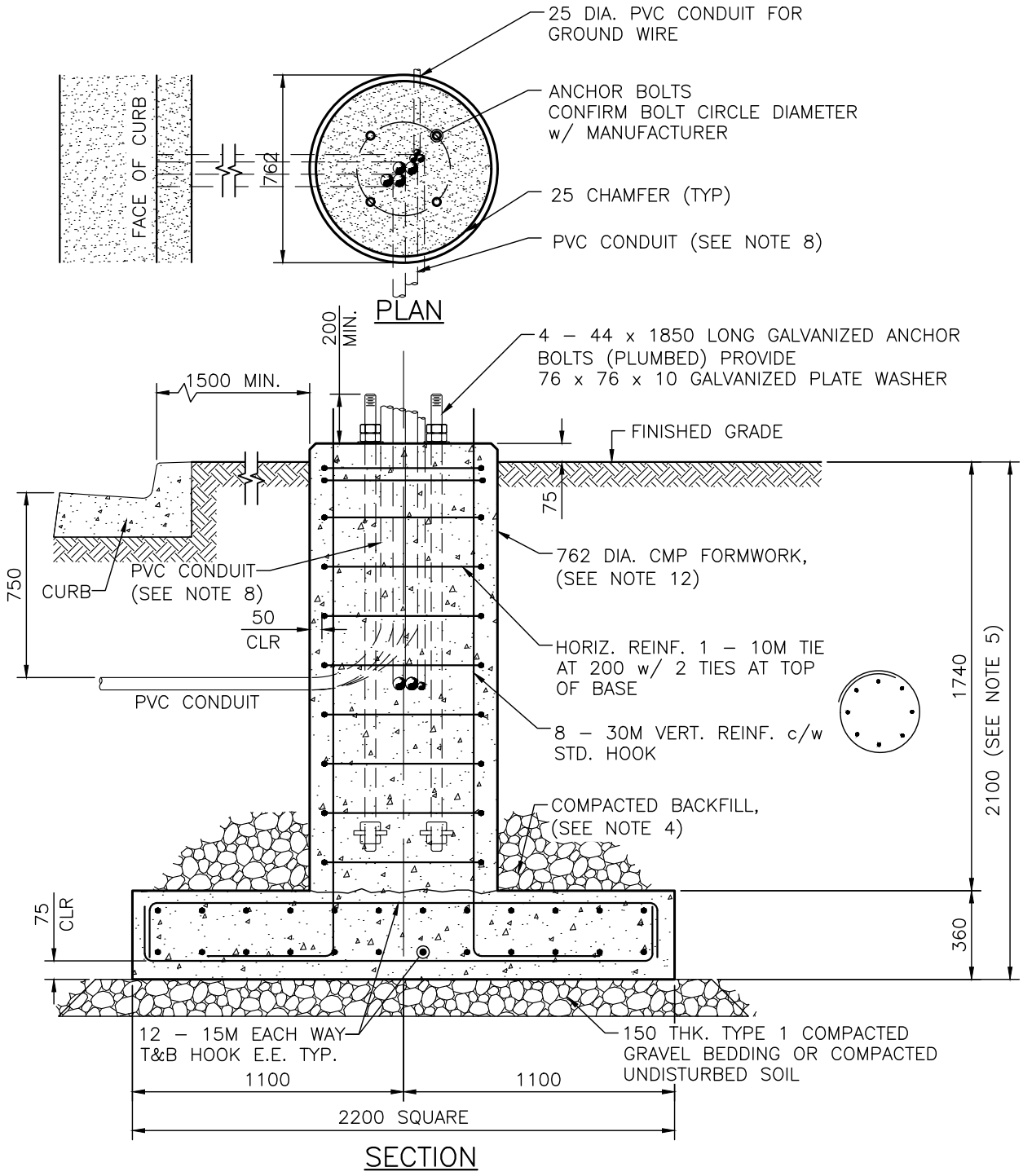
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N2.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION Q, R AND S

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 72A



NOTES:

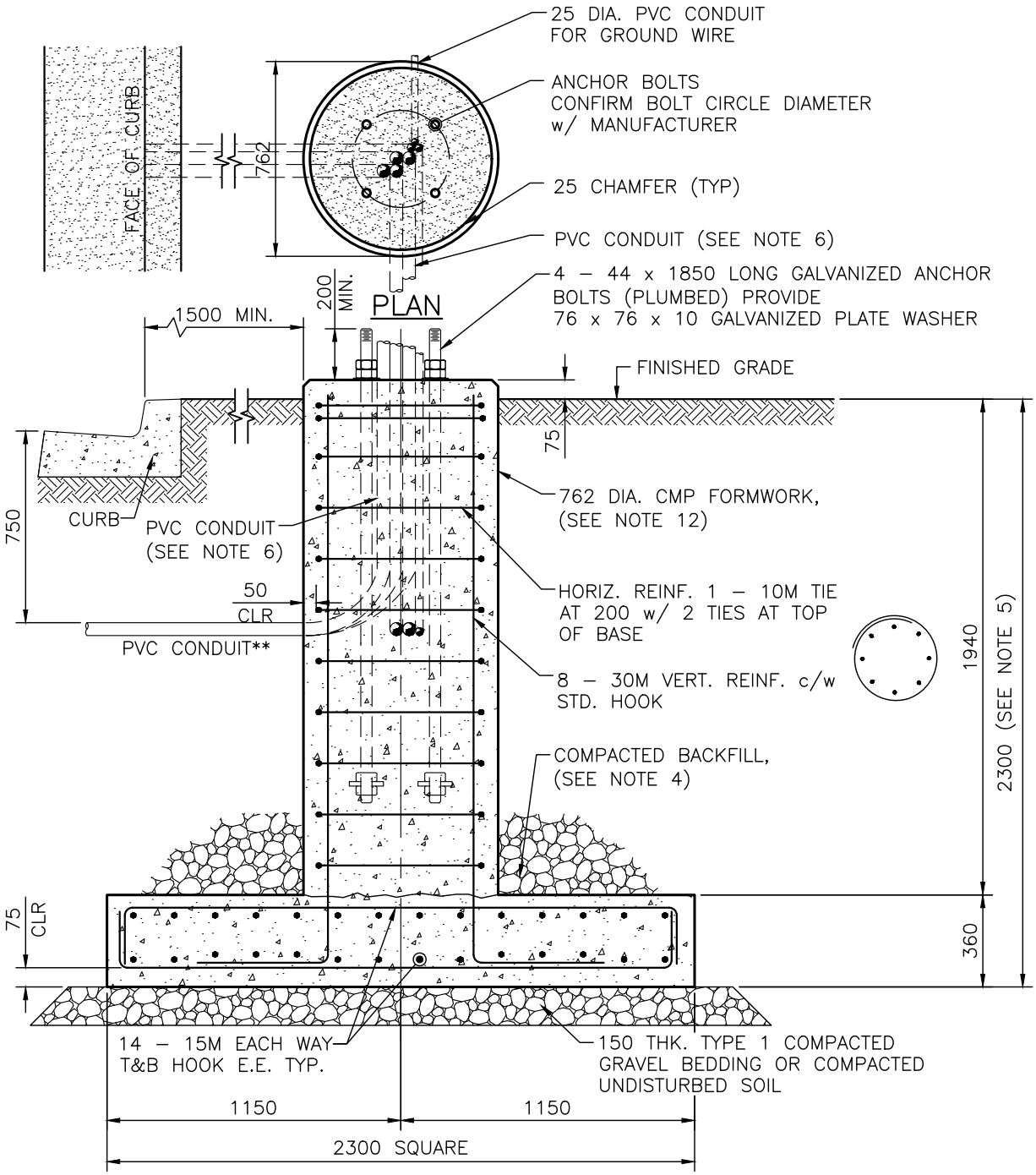
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N2.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION T, U AND V

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 73



SECTION

NOTES:

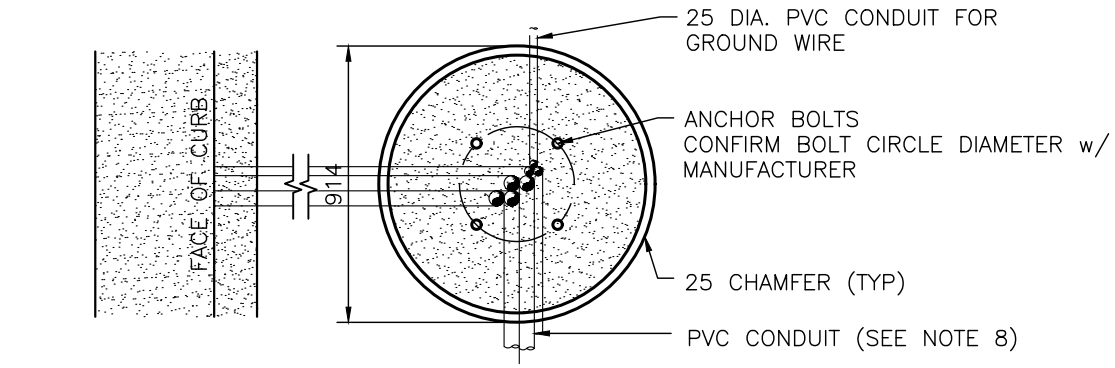
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N2.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

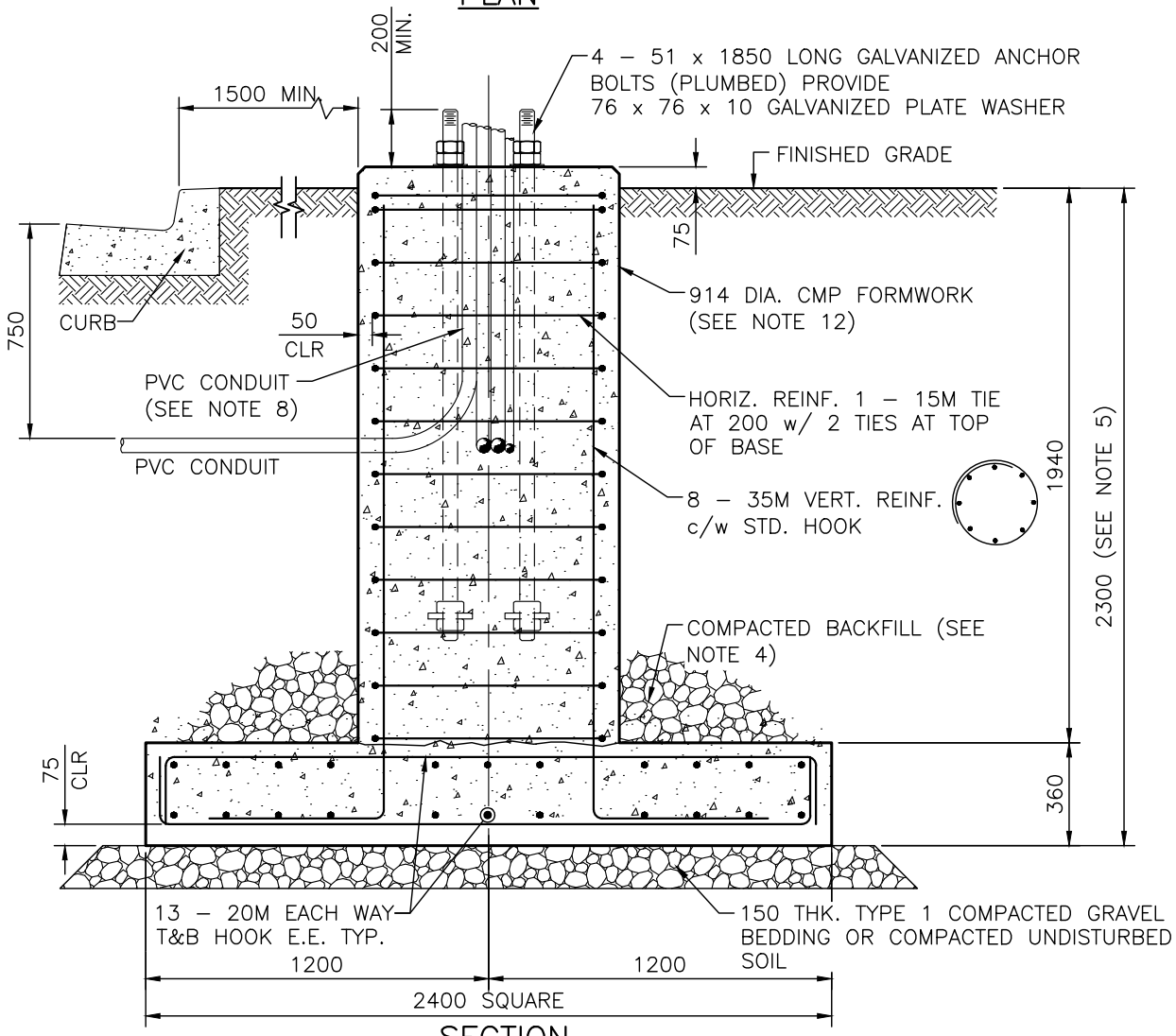
STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION W, X AND Y

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 73A



PLAN



SECTION

NOTES:

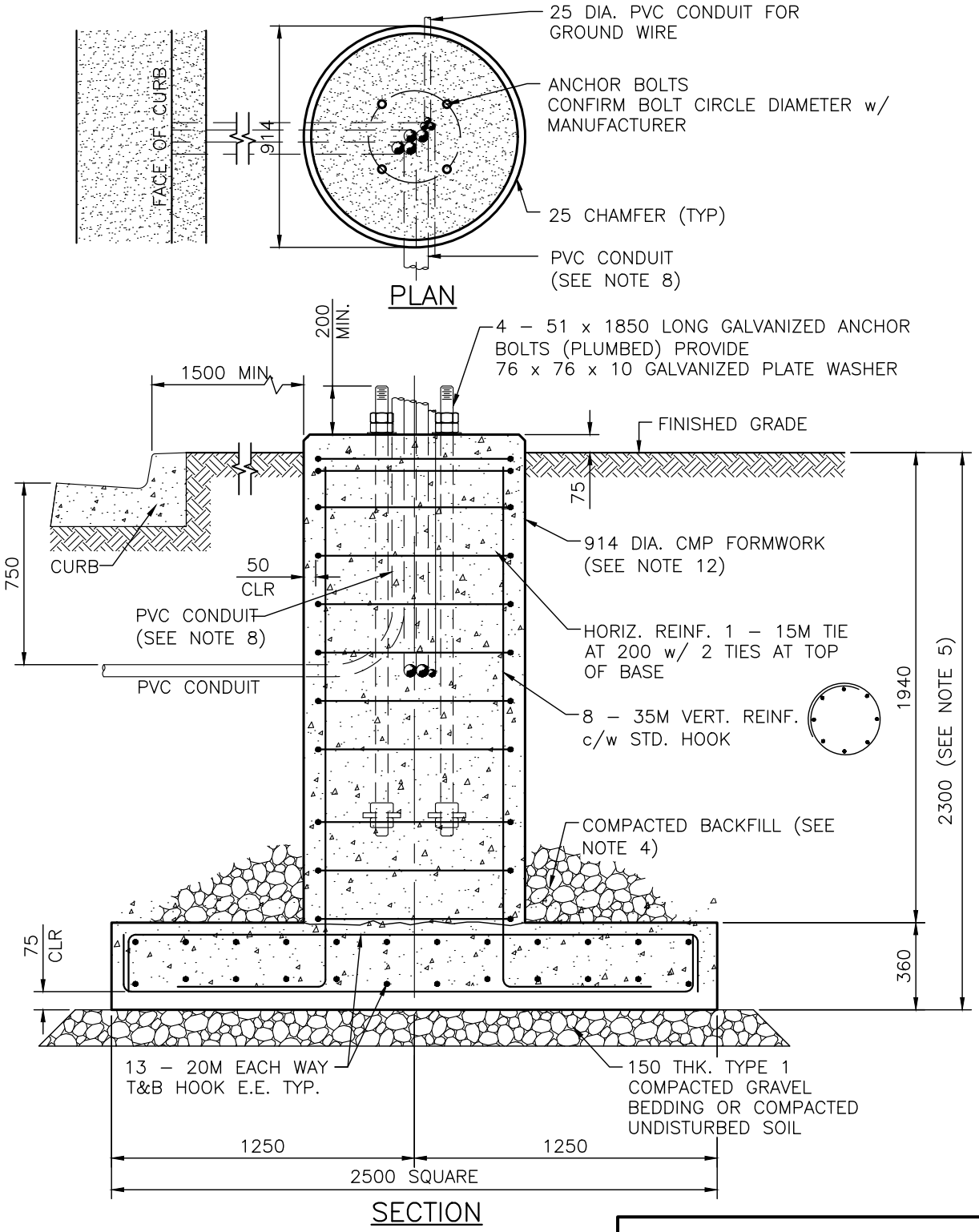
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N2.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION Z, AA AND AB

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 74



NOTES:

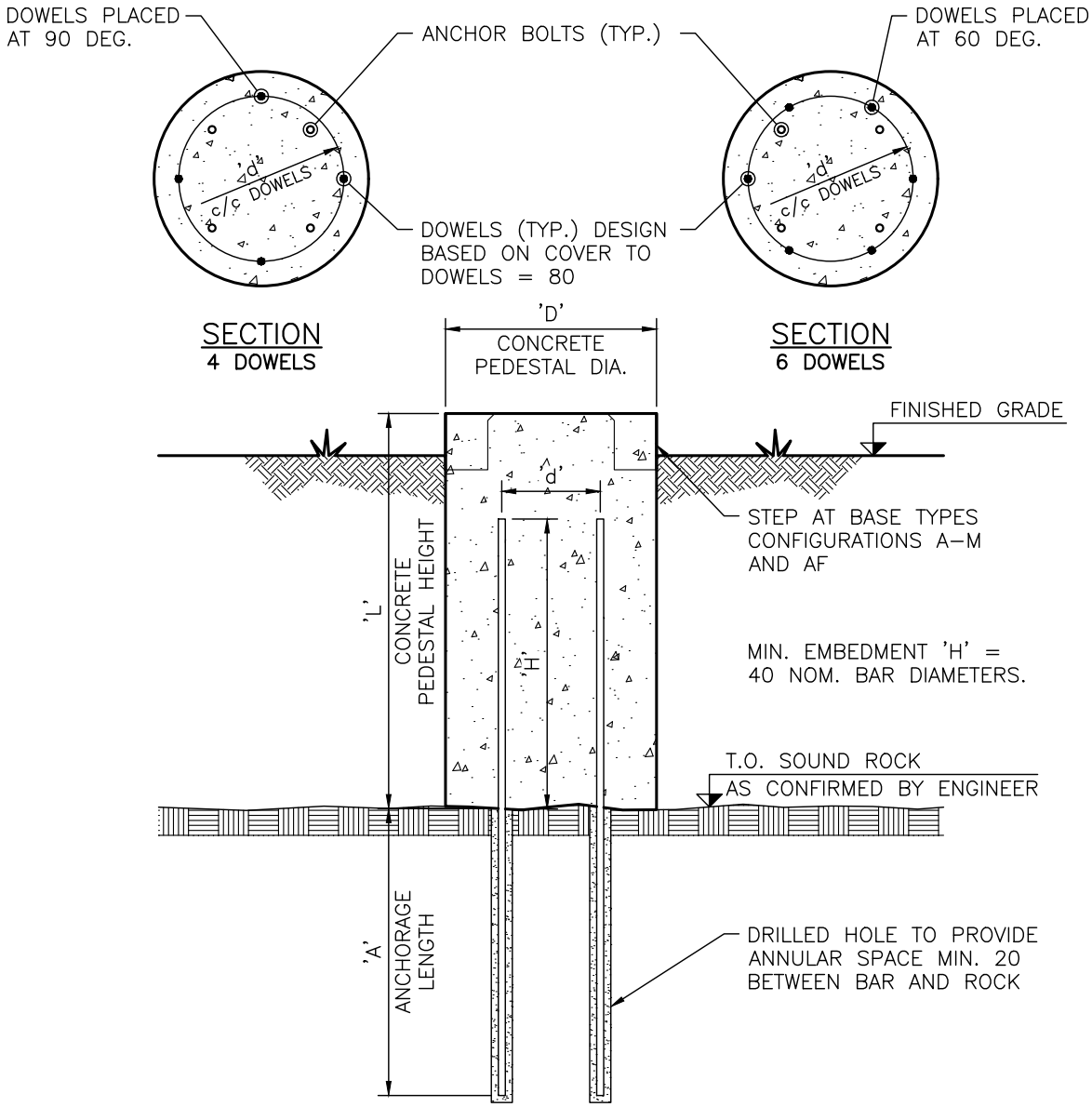
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N2.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

TRAFFIC SIGNAL BASE FOR CONFIGURATION AC, AD AND AE

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 74A



NOTE:

1. SEE HRM 74B.2 FOR ANCHORAGE DETAILS.
2. PEDESTAL REINFORCING NOT SHOWN FOR CLARITY.
3. ANCHOR BOLTS TO BE DESIGNED BY AND STAMPED BY AN ENGINEER LICENSED TO PRACTICE IN NS.

HALIFAX

STANDARD DETAIL

FOUNDATION REVISIONS FOR DOWELING INTO ROCK

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 74B.1

ANCHORAGE SCHEDULE					
REF. DWG.	'L' MIN.	'D'	'd'	'A' MIN	DOWELS
68	1200	610	425	2500	4 – 25M
69	1200	760	575	2500	4 – 25M
70, 71, 71A	1300	760	570	3000	4 – 30M
72, 72A	1500	760	565	3500	4 – 35M
73, 73A	1800	760	565	3500	6 – 35M
74, 74A	1800	910	715	4000	6 – 35M
74X	1300	760	570	3000	4 – 30M

NOTES:

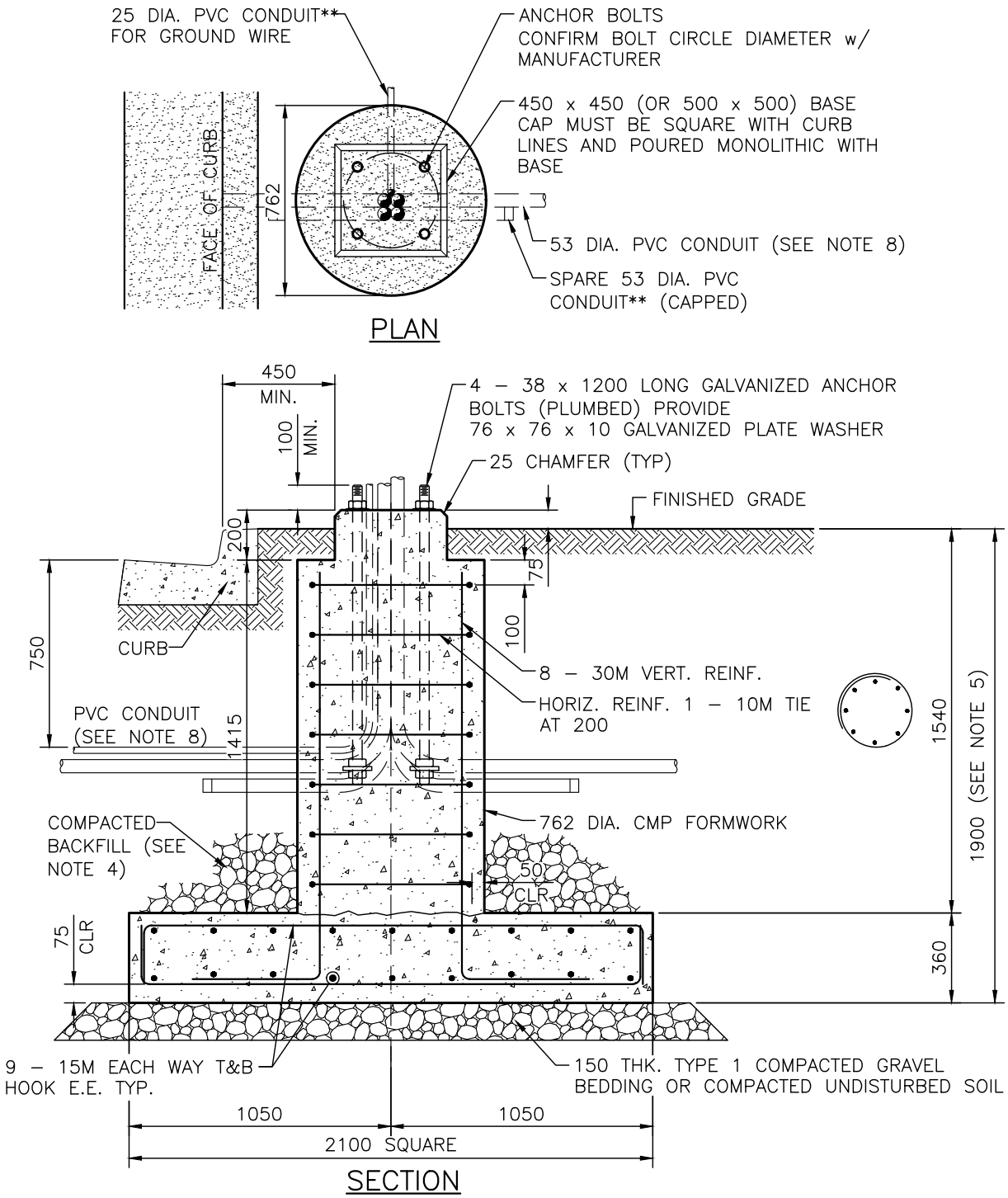
1. SOUND ROCK TO BE CONFIRMED BY ENGINEER.
2. MIN. LENGTH 'L' IS REQUIRED TO SUIT LENGTH OF ANCHOR BOLTS.
3. DRILLED HOLE IN ROCK TO BE CLEAN AND DRY BEFORE GROUTING. GROUT TO BE MASTERFLOW 816 CABLE GROUT OR APPROVED EQUAL, INSTALLED IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS.
4. THIS DRAWING TO BE USED IN CONJUNCTION WITH HRM 74B.1.
5. ANCHOR BOLTS TO BE DESIGNED BY AND STAMPED BY AN ENGINEER LICENSED TO PRACTICE IN NS.

HALIFAX

STANDARD DETAIL

FOUNDATION REVISIONS FOR DOWELING INTO ROCK

DATE: 2021	REFERENCE	APPROVED
SCALE: NTS		FIG No.: HRM 74B.2



NOTES:

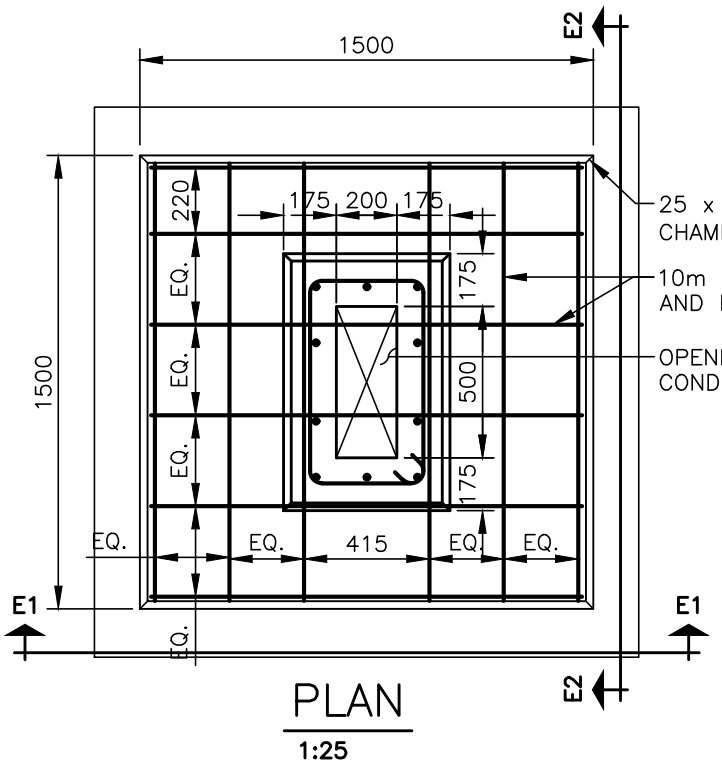
1. SEE HRM 68N3, SELECTION GUIDE, FOR PERMITTED POLES AND TRAFFIC SIGNAL EQUIPMENT.
2. FOR NOTES REFER TO HRM 68N2.
3. DIMENSIONS ARE IN MILLIMETRES.

HALIFAX

STANDARD DETAIL

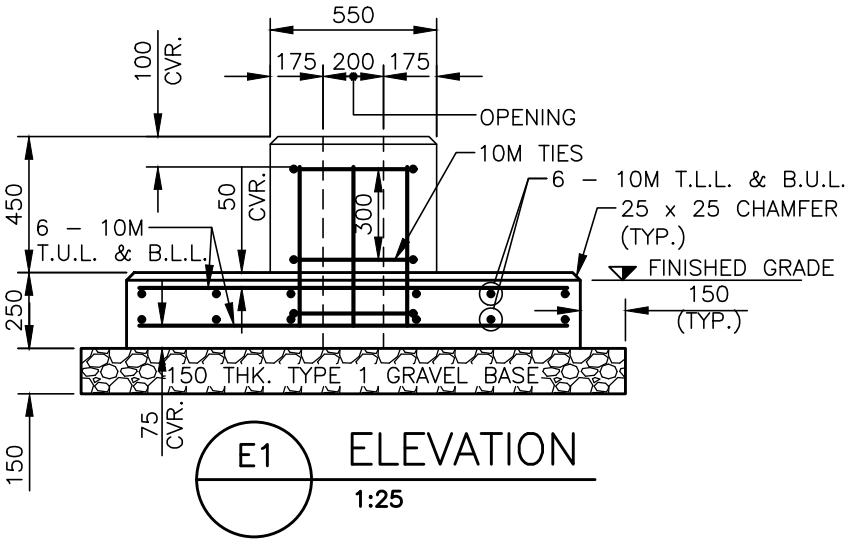
TRAFFIC SIGNAL BASE FOR CONFIGURATION AF

DATE: 2021	REFERENCE	APPROVED
SCALE: 1:25		FIG No.: HRM 74X



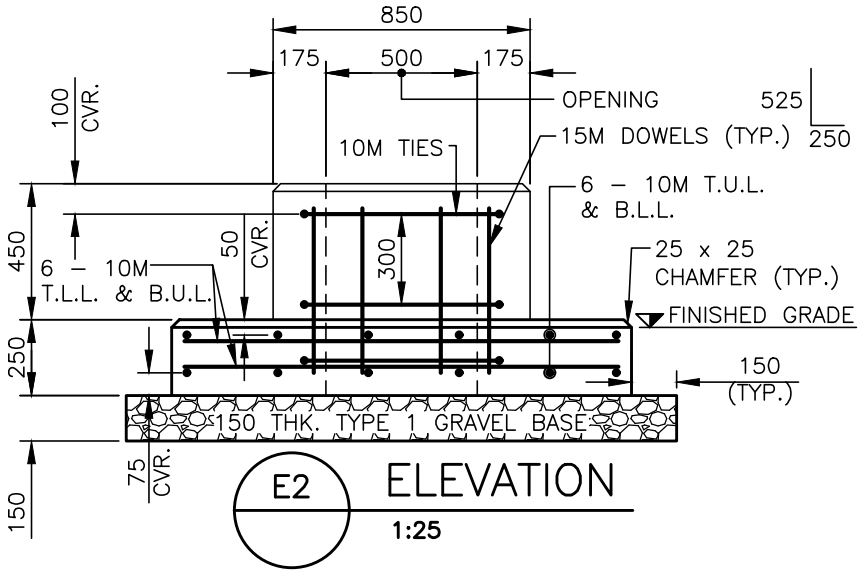
PLAN

1:25



E1 ELEVATION

1:25



E2 ELEVATION

1:25

NOTES:

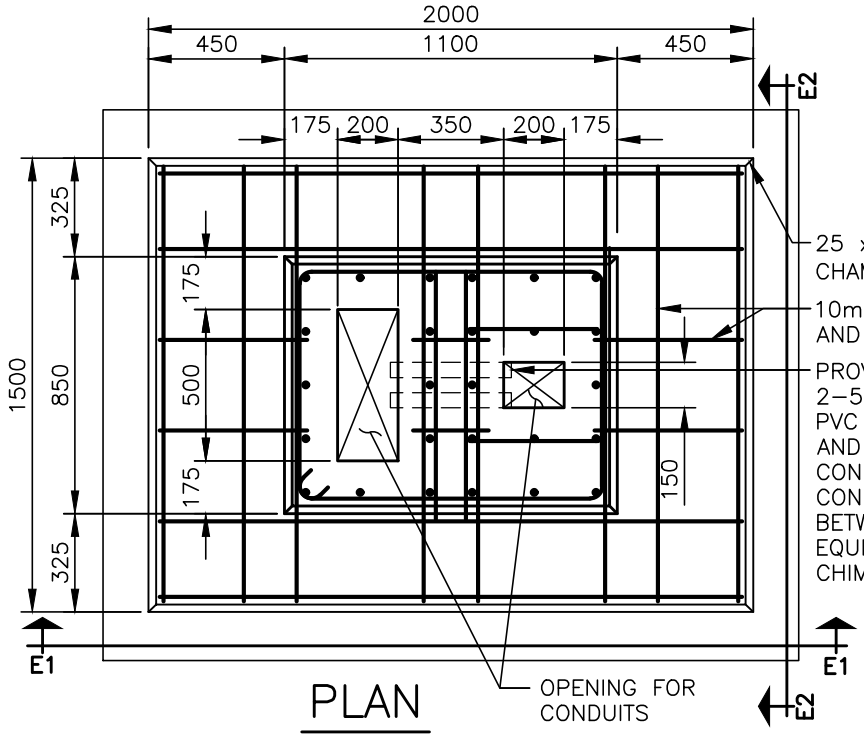
1. CONCRETE 28 DAY COMPRESSIVE STRENGTH TO BE 35 MPa.
2. PROVIDE MIN. 50 COVER FOR ALL REBAR (UNLESS NOTED OTHERWISE).
3. PROVIDE GROUNDING FOR CONTROLLER CABINET.
4. IN ADDITION TO CONDUITS SPECIFIED ON EQUIPMENT DRAWINGS/ SPECIFICATIONS, PROVIDE 2–50mm DIA. PVC CONDUIT AND STUB OUTSIDE OF BASE.
5. ALL CONDUIT FITTINGS SHALL BE TO CANADIAN ELECTRICAL CODE.
6. CONTROLLER CABINET ANCHORS ARE ASSUMED TO BE 20mm DIA. x 150mm LONG A304 STAINLESS STEEL THREADED ROD, WITH APPROVED CHEMICAL ADHESIVE, INSTALLED IN ACCORDANCE WITH ANCHOR MANUFACTURERS GUIDELINES.
7. SUITABILITY OF ANCHORS IS TO BE CONFIRMED BY EQUIPMENT MANUFACTURER PRIOR TO INSTALLATION.
8. MAXIMIZE ANCHOR EDGE DISTANCES.
9. ALL DIMENSIONS IN MILLIMETERS.
10. REBAR TO CONFORM TO CAN/CSA G30.18–09 GRADE 400W DEFORMED BARS.

HALIFAX

STANDARD DETAIL

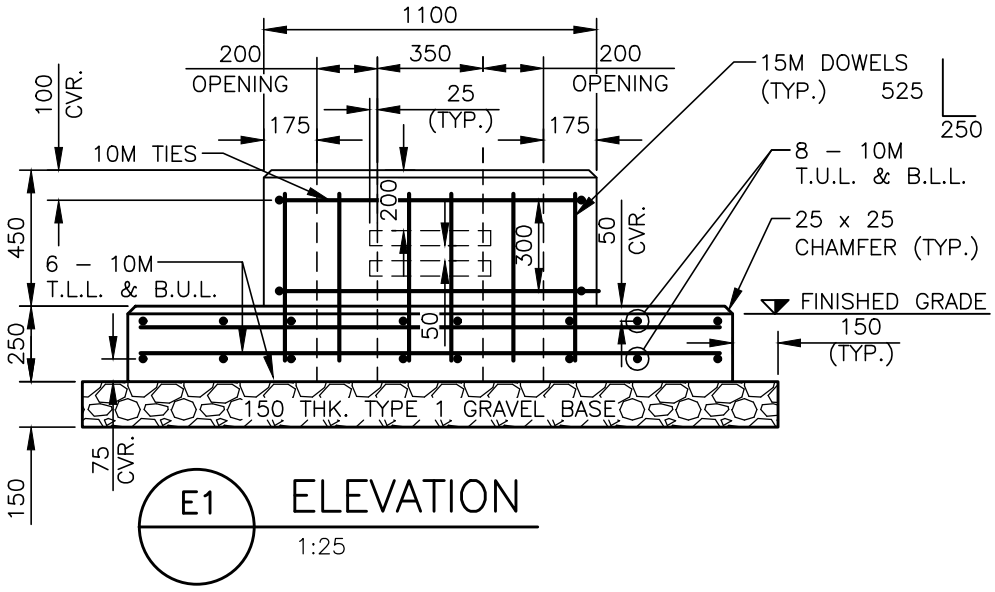
BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET

DATE: 2021	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 175



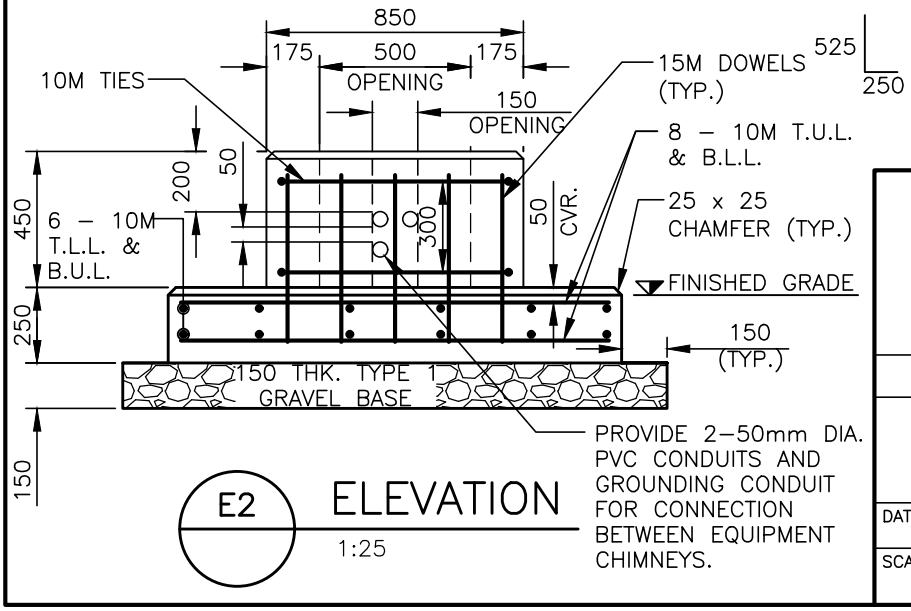
PLAN

1:25



E1 ELEVATION

1:25



E2 ELEVATION

1:25

NOTES:

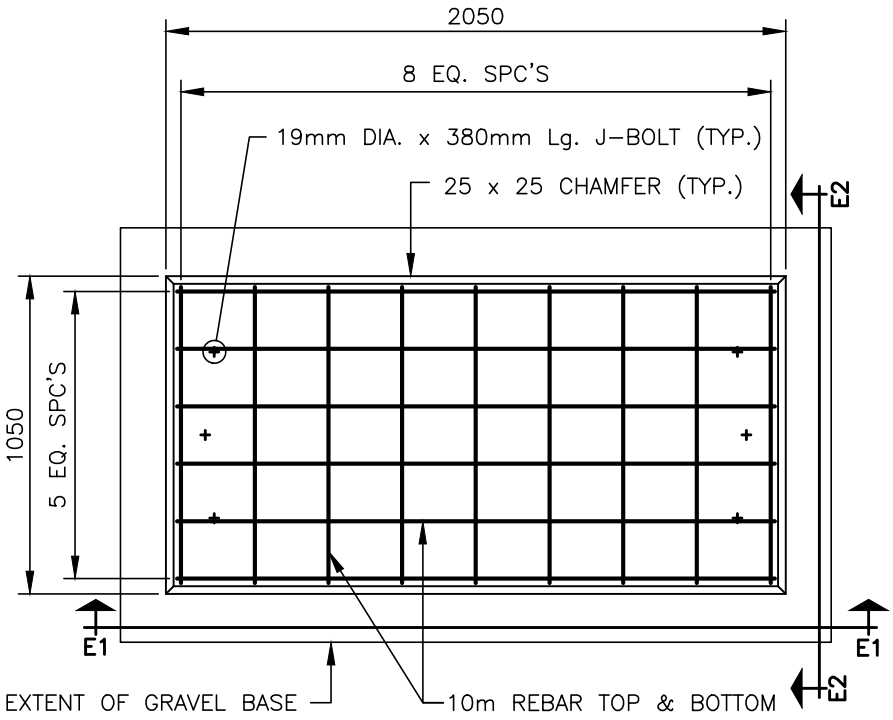
1. CONCRETE 28 DAY COMPRESSIVE STRENGTH TO BE 35 MPa.
2. PROVIDE MIN. 50 COVER FOR ALL REBAR (UNLESS NOTED OTHERWISE).
3. PROVIDE GROUNDING FOR CONTROLLER CABINET.
4. IN ADDITION TO CONDUITS SPECIFIED ON EQUIPMENT DRAWINGS/SPECIFICATIONS, PROVIDE 2–50mm DIA. PVC CONDUIT AND STUB OUTSIDE OF BASE.
5. ALL CONDUIT FITTINGS SHALL BE TO CANADIAN ELECTRICAL CODE.
6. CONTROLLER CABINET ANCHORS ARE ASSUMED TO BE 20mm DIA. x 150mm LONG A304 STAINLESS STEEL THREADED ROD, WITH APPROVED CHEMICAL ADHESIVE, INSTALLED IN ACCORDANCE WITH ANCHOR MANUFACTURERS GUIDELINES.
7. BATTERY BACK–UP UNIT ANCHORS ARE ASSUMED TO BE 22mm DIA. x 150mm LONG A304 STAINLESS STEEL THREADED ROD, WITH APPROVED CHEMICAL ADHESIVE, INSTALLED IN ACCORDANCE WITH ANCHOR MANUFACTURERS GUIDELINES.
8. SUITABILITY OF ANCHORS IS TO BE CONFIRMED BY EQUIPMENT MANUFACTURER PRIOR TO INSTALLATION.
9. MAXIMIZE ANCHOR EDGE DISTANCES.
10. ALL DIMENSIONS IN MILLIMETERS.
11. REBAR TO CONFORM TO CAN/CSA G30.18–09 GRADE 400W DEFORMED BARS.

HALIFAX

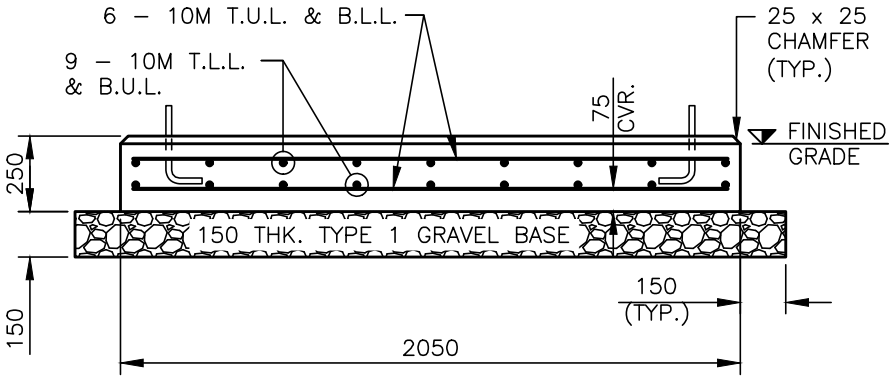
STANDARD DETAIL

BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET WITH BATTERY BACK–UP UNIT

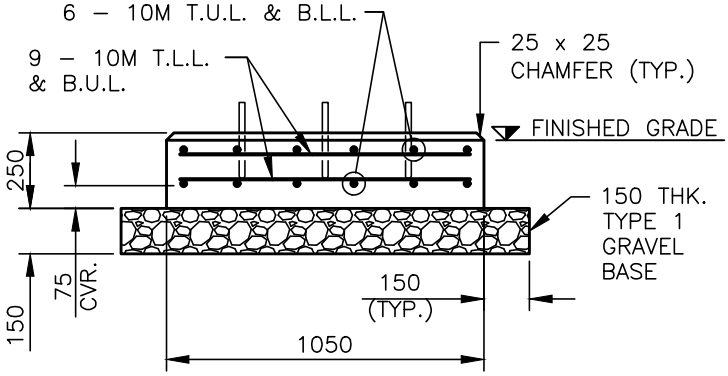
DATE: 2021	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 176



PLAN
1:25



E1 ELEVATION
1:25



E2 ELEVATION
1:25

NOTES:

1. CONCRETE 28 DAY COMPRESSIVE STRENGTH TO BE 35 MPa.
2. PROVIDE MIN. 50mm COVER FOR ALL REBAR (UNLESS NOTED OTHERWISE).
3. PROVIDE GROUNDING PLATE FOR CABINET.
4. TYPICAL STREET LIGHT POWER ENCLOSURES ARE 610mm WIDE BY 1830mm LONG BY 1830mm HIGH. THE ENCLOSURE MUST BE CENTERED ON THE CONCRETE PAD AND THE CONDUIT LAYOUT MUST ALIGN WITH THE MOUNTING BACKBOARD INSIDE THE ENCLOSURE AS PER THE TYPICAL STREET LIGHT POWER ENCLOSURE "RED BOOK" DETAILS HRM 109–HRM 111.
5. ALL CONDUIT FITTINGS AND GROUNDING SHALL BE TO CANADIAN ELECTRICAL CODE.
6. CONTROLLER CABINET ANCHORS ARE ASSUMED TO BE 6–19mm DIA. x 380mm LONG A307 GALVANIZED STEEL J–BOLTS.
7. SUITABILITY OF ANCHORS IS TO BE CONFIRMED BY EQUIPMENT MANUFACTURER PRIOR TO INSTALLATION.
8. ALL DIMENSIONS IN MILLIMETERS.
9. REBAR TO CONFORM TO CAN/CSA G30.18–09 GRADE 400W DEFORMED BARS.
10. MAXIMUM CONDUIT DIAMETER = 150mm. PROVIDE AT LEAST 25mm CLEAR SPACE BETWEEN CONDUITS.
11. MAXIMUM NUMBER OF CONDUITS PER BASE = 10 x 150mm DIA. CONDUITS OR EQUIVALENT AREA OF SMALLER CONDUITS. (LOCALLY ADJUST REBAR SPACINGS IF NECESSARY).

HALIFAX

STANDARD DETAIL

STREET LIGHTING POWER ENCLOSURE BASE

DATE: 2021	REFERENCE	APPROVED
SCALE: AS NOTED		FIG No.: HRM 177

Occupational Health & Safety Policy

The Halifax Regional Municipality is committed to providing a healthy, safe and supportive workplace for its employees, and believes that the physical and psychological well-being and safety of employees are important for accomplishing organizational success and sustainability.

The municipality believes that Occupational Health & Safety (OHS) is the direct responsibility of all employees to the extent of each person's authority and ability to act. Therefore, the municipality supports the Internal Responsibility System (IRS) framework and is committed to working collaboratively with employees, their representatives, and Joint Occupational Health & Safety Committees to realize an effective Occupational Health & Safety Program (OHS Program). To this end:

- The municipality shall actively seek and consider input of the diverse perspectives and needs of employees with respect to the OHS Program, Corporate Procedures and Safe Work Practices;

- All municipal employees and volunteers are accountable for creating safe work environments and adhering to safe work practices, and are accountable for reporting all unsafe acts, hazards and conditions;

- The municipality shall cooperate with the Joint Occupational Health & Safety Committees and any safety representatives;

- The municipality holds all levels of management responsible and accountable for implementation and enforcement of this Policy, the OHS Program, the development and implementation of job-specific safe work practices, and for ensuring compliance with the *Nova Scotia Occupational Health & Safety Act* (OHSA) and applicable regulations;

- The municipality ensures health and safety considerations are integrated into the daily planning and execution of work, and maintenance of tools, machinery, facilities and equipment;

- The municipality takes every reasonable precaution to eliminate any foreseeable hazards in municipal workplaces that may result in personal injury or illness;

- The municipality recognizes that violence in the workplace is an occupational health and safety hazard that may result in physical and/or emotional harm. Any form of violence is unacceptable, and the municipality is committed to minimizing/eliminating the risk of violence. The municipality will not tolerate any act of violence committed by or against employees, contractors, suppliers, volunteers or other persons present at Halifax Regional Municipality workplaces;

- Outside contractors, suppliers and volunteers are to be informed of this Policy, sections of the OHS Program, any job specific safe work procedures that impact them, and will be held responsible for complying with those requirements along with any other requirements under the OHSA and applicable regulations.

Original Signed

_____	_____
Jacques Dubé, Chief Administrative Officer	March 30, 2021