

Department of Transportation and Infrastructure

General Provisions and Contract Specifications
for Highway & Bridge Construction

Revised 2025

SPECIFICATIONS: Current Status
Date: January 2025

DIVISION / Section	Latest Revision Date
100 - General	
101	2025.01.15
102	2025.01.22
103	2025.01.22
104	2025.01.22
105	2025.01.15
106	2025.01.15
107	2025.01.15
108	2025.01.15
200 - Earthwork	
201	2019.01.14
202	2012.02.09
203	2021.01.18
204	2014.01.15
205	2003.03.27
206	2014.01.15
207	2014.01.15
208	2015.01.15
209	2017.02.17
210	2002.04.10
211	2021.01.18
212	2017.02.17
213	2017.02.17
214	2019.01.14
215	2019.01.14
216	2003.03.27

DIVISION / Section	Latest Revision Date
217	2015.01.15
218	2006.03.28
219	2020.01.10
220	2015.01.15
300 - Drainage	
301	2023.01.18
Figures 301-01 & 301-	2019.01.14
302	2009.02.04
303	2022.01.04
Figure 303-01 (New)	2019.01.14
304	2007.02.09
305	2023.01.18
306	2013.01.15
307	2012.02.09
308	2016.01.15
~~309~~	~~Rescinded~~
~~310~~	~~Rescinded~~
~~311~~	~~Rescinded~~
312	2017.02.17
Figures 312-01 & 312-	Revised 2002
400 - Granular	
401	2016.01.15
402	2016.01.15
500 - Bitumen	
501	2020.01.10
~~502~~	~~Rescinded~~
503	2020.01.10
600 - Pavement	

DIVISION / Section	Latest Revision Date
601	2020.01.15
~~602~~	~~Rescinded~~
603.01/02	2024.01.11
603.03	2021.01.18
~~603.04~~	~~Rescinded~~
603.05	2024.01.11
603.06	2007.02.09
603.07	2007.02.09
603.08/09	1997.05.16
603.10	2011.02.14
603.11	2018.01.15
603.12	2020.01.05
603.13	2022.01.04
603.14	2024.01.11
603.15	2024.01.11
603.16	2000.02.29
603.17/18	2022.01.04
~~604~~	~~Rescinded~~
~~605~~	~~Rescinded~~
606	1994.03.28
607	1994.04.11
608	1998.03.03
609	See Below
609.01/02	2016.01.15
609.03	2012.02.09
609.04	2013.01.15
609.05	2013.01.15
609.06/07	2013.01.15

DIVISION / Section	Latest Revision Date
610	2017.02.17
700 - Rehabilitation	
701	1999.01.13
702	2003.03.27
703	2000.02.29
704	2019.01.14
705	2003.03.27
706	2004.05.05
707	2005.04.15
708	1994.03.28
709	1996.04.15
710	1994.03.28
711	2004.05.05
712	2024.01.11
713	1999.01.13
714	2003.03.27
715	2024.01.11
716	2013.01.15
800- Environment	
801	2017.02.17
Figures 801-01, 801-02,	Revised 2002
802	1994.03.28
803	2016.01.15
804	2013.01.15
805	2019.01.14
806	2013.01.15
807	2013.01.15
808	2017.02.17

DIVISION / Section	Latest Revision Date
809	2014.01.15
810	Rescinded
811	2016.02.12
812	2004.05.05
813	2013.01.15
900 - Safety	
901	2017.02.17
902	2005.04.15
903	2021.01.18
Figure 903-01	Revised 2020
Figure 903-01B	Added 2025
Figure 903-02	Revised 2025
Figure 903-03	2005
Figure 903-04	Revised 2010
904	2011.02.14
Figure 904-01	Revised 2001
905	2016.01.15
906	2020.02.19
907	2016.01.15
Figures 907-01, 907-02	Revised 2001
908	2017.02.17
909	2016.01.15
1000 - Electrical	
1001	2025.01.14
1002	2014.01.15
1003	2016.01.15
1004	2014.01.15
1100 - Concrete	

DIVISION / Section	Latest Revision Date
1101	2019.01.14
1102	2016.01.15
Figures 1102	Revised 2025
1103	2025.01.14
Figure 1103-01	Revised 2005
1104	Rescinded
1200 - Miscellaneous	
1201	1999.01.18
1202	1994.03.28
1300 – Bridge Specs	
1301	2024.01.22
1302	2025.01.10
1303	2021.12.22
1304	2024.01.22
1305	2021.01.15
1306	2025.01.10
1307	2024.01.22
1308	2025.01.10
1311	2024.01.22
1312	2024.01.22
1321	2024.01.22
1322	2021.01.15
1330	2025.01.10
1331	2025.01.10
1332	2023.01.10
1333	2025.01.10
1335	2025.01.10
1336	2025.01.10

DIVISION / Section	Latest Revision Date
1337	2025.01.10
1338	2024.01.22
1339	2024.01.22
1341	2023.01.11
1342	2025.01.10
1343	2025.01.10
1344	2023.01.11
1345	2021.01.15
1346	2021.01.15
1348	2025.01.10
1350	2025.01.10
1351	2023.01.13
1361	2024.01.22
1365	2022.02.09
1366	2024.01.22
1371	2021.01.15
1372	2024.01.22
1381	2024.01.22
1382	2023.01.12
1383	2023.01.12
1384	2024.01.22
1385	2024.01.22
1399	2024.01.22
1400 - Supplementals	As required
Appendix 1 - Tender	2025.01.16
Appendix 2	2021.01.18
Appendix 3	2018.01.15
Appendix 4	2003.03.27

DIVISION / Section	Latest Revision Date
Appendix 5	2025.02.04

Revision #32

Note: Blue text indicates additions, red strikethrough text indicates removal, green indicates relocated.

All drawings/figures to be inserted into the 2025 paper and electronic versions of the Spec manual.

TERMINOLOGY AND DEFINITIONS

101

101.01 Terminology

This document titled "General Provisions and Contract Specifications for Highway & Bridge Construction", hereinafter referred to as 'this Document', contains information which is relevant to the administration of highway construction contracts.

AAMP:

Association for Materials Protection and Performance

ACI

American Concrete Institute

ANSI

American National Standards Institute

ASTM:

American Society for Testing and Materials.

AWS:

American Welding Society

Addendum:

A change in a Tender issued prior to the time and date of Tender Closing, stated in the Advertisement, which has the effect of modifying the Tender. An addendum shall be considered as an integral component of the Tender [Submission](#) and shall be deemed to take precedence over all other components of the Tender [Document](#).

Agreement:

The Agreement is a legal document, signed and witnessed, between the Contractor and the Department, which covers the respective legal responsibilities in, among other things, performance of the work and furnishing of construction materials as well as payment for acceptable services rendered.

Bid:

A bid is a formal offer made by a contractor.

CAC:

Cement Association of Canada

CISC:

Canadian Institute of Steel Construction

Contract:

~~The agreement between the Contractor and the Department covering the performance of the work and furnishing of construction materials. The Contract shall include the Advertisement, this Document, the Plans, the Agreement, Addenda, Schedule, the Special Provisions, the Release from Liability and any Supplemental Agreements.~~

Contract Document:

The Contract Document shall include the Advertisement, the Tender Document (which includes the Tender Submission), this Document and all Sections within, the Executed Agreement all drawings, sketches, reports, addenda and all other documents appended to the Tender Documents.

Contract Price:

The amount stated in the Contract to be payable to the Contractor for the Work, exclusive of applicable taxes.

CPCI:

Canadian Precast Prestressed Concrete Institute

CSA International:

Canadian Standards Association

CWB:

Canadian Welding Bureau

CWC:

Canadian Wood Council

FHWA:

Federal Highways Association

GSI:

Geosynthetic Institute

ICRI:

International Concrete Repair Institute

NACE:

National Association of Corrosion Engineers

NGLA:

National Lumber Grades Authority

RSIC:

Reinforcing Steel Institute of Canada

Special Provisions:

Special directions containing requirements peculiar to the work not adequately provided for by the General Provisions and Contract Specifications for Highway & Bridge Construction.

SSPC:

The Society of Protective Coatings

Tender:

~~An offer by the Bidder for work on which the Department requires formal bids to be prepared and submitted.~~

Tender Document:

The documents released by the Department for the Bidders to consider during the open tendering period. These may include; but, not be limited to: the Tender Form, Schedule 'A', Schedule of Special Provisions; Schedule 'B' Identification of Principals; Schedule 'C' Estimate of Items; Schedule 'D', Schedule of Equipment to be used on the Work; Schedule 'E', Schedule of Sub-Contractors; Schedule 'F', which includes this Document, supplemental specifications, drawings, safety documents, addenda, or any other supplemental information required for the Bidder to adequately estimate the project.

Tender Form:

~~The approval form for work on which the Department requires formal bids to be prepared and submitted.~~

Tender Form:

The form for which Bidders are to sign, date and have witnessed. The Tender Form reflects the Bidders intent to enter into a formal Agreement with the Department if they are deemed successful in providing the winning tender submission.

Tender Submission:

An offer by the Bidder for work on which the Department requires formal bids to be prepared and submitted. Refer to Section 102, Cl. 102.04 for details.

Transportation and Infrastructure Renewal:

Transportation and Public Works or Transportation and Infrastructure Renewal or [Transportation, Infrastructure & Energy](#), which may be stated within this document, shall mean Transportation and Infrastructure.

102 INSTRUCTIONS TO BIDDERS**102.02 Contents of Tender**

The Department shall furnish the Bidder with a Tender [Document Form and Agreement](#) which will show an estimate of the various quantities of work to be performed, materials to be furnished and the time before which the work must be completed.

All papers bound, attached or supplied with the Tender [Document Form and Agreement](#) are a necessary part thereof and must not be removed from the Tender Package.

Special Provisions, which are issued [with as part of](#) the Tender [Document Form and Agreement](#) shall supersede all other components of the Tender; ~~but~~ however, Addenda may be issued at any time prior to the time and date specified in the Advertisement for Tender Closing which may have the effect of modifying a Special Provision or any other ~~Tender~~ component [of the Tender Document](#).

Addenda issued within 24 hours of the closing date, which affect a change in scope to the contract, shall require an extension to the closing date of the Tender. The Engineer shall determine the effect of a change in scope and the appropriate extension to the closing date required due to the effect.

102.03 Bidder Investigations

The Bidder shall fully investigate the site and become acquainted with the location and character of the terrain upon which the work is [being to be](#) undertaken. The Bidders shall also become familiar with the plans, profiles, specifications, both general and special

provisions, soil borings and reports, and all other information concerning the work which may be supplied by the Department to those bidding the Contract.

No claims for extras will be entertained by the Engineer for failure to investigate the site conditions, unless ~~the Bidder~~ it can ~~be proved~~ ~~show~~ that the extra cost arose from unforeseen circumstances not covered by the information provided to Bidders by the Department, or not obvious to a prudent Bidder before entering into the Contract.

102.04

Preparation of Tender

The Bidder must submit their Tender ~~Submission~~ on the forms furnished by the Department. ~~The blank spaces in the Tender Form and Agreement must be filled in for each and every item for which a quantity is given.~~

Each tender submission must include the following:

- a) The Tender Form, duly signed, and witnessed;
- b) Completed Schedule 'B';
- c) Completed Schedule 'C';
- d) Security Deposit and
- e) All signed Addenda (if any).

The Tender Form must be dated and signed by person(s) having authorized signing authority. This shall be witnessed in the appropriate location.

Schedule "B" shall identify the Contractor supplying the Tender Submission, including Registered name, address, contact information and the person or persons legally authorized to sign on behalf of the entity. If the Tender Form is made out by an individual, the individual's name and Post Office address must be shown; if it is made out by a firm or partnership, the name and Post Office address of each member of the firm or partnership must be shown; and if it is made out by a corporation, the person signing the Tender must show the name of the Province under the laws of which the corporation was incorporated and the names, titles, and business addresses of the President, Secretary and Treasurer.

Schedule 'C' is the Schedule of Items for Tender. The Bidder must write in ink the prices, both in words and numerals, for which the Bidder proposes to do each item of the work contemplated. The Bidder must extend the total for each item of the work and carry out a summation to the total value of the work to be done under the Tender.

~~If the Tender Form and Agreement is made out by an individual, the individual's name and Post Office address must be shown; if it is made out by a firm or partnership, the name and Post Office address of each member of the firm or partnership must be shown; and if it is made out by a corporation, the person signing the Tender must show the name of the Province under the laws of which the corporation was incorporated and the names, titles, and business addresses of the President, Secretary and Treasurer.~~

See Section 102.07 for Security Deposit requirements.

Any addenda shall be signed and dated by the person(s) having authority to do so.

No other documentation is required for the Tender Submission.

102.05

Delivery of Tender

The Tender **Submission** must be received on or before the time and date of the Tender Closing specified in the advertisement. **At the time of tender closing, should the Provincial offices at the tender location be closed due to inclement weather, the tender closing will be moved to the following business day at the same tender closing time and location.** Each Tender **Submission Form and Agreement** must be submitted in a sealed envelope and should be **clearly** marked:

"Tender for **(Insert Project Name)**."

~~If forwarded by registered mail, The sealed and marked envelope should be enclosed in another and sent to the Minister, Department of Transportation and Infrastructure, PO Box 2000, Charlottetown, Prince Edward Island, C1A 7N8; if forwarded other than by registered mail, it should~~ **is to be delivered to the Minister at the Tender Closing location identified in the tender documents, of the Prince Edward Island Transportation and Infrastructureenergy, 11 Kent Street, Charlottetown.**

Faxed, **mailed or emailed submissions, edits, changes, etc. shall not be accepted.**

102.06 Rejection of Tender

Tenders will be rejected if they show any omissions, form alterations, additions not called for, conditional or alternate bids, or irregularities of any kind, or if they contain a clause in which the Bidder reserves the right to accept or reject a Contract awarded. The right to reject any or all Tenders is reserved by the Minister. **The ; and** lowest or any Tender will not necessarily be accepted.

102.07 Bid and Performance Security

Bid Security:

The Tender shall be accompanied by either:

- a) a certified cheque equal to or greater than the amount stipulated in Schedule A - Schedule of Special Provisions; or
- b) a bank draft equal to or greater than the amount stipulated in Schedule A - Schedule of Special Provisions; or
- c) a bid format irrevocable standby letter of credit equal to or greater than the amount stipulated in Schedule A - Schedule of Special Provisions; or
- d) a bid bond equal to or greater than the amount stipulated in Schedule A - Schedule of Special Provisions. (The bid bond shall be from a surety company authorized to do business in Canada guaranteeing to supply a performance bond and a labour and materials bond equal to the amount specified in section ~~102.07 (h)~~ 103.02 (d))

The Bidder shall forfeit the bid security to the Minister if the Bidder fails to enter into a Contract when called upon to do so.

Performance Security:

Performance Security shall be as set forth in Section 103, Cl. 103.02.

~~Before Work commences on the project a Performance Security shall be filed with the Department. This Security shall remain in place until the warranty period expires (one year after substantial completion). This Performance Security shall be either:~~

- ~~(e) a certified cheque in the minimum amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year after substantial completion) has elapsed. Note: A certified cheque which has not been cashed shall be replaced within six months of the issue date; or~~
- ~~(f) a bank draft in the minimum amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year substantial completion) has elapsed.~~
- ~~(g) a performance format irrevocable standby letter of credit on a government approved form in the minimum amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year after substantial completion) has elapsed.~~

~~A performance standby letter of credit must have an automatic renewal clause within the body of the agreement; or~~

- ~~(h) a performance bond equal to 50% of the Contract value, excluding HST and a labour and materials bond equal to 25% of the Contract value, excluding HST which shall be retained until the warranty period (one (1) year after substantial completion) has elapsed. The company issuing these bonds must be authorized to do business in Canada. A performance bond and/or a labor and materials bond which matures prior to the end of the warranty period shall be replaced, by the Contractor, with new Security of equal value, before maturity. The Minister may limit the performance security to bonds only to assure the completion of the work.~~

~~When a contract is to be completed over several construction years, and portions of the contract are considered by the Engineer as complete, but the entire Contract is not, the Engineer can issue a certificate of Substantial completion for those portions of the Work that are complete. Performance Security, however, which would be appropriate for that Work will only be released after the one year warranty expires from the total contract's substantial completion date.~~

~~All certified cheques, irrevocable standby letters of credit, bank drafts, and bonds are to be made payable to the Minister of Finance, Province of Prince Edward Island.~~

~~The Contractor will forfeit the performance security to the Minister if the Contractor fails to carry out the Contract when called upon to do so.~~

The Government approved templates for the Bid Format and Performance Format irrevocable standby letters of credit can be found in Appendix 1. Bidders who choose to use the letter of credit as security must provide them as shown on these approved templates. Any deviation from this standard template may be cause for rejection of the Tender. The letters shall be on the Bidder's preferred Financial Institutions letter head and shall be signed and sealed by personnel having proper authority.

102.08 Withdrawal of Tender

A bidder will be permitted to withdraw the Tender, unopened after it has been deposited, if a request is received by the Department in writing prior to the latest time for receiving tenders.

102.09 Disqualification of Tender Unauthorized Multiple Bids

Each Bidder shall submit only one (1) Tender. Bidders who submit more than one (1) Tender shall have all bids disqualified.

102.10 Competency of Bidder

Bidders must be capable of performing the various items of work bid upon. Bidders shall, upon the request of the Department, provide a statement covering experience on similar work and a statement of their financial resources.

~~102.11~~ Material Guarantee (moved to section 103)

~~Upon the request of the Department, Bidders shall furnish a complete statement of the origin, composition and manufacture of all materials to be used in the construction of the work together with any manufacturers' instructions. Upon the request of the Department, Bidders shall furnish samples of any or all materials to be used in the work; these samples may be subject to testing as required by the Department to determine their quality and fitness for the work.~~

~~102.12~~ Open Truck Haul (moved to section 103)

~~For all truck haul for which Department tickets are issued, the Contractor shall permit any person, partnership or corporation to supply trucks for haulage of material to be used in the Contract, without giving preference to the Contractor's own trucks. The Contractor shall pay for trucks employed to haul materials to a work site at rates not less than the current government rates which may be re-established from time to time by the Department.~~

~~For those materials which are weighed for payment, only those trucks which can be fully supported by the scales as required by Measurements Canada, shall be permitted to haul. These trucks must also conform to the Vehicle Configurations and Restrictions as provided in Section 907 of these specifications.~~

~~For those materials which are paid by volume, the trucks must conform to the Vehicle Configurations and Restrictions as provided in Section 907 of these specifications.~~

~~The truck haul shall be considered to be that distance from the point of loading to the centre of the work being carried out in the Contract Agreement.~~

~~Truck haul shall be determined in advance of any material being delivered to the work site. The Department representative and the Contractor shall be in agreement with truck haul measurement, prior to commencing the work.~~

~~The Contractor shall limit the truck haul to those roads that can accommodate two-way traffic flow. In the case of the material source being located on a road that can not meet this requirement, the Contractor may be required to provide pull-off areas as directed by the Engineer.~~

~~The Contractor may stockpile materials one time only prior to their incorporation into the work. Stockpile sites shall be determined and approved in advance of the stockpiling of the materials. The Contractor shall install weigh scales in accordance with Section 107.03 at either the production site or the stockpile site. In the case of materials imported by floating vessel, the contractor may stockpile materials one time prior to their incorporation into the work.~~

~~In the case of materials imported by truck, the Contractor must stockpile materials one time only prior to their incorporation into the work. The haul from the stockpile to the work site shall be the open haul and no scales shall be required at the production site.~~

102.131 Scheduling of the Work

The ~~Successful Bidder Contractor~~, upon receiving notification from the Department, shall submit a schedule prior to being awarded the Contract. ~~The Department shall notify the successful bidder.~~ After receiving the notification, the ~~Successful Bidder Contractor~~ shall have seven (7) working days to deliver an acceptable schedule. The schedule shall be limited to the number of working days as stipulated in the ~~Tender Form and Agreement~~ Schedule 'A' of the Tender documents and shall be within the construction period as defined in Section 101.02 Definitions. The Department reserves the right to ask the Contractor to revise the schedule prior to the time of commencement of the work or during the work progression. In no case, shall the scheduled completion date surpass the time of completion as stated in the Tender ~~Form and Agreement~~ Documents unless approved by the Engineer.

102.142 Errors or Omissions

~~The bidder shall notify the Department of any errors or omissions found in the Tender document prior to the Tender closing.~~ The Bidders are to report any conflicts or omissions within the Tender Documents prior to Tender closing and as soon as they become apparent. The Engineer shall determine which is to be followed and how the work is to be carried out and advise Bidders through Addenda.

102.153 References

All reference to acts, regulations, codes, testing procedures, and methods shall be understood to be the latest update to such acts, regulations, testing procedures, and methods, unless stated differently in the Tender ~~Form and Agreement~~ Documents.

102.164 Taxes

Harmonized Sales Tax. The Province is not exempt for Harmonized Sales Tax (HST) purposes. As a result, the aggregate amount of Tender for Department Contracts is subject to HST, however, prices submitted shall not include HST. The HST payable by the Department will be added as a separate item during Department processing of progress payments and, therefore, HST will not appear as a cost in the aggregate amount of Tender.

Bidders are advised that they are eligible to claim an Input Tax Credit (ITC) for a portion of the HST paid in relation to the Contract to the requirements of the Government of Canada.

102.175 Procedures for Tender Openings and Evaluations

102.175.1 Tender Opening

A preliminary check will be conducted at the Tender opening to ensure the following information has been included.

- a) Security Deposit. Each Tender is reviewed to ensure that a sufficient Security Deposit accompanies the Tender.
- b) Original Signatures/Acknowledgements. The Tender Document ~~Form and Agreement~~ shall be completed, and signed and witnessed as an acknowledgement of the receipt and understanding of the Tender documents.
- c) Completed Schedule B;
- d) All signed Addenda (if any).
- e) Aggregate Amount of Tender (Contract Price). Each Tender is reviewed to ensure the total aggregate amount of Tender (Contract Price) has been included.

- ~~Failure to meet these requirements shall result in rejection of the Tender at the Tender opening stage.~~

Failure to meet these requirements shall result in rejection of the Tender and the Tender not being read at the Tender opening stage.

102.175.2 Tender Evaluations.

All Tenders not rejected at the Tender opening will be subject to a detailed evaluation by Department staff before a recommendation is made for award of Tender. This detailed review will take place as soon as possible after the public Tender opening and will consist of the following:

- ~~Tender Form. The Tender shall be submitted on the proper forms, supplied by the Department. Unit prices shall be written in ink or typewritten and shall be given in both words and numerals in the appropriate columns. Forms shall not be altered, unless called for in a Department Addendum.~~
- ~~Bid Conditions. The Bidder is not permitted to include conditions with their Tender.~~
- ~~Bid Security. Bid Security, meeting the requirements of Clause 102.07, shall be included with the Tender.~~
- ~~Arithmetic Checks. The Tender will be checked for arithmetic errors. In cases where the written unit price does not agree with the numeric price, the written unit price will be used. All mathematic errors will be corrected by Department staff and the rating of Tenders as to total Bid will be based on the corrected totals.~~

• Tender-Form Submission	The Tender shall be submitted on the proper forms, supplied by the Department. Unit prices shall be written in ink or typewritten and shall be given in both words and numerals in the appropriate columns. Forms shall not be altered, unless called for in a Department Addendum.
• Bid Conditions	The Bidder is not permitted to include conditions with their Tender.
• Bid Security.	Bid Security, meeting the requirements of Clause 102.07, shall be included with the Tender.
• Signatures/Acknowledgements	The Tender Form shall be completed, ~~and~~ signed and witnessed as an acknowledgement of the receipt and understanding of the Tender documents.
• Arithmetic Checks.	The Tender will be checked for arithmetic errors. In cases where the written unit price

does not agree with the numeric price, the written unit price will be used. All mathematic errors will be corrected by Department staff and the rating of Tenders as to total Bid will be based on the corrected totals.

- Value Engineering

Provided that all the requirements stated above have been met, any VE proposals brought forth by the Bidders will be evaluated as per Cl. 103.08..

Failure to meet the requirements of the above items will result in the rejection of the Tender Submission.

103 **SCOPE OF WORK**

103.01 Scope of Work

The Scope of the Work shall be determined from the Tender Documents, which are defined in Section 102, ~~under Definitions~~, Clause 102.02.

The Successful Bidder, upon receiving notification from the Department, shall submit Performance Security prior to being awarded the Contract. After receiving the notification, the Successful Bidder shall have seven (7) working days to deliver an acceptable Performance Security as outlined in Section 103.02.

The Government approved templates for the ~~Bid-Format and~~ Performance Format irrevocable standby letters of credit can be found in Appendix 1. Bidders who choose to use the letter of credit as security must provide them as shown on these approved templates. Any deviation from this standard template may be cause for rejection of the Tender. The letters shall be on the Bidder's preferred Financial Institutions letter head and shall be signed and sealed by personnel having proper authority.

103.043 Quantities

The quantities set forth in Schedule C of the Tender ~~Form and Agreement Documents~~ are based on estimated quantities. If when carrying out the work and/or supplying materials under the Contract, the quantities are foreseen to exceed the Contract amount, then the Contractor shall notify the Engineer.

Either party may request a price adjustment when quantities on major items, as stated within the Tender ~~Form and Agreement Documents~~, vary by more than 25% from the contract quantity. Adjustments to unit prices, in the case of an over-run, shall be applied only to that quantity that is over and above 125% of the original quantity.

103.05 Material Guarantee *(moved from section 102)*

Upon the request of the Department, ~~Bidders the Contractor~~ shall furnish a complete statement of the origin, composition and manufacture of all materials to be used in the construction of the work together with any manufacturers' instructions. Upon the request of the Department, ~~Bidders the Contractor~~ shall furnish samples of any or all materials to be

used in the work; these samples may be subject to testing as required by the Department to determine their quality and fitness for the work.

103.06 Open Truck Haul *(moved from section 102)*

103.048 Value Engineering

The Department will entertain proposals brought forth by any Successful Contractor for Value Engineering (VE). The Department will review all proposals for technical merit and proposed cost savings. The Department will then advise whether or not the VE Proposal is feasible. The Department's decision shall be considered as final.

Proposal(s) from any Contractor shall be submitted any time after the Agreement has been Executed with the Minister.

Proposal(s) from any Contractor shall contain a detailed breakdown of all related work activities complete with associated costs (credits and debits), with the net cost savings clearly indicated.

Any proposals deemed acceptable to the Department will be eligible for cost savings sharing of 50% for the Department and 50% for the Contractor. There will be no compensation for those proposals which are deemed unacceptable.

Note the 50/50 cost savings sharing shall **not** be applied to any credits to the Contract nor unused quantities. The cost savings sharing shall **ONLY** be applied to VE Proposals brought forth by the Contractor and agreed to with the Department.

All costs related to updating the Departments and/or Consultants drawings as a result of an accepted proposal shall be covered by the Contractor, independent from the 50/50 cost split items.

104 CONTROL OF WORK

104.02 Claims

All claims shall be submitted in writing to the Engineer prior to the acceptance of the work by the Department. The Contractor shall be required to submit in writing any additional information that may be requested for the purpose of assessing the claims. *All claims for approved additional works shall be made within 30 days of the works being finalized.* Failure to submit the additional information requested, in writing, will be sufficient cause for not accepting the claim.

104.04 Plans and Working Drawings

~~Detailed~~ Plans and drawings of the existing conditions with a comprehensive description of the construction contemplated shall be available and *provided if the Department possess from the Department* and *when conditions warrant such plans.*

Working drawings showing shop details, erection diagrams, falsework, formwork, and any other such details that may be required for the work shall be submitted and approved by the Contractor *prior to submitting to for review and acceptance by* the Department *for review.* All working drawings shall be reviewed by the Department prior to work commencing.

The review ~~and acceptance~~ of any working drawings shall not alleviate the Contractor from the responsibility for the soundness of such working drawings or for the work they represent.

The Contractor shall not deviate from the contract plans or ~~approved~~ reviewed working drawings by the contractor without approval in writing from the Engineer.

104.05 Interpreting Documents

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

In interpreting the Plans and Specifications:

- a) in the event of discrepancies or conflicts between the Plans and Specifications (including the Special Provisions), the Specifications (or Special Provisions) shall govern;
- b) in the event of discrepancies or conflicts between the Plans, the Plans drawn with the largest scale shall govern; and
- c) in the event of discrepancies or conflicts between figured dimensions and scaled dimensions, the figured dimensions shall govern.

104.067 Lines and Grades

Unless noted otherwise in the Contract Documents, ~~t~~The Department ~~Engineer~~ will only set such stakes that are necessary to properly define the location, alignment, elevation and grade of the work. The Contractor shall give a reasonable notice of the time and place where the lines and grades will be needed.

104.12 Detours *(moved from section 105)*

104.13 Provision of a Road Through the Work *(moved from section 105)*

104.14 Accommodating Traffic *(moved from section 105)*

104.15 Access to Adjoining Property *(moved from section 105)*

104.16 Protection of Utilities *(moved from section 105)*

104.17 Use of Explosives *(moved from section 105)*

~~The use of explosives are not permitted. must be approved by the Engineer. The Contractor shall conform to all regulations of the Occupational Health and Safety Act pertaining to the use and handling of explosives. Blasting shall be controlled electrically and the total electrical requirements of the circuits shall be within the stated capacity of the electrical equipment. Charges are to be a size and number compatible with the requirements of the project. In addition to standard signals at the time of blasting, the Contractor shall warn all affected residents in advance that blasting will take place. Storage and transportation of explosives shall be in accordance with the provisions of the Explosives Act and any other requirements requested by the representative of the Explosive Division of the Federal Department of Energy, Mines and Resources.~~

104.18 Protection Against Royalties and Patented Inventions *(moved from section 105)*

104.19 Protection of Survey Monuments *(moved from section 105)*

104.1420 Excess Loading of Motor Vehicles

The Contractor shall not cause or permit vehicles to be loaded beyond the legal limits as specified in the Roads Act ~~and~~ *Vehicle Weights and Dimensions* Regulations whether such vehicle is owned by the Contractor or otherwise.

104.121 Defective Work and Materials

~~The work performed by the Contractor shall have a warranty period of 1 year from the date of substantial completion.~~ If any failure due to poor workmanship or defective material occurs within the warranty period, as stipulated in Clause 101.02, then the Contractor, at ~~the Contractor's~~ *their* own expense, shall repair the deficiency.

104.1322 Materials Supplied by the Department

When the Department is supplying material under the Contract, the Contractor shall give the Department sufficient notice for the delivery of the material. When the Department is supplying *materials liquid asphalt cement*, the Contractor shall pick up the *materials asphalt cement* from the source designated in the Contract. If any damage is done to *the* material by the Contractor after delivery, it shall be repaired or replaced at the Contractor's own expense.

104.1322.01 Materials Supplied by the Contractor

104.1423 Utilization of Surplus Material and Disposal of Waste Material

104.1524 Pit Requirements

Prior to hauling of any material from any pit, the Contractor will make sure that the pit has a valid permit issued by the Department of ~~Communities, Land and Environment~~ *Environment, Water and Climate Change*. No material shall be hauled from any pit to the work site without this permit in place.

104.27 Concrete Washout Pits

On projects which require them, the Contractor shall carry out all works associated with excavating, constructing, supplying, and installing environmental controls complete with their continued maintenance, clean out and disposal of waste material, decommissioning, removal of environmental controls, filling in, levelling out, and full reinstatement of washout pits to be used for cleaning the concrete trucks' chutes.

The Contractor shall account for the quantity of pits required based on the location of concrete truck delivery relative to the site. The location of pit(s) shall be coordinated with a Department representative. The Contractor shall arrange, obtain permission, and pay for, any pits which may have to be located on adjacent privately owned land.

This shall be considered incidental to the works and no additional compensation shall be provided for any labour and/or equipment related to the construction and decommissioning of washout pits.

105 LEGAL RELATIONS AND RESPONSIBILITIES

105.04 Insurance Requirements

In addition to Contractor's General Liability insurance, projects which require an engineering component for the supply and installation of engineered systems (water, sewer, structure, etc), then the Contractor shall ensure that their Engineer of Record has Professional Liability Insurance for Errors and Omissions (E&O), subject to limits not less than Two Million (\$2,000,000.00) Dollars per occurrence, with Two Million (\$2,000,000.00) Dollars Aggregate.

105.04.01 Proof of Insurance

A certified copy of the required insurance [certificate\(s\)](#) shall be submitted prior to commencing work and shall be subject to the Engineer's approval for adequacy of protection. Approval by the Engineer of any policy filed by the Contractor shall in no way relieve the Contractor of its obligations to provide the insurance referred to in the Contract, nor shall it imply that the policies are in accord with the terms of the agreement.

The Contractor shall require and ensure that each Sub-contractor submits a certified copy of the required insurance in accordance with provision 105.04 Insurance Requirements and shall provide copies to the Department upon request.

105.05 Certificate of Authorization

On projects which require the supply and installation of an engineered component for which drawings with the Engineers seal and signature are required, the Contractor shall ensure that the design of engineered components (structural, municipal, electrical, mechanical) shall be performed by a company registered to practice engineering in PEI.

The Contractor shall submit to the Department a copy of their design company's Certificate of Authorization (COA) as granted by Engineers PEI.

105.06 Occupational Health and Safety Act *(moved from section 106)*

105.06.01 Safety Certificates

Upon the request of the Engineer, the Contractor shall provide the following documentation to the Department for their files. The documents are not limited to the following:

- a) Project Specific Hazard Assessment Form
- b) Contractors Safety Checklist
- c) Crane/Boom Truck Certificates (both on and off site)
- d) Inspection certificates of all equipment (including sub-contractors) or, where inspection certificates are not available, a letter from the Contractor stating that all equipment has been maintained and in good working order
- e) Statement from the contractor that all personnel employed on site are trained in their respective equipment and operations.

105.07 Workers' Compensation Insurance *(moved from section 106)*

105.08 Work Conditions *(moved from item 15 – Tender Form & Agreement)*

The Contractor agrees to accept sole responsibility to comply with all federal, provincial and municipal legislation which may have application to the Work and agrees to comply with all provincial and federal legislation affecting conditions of work and wage rates

including the Employment Standards Act R.S.P.E.I. 1988, Cap. E-6.2, the Workers Compensation Act R.S.P.E.I. 1988, Cap. W-7.1, or any other laws that impose obligations in the nature of employers' obligations. The *Contractor* agrees to follow the Public Service Commission Human Resource Policies 9.05 Violence in the Workplace Policy; 9.08 Drug, Alcohol, and Medication Policy, and 11.01 Policy for the Prevention and Resolution of Harassment in the Workplace while working on Government sites, in Government vehicles or alongside Government staff.

https://psc.gpei.ca/sites/psc.gpei.ca/files/HRPolicy/HRManual_9.05.pdf
<https://psc.gpei.ca/sites/psc.gpei.ca/files/9.08%20DrugAlcoholAndMedicationPolicy.pdf>
https://psc.gpei.ca/files/PDF%20Files/hrp-manual/hrppm_11.01.pdf

The *Contractor* agrees to accept the full cost of doing those things required under this paragraph and will not charge or seek reimbursement from the *Owner* in any way, such costs having been taken into consideration and included in the rates of payment stipulated in this Agreement.

~~105.05~~ ~~Detours~~ (moved to section 104)

~~105.06~~ ~~Provision of a Road Through the Work~~ (moved to section 104)

~~105.07~~ ~~Accommodating Traffic~~ (moved to section 104)

~~105.08~~ ~~Access to Adjoining Property~~ (moved to section 104)

~~105.09~~ ~~Protection of Utilities~~ (moved to section 104)

~~105.10~~ ~~Use of Explosives~~ (moved to section 104)

~~105.11~~ ~~Protection Against Royalties and Patented Inventions~~ (moved to section 104)

~~105.12~~ ~~Protection of Survey Monuments~~ (moved to section 104)

106 ~~PRO~~**EXECUTION AND PROGRESS**

106.02 Time of Commencement

The contractor shall commence work in accordance to the Schedule of Work submitted under Section 102.11~~3~~, unless directed otherwise by the Engineer, and shall proceed continuously, diligently and with all reasonable dispatch consistent with the proper execution of the work until final completion. The rate of progress shall be such to ensure its final completion within the specified time.

After the schedule has been ~~approved~~ reviewed, any changes to the date of commencement ~~will~~ shall require a minimum of one week's notice to the Engineer and approval from the Engineer to allow for the proper utilization and scheduling of Department workers. Revised schedules must be signed by the Contractor and approved by the Department prior to starting work.

The Contractor ~~must~~ shall advise both the Project Manager and Materials Testing Lab no later than 3pm the previous day from when work on a project is to start or when the work plan changes where Department staff are required. Failure to do this may result in the work for that day not being permitted.

106.03 Time of Completion

The Whole of the work to be done under the Contract shall be completed in accordance to the Schedule of Work submitted under Section 102.11~~3~~. In no case shall the ~~T~~ime of ~~C~~ompletion exceed the completion of work date as specified in the ~~Tender~~ Contract Document.

106.10 Character and Employment of Workers

Whenever the Engineer informs the Contractor, in writing, that any person or persons involved in the work are, in the opinion of the Engineer, ~~not following the PEI Public Service Commission Human Resource Policies 9.05 Violence in the Workplace Policy; 9.08 Drug, Alcohol, and Medication Policy, 11.01 Policy for the Prevention and Resolution of Harassment in the Workplace or who is~~ incompetent, ~~unfaithful~~-abusive, unsafe or disorderly, such person or persons shall be discharged from the work and shall not again be employed on the work without the consent, in writing, of the Engineer.

https://psc.gpei.ca/sites/psc.gpei.ca/files/HRPolicy/HRManual_9.05.pdf
<https://psc.gpei.ca/sites/psc.gpei.ca/files/9.08%20DrugAlcoholAndMedicationPolicy.pdf>
https://psc.gpei.ca/files/PDF%20Files/hrp-manual/hrppm_11.01.pdf

~~106.13 Occupational Health and Safety Act~~ *(moved to section 105)*

~~106.14 Workers' Compensation Insurance~~ *(moved to section 105)*

107 PAYMENT

107.02 Measurement of Excavated Materials by Volume

~~Whenever the Contract requires the payment for excavation at a price per cubic metre, the volumes shall be measured in their original position and computed in cubic metres~~
Whenever the Contract requires the payment for excavation at a price per cubic metre, the volumes shall be measured in their original position and computed in cubic metres ~~by the method of average end areas unless otherwise specified~~ by comparing the original triangulated three dimensional surface (in CADD) to the excavated or graded triangulated three dimensional surface (in CADD). These two surfaces combine to form an enclosed volume. The number generated for this volume in cubic metres represents the excavation quantity.

107.03 Measurement of Weighed Materials

Where an individual line item for granular material exceeds 3,000 tonnes, the contractor shall ensure that scales of a minimum of 18.3m (60ft) are used to weigh the material. Split weighing shall not be permitted.

107.04 Measurement of Quantities Delivered by Volume

When roadway materials are being paid for by volume delivered, payment will be based on truck measurement.

When concrete materials are being paid for by volume, the volumes shall be the ticket volume supplied by the ready-mix plant and agreed to with the Department. The Engineer reserves the right to determine the amount paid for partial loads delivered and placed into the works.

108 GENERAL CONDITIONS AND AGREEMENT

New section added in its entirety, January 10, 2025

900 SAFETY

903 Flex Beam Guiderail

FIGURE 903-01B GUIDERAIL BEHIND CURB added January, 2025

1001 ELECTRICAL GENERAL PROVISIONS

1001.18 Cleaning

Do cleaning in accordance with Provision ~~103-04.~~ 103.09

1102 Curb and Gutter

Figure 1102-01, 1102-02, 1102-03 (Rescinded)

1103 Concrete sidewalk and Flatwork

1103.02 Material

Isolation joint filler: to ASTM D1751 or ASTM D5249: 12 mm preformed, non-extruding, resilient, bituminous, ~~type—polyethylene foam~~, cross linked polyethylene foam, or polyurethane.

1302 CONCRETE IN STRUCTURES

1302.2.4 Canadian Standards Association (CSA International)

- .1 CSA A3000-18, Cementitious Material Compendium.
- .2 CSA A23,1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Tests and Standard Practices for Concrete.
- .3 CSA S269.1-16 (R2021), Concrete Formwork.
- .4 [CSA S6-19, Canadian Highway Bridge Design Code.](#)

1306 GFRP REINFORCING BARS

1306.5. 3 Support of Reinforcement

.5 Protection

- .1 GFRP bars that are to be exposed after concrete pouring shall be protected from concrete laitance. Any wet concrete that is adhered to GFRP that is planned to be exposed shall be removed as soon as possible prior to the concrete laitance setting.

1308 External Corrosion Prevention/Sealing Systems

- New section added in its entirety, January 10, 2025

1330 PLANT PRE-CAST STRUCTURAL CONCRETE

1330.3 .6 Composition of Mix

~~.1 Concrete shall meet the requirements of CSA A23.1, exposure class C-XL, with a 28-day compressive strength of minimum 45 MPa.~~

.1 Concrete shall meet the requirements of Type "A" in accordance with Section 1302.

.2 Grout mixes for keyways, closures, joint pour-backs, lift inserts, etc., shall meet the requirements of A23.1, with a 28-day compressive strength of 35 MPa.

.3 Concrete shall have a slump not greater than 210 mm.

.4 No materials shall be used in the mix design that contain purposefully added chloride compounds in any quantity.

~~5 A calcium nitrite corrosion inhibitor shall be added to the concrete at a dosage rate of 15 L/m³.~~

.5 A calcium nitrite corrosion inhibitor shall be added in accordance with Type "A" concrete as per Section 1302.

1330.5 .2 Curing of Concrete

.11 The Contractor/Supplier shall perform a daily curing inspection (indicating for example but not limited to: type of curing, time duration, and support reasoning for termination, etc) on each unit, with results documented corresponding to its respective label identification. Results shall be submitted to the Department for project record purposes.

1330.5 .3 Finishing of Concrete Surfaces

.2 The Contractor/Supplier shall perform a post-form removal surface inspection on all surfaces for each unit. Items to identify shall include but not limited to: honeycombing, delamination, spall, cracking, disintegration, and cold joint. Each surface as well as all these defects shall be listed on the inspection form, with confirmation whether present or not. If any defect is present, indicate the global location and area / length extent. Each precast unit shall receive a post-form removal surface inspection, with results documented corresponding to its respective label identification. Results shall be submitted to the Department for project record purposes.

1330.5.4 Quality Testing

1330.5.4.1 General

.3 The Contractor/Supplier shall carry out Quality Control sampling/testing during the concrete placement, including air, temperature, and slump testing; as well as after

casting at time periods indicated for compressive strength. All costs associated with quality testing shall be covered by the Contractor/Supplier.

1330.5 .13 Installation

- .3 Grouting of keyways, closures, joint pour-backs, lift inserts, etc., shall be conducted as soon as practicable.

1330.7 Basis of Payment

- .5 Payment for units installed shall be made only upon complete installation of the structure, with no damage to any precast units. The supply, mixing and placement of grout material for keyways, closures, joint pour-backs, lift inserts, etc., shall be considered incidental to the work and shall not be measured or paid for separately.

1331 PRE-CAST PRESTRESSED CONCRETE BEAMS

1331.2.2 .4 Composition of Mix

- ~~.1 Concrete shall meet the requirements of CSA A23.1, exposure class C-XL~~
- .1 Concrete shall meet the minimum requirements of Type "A" concrete in accordance with Section 1302.
- .2 Concrete shall have a slump not greater than 210 mm.
- .3 No materials shall be used in the mix design that contain purposefully added chloride compounds in any quantity.
- ~~.4 A calcium nitrite corrosion inhibitor shall be added to the concrete at a dosage rate of 15 L/m³.~~
- .4 A calcium nitrite corrosion inhibitor shall be added to the concrete in accordance with Type "A" concrete as per Section 1302.

1331.4 .3 Finishing of Concrete Surfaces

- .3 The Contractor/Supplier shall perform a post-form removal surface inspection on all surfaces for each unit. Items to identify shall include but not limited to: honeycombing, delamination, spall, cracking, disintegration, and cold joint. Each surface as well as all of these defects shall be listed on the inspection form, with confirmation whether present or not. If any defect is present, indicate the global location and area / length extent. Each precast unit shall receive a post-form removal surface inspection, with results documented corresponding to its respective label identification. Results shall be submitted to the Department for project record purposes.

1331.4 .4 Quality Testing and Inspection

- .1 Perform all quality testing in accordance with Section 1330.5.4.

1331.4 .7 Identification of Prefabricated Beams

- .1 The Contractor shall adopt and show a beam identification system on the beam layout drawing of the shop drawings, whereby identical beams have identical numbers.
- .2 During construction, the date of fabrication shall be indicated on each beam as per 1330.5.6.
- .3 Identification and fabrication numbers shall be painted on the side of the upper flange of each beam.
- ~~.4 Each beam end shall be identified by painting on the approximate compass direction.~~

1331.6 Basis of Payment

- .3 Tables 1302-6 and 1330-3 shall not apply to this section.

1333 **MECHANICALLY STABILIZED EARTH WALLS**

1333.3 .12 Pre-Cast Concrete Fascia Panel Fabrication

- .1 The fabrication of pre-cast concrete fascia panels shall be in accordance with 1330, A23.4 and this section, ~~Type 'B'~~.
- .2 Concrete materials used in the fabrication of pre-cast concrete fascia panels shall be in accordance with 1301 and 1302, Type "B".

1335 **STEEL SUPERSTRUCTURE**

1335.3 .2 Quality Systems Manual

- .1 The Contractor shall submit the steel fabricator's Quality System Manual to the Engineer five (5) weeks prior to the start of fabrication, in accordance with the latest version of the CISC's Steel Bridge Certification Standard.
- .2 In addition to the requirements of the CISC's Steel Bridge Certification Standard, the Quality System Manual shall include the following:
 - .1 Method of transferring heat numbers, including traceability.
 - .2 Method of ensuring dimensional correctness, including traceability.
 - .3 Method of ensuring camber checks are complete, including traceability.

1335.3 .5 Detailed Fabrication Schedule

- .1 A fabrication schedule shall be submitted to the Engineer fourteen (14) days prior to the commencement of fabrication.
- .2 The Contractor shall provide seven (7) days written notice prior to commencement of fabrication or change in the fabrication schedule.

1335.3 .8 Transportation

- .1 Two (2) weeks prior to transportation to the site, the Contractor shall submit a transportation plan to the Engineer showing support details, lateral bracing, and tie-down locations for primary members during transportation to the work site.

1335.3 .9 Submittal Summary and Other Requirements

- .1 Submittals are required for this Item that are contained within the sections applicable to the specific phase of the Work being undertaken, separate and distinct to those listed here.

Table 1335-1
Submittal Summary and Other Requirements

Document	Reference Specification	Frequency and/or Timeline Requirement
Qualifications and Fabricator	1335.3.1	Once per contract
Quality Systems Manual	1335.3.2	Once per contract
Shop Drawings	1335.3.3 & 1385	Once per contract
Detailed Fabrication Schedule	1335.3.5	
Erection Procedure Drawings and Calculations	1335.3.7	Once per contract
Transportation Plan	1335.3.8	Once per contract
Welding procedure specifications, welding repair procedures and welding procedures data sheets	1335.3.4	
Mill test reports	1335.3.6 and 1335.4.3.2	Per plate, 48 hours prior to fabrication
Conformance for Shear Stud Connectors	1335.3.6	
Lamination Scan results	1335.4.6.6	
Alignment and dimensional checks at shop trail assembly with verified records of the actual measured camber layout/blocking details ¹	1335.4.2.10.1	Within 4 days of girder fabrication
Fit up of web-to-flanges, ensuring dimensional correctness and proper members used ¹	N/A	Within 4 days of girder fabrication
Fit up and layout of all stiffeners near side and far side, ensuring dimensional correctness and proper members used ¹	N/A	Within 4 days of girder fabrication
All web and flange splices tested and approved by quality control ¹	N/A	For each girder, prior to fit up and welding
Traceability of documentation of transfer of heat numbers	1335.4.3.2 and 1335.4.6.5	Within 4 days of girder fabrication
Shear stud connector installations ¹	1335.2.5	Within 4 days of girder fabrication
Dimensional inspection reports, including individual pieces, diaphragms and lateral bracing ¹	N/A	Within 4 days of girder fabrication
Quality Control NDT reports ¹	1335.4.6.7	Within 4 days of girder fabrication
Non-Conformance Reports (NCRs)	N/A	Immediately upon occurrence
Tracking documents to be on hand at fabrication plant for review by the Engineer's representative when visiting the facility.	1335.4.6.3	Updated daily and provided upon request by the Engineer's representative.
NOTES:		

1) Submittals shall include the signature of the person responsible, verifying conformance to the contract specification

2) The Engineer may request revisions and resubmittals at any time.

1335.4.2 .2 Workmanship and Finish

- .2 All edges of all members and plates that are not to be coated shall be chamfered 2.0 mm by grinding prior to blast cleaning and/or fit up.

1335.4.6 .6 Lamination Scans

- .1 The contractor shall perform lamination scans by ultrasonic examination on all plates with a thickness of 25 mm or greater.
- .2 Ultrasonic examination shall be performed in accordance with ASTM A435/A435M.
- .3 Personnel performing ultrasonic examination shall be qualified as a minimum Level 2 or 3 Ultrasonic Operator in accordance with the pertinent requirements of CSA S6, CSA W59, CSA W178.1 and CAN/CGSB-48.9712/ISO 9712.
- .4 The contractor shall submit the inspection reports to the Engineer prior to the plate being placed into fabrication.

.7 Inspection of Welds

- .1 Quality control shall be in accordance with CSA S6, Clause A10.18. The acceptance standards for CSA W59 for dynamically loaded structures shall also apply.
- .2 In addition to quality control measures instituted by the Contractor, the Contractor shall be responsible for quality control procedures specified herein.
- .3 The Contractor shall utilize an independent agency for quality control non-destructive weld inspection. The independent agency shall select the locations for testing.
- .4 All weld inspection personnel and agencies shall be certified to the requirements of CSA W47 and CSA W59.

1336 MISCELLANEOUS METALS

1336.1 DESCRIPTION

- .1 This Item consists of the supply, fabrication and installation of miscellaneous metals onto the structure, including; but, not limited to: deck drains, miscellaneous plates and embedded items, including expansion joint cover plates, steel angle on the top of each abutment ballast wall, anchor rods, all bent plates, angles, anchors,

bolts, etc. for timber bridge construction, steel traffic barriers, including barrier rails, posts, post caps, base plates, anchor bolts, handrails, and all other metals not associated with the steel superstructure as identified in Section 1335 or steel piles as indicated in Sections 1311 and 1312.

1337 **TIMBER STRUCTURES**

1337.4 **Construction**

- .4 The Contractor shall provide all labour, materials, and equipment required for the assembly of respective timber item as indicated on the drawings. ~~This item also includes the supply and installation of all connection hardware required to positively connect the concerned members.~~

1348 **SERVICE DUCTS – STRUCTURES**

1348.2 .4 **Steel Supports**

- .2 All steelworks shall be galvanized in accordance with ASTM A123 min ~~720 g /m²~~ 610 g /m².

1350 **STEEL COATINGS**

- New section added in its entirety, January 10, 2025

APPENDIX 1 – SAMPLE TENDER DOCUMENT (*Revisions*)

TENDER FORM ~~AND AGREEMENT~~ Revision 0

THIS AGREEMENT made by and between, herein called the Contractor, the Party of the First Part and The Government of Prince Edward Island as represented by the Minister of the Department of Transportation and Infrastructure, herein called the Minister, the Party of the Second Part.

WITNESS, AS FOLLOWS:

1. Definitions

The definition of terms used in this Tender Form and Agreement shall conform in all respects to the definition of terms contained in the document entitled "General Provisions and Contract Specifications for Highway *and Bridge* Construction," published by the Department of Transportation and Infrastructure of the Province of Prince Edward Island as amended on the date of closing of Tenders pursuant to this Agreement.

2. General Covenant

The *Bidder* ~~Contractor~~ hereby covenants and agrees with the Minister as herein provided in connection with the following work, namely:

For a distance of

The work includes

TENDER CLOSES:

~~(Tenders shall be delivered between 12:00 pm and 2:00 pm)
Queens County Highway Depot, 355 Brackley Point Road, Charlottetown, PEI~~

2:00 p.m., (*Insert day, month, date*)

Tender Closing Location: Tenders shall be received at the Queens County Highway Depot, 355 Brackley Point Road, Charlottetown PE.

8. **Bid and Performance Security**
8. **Bid and Performance Security (continued)**
12. **Components of the Contract**

Any and all plans or drawings prepared by the Department, the document titled "General Provisions and Contract Specifications for Highway & Bridge Construction", the advertisement, the Tender Form, and Construction Services Agreement together with Schedule A, Schedule of Special Provisions; Schedule B, Identification of Principals; Schedule C, Schedule of Tendered Unit Prices; Schedule D, Schedule of Equipment; and Schedule E, Schedule of Sub-Contractors, as well as any addenda which may be issued by the Department pursuant to this Contract shall hereby be a part of this Contract as fully and to the same effect as if the same had been set forth at length in the body of the Contract.

~~15. Work Conditions (moved to section 105 of DTI Specifications)~~

- ~~— The Contractor agrees to accept sole responsibility to comply with all federal, provincial and municipal legislation which may have application to the Work and agrees to comply with all provincial and federal legislation affecting conditions of work and wage rates including the Employment Standards Act R.S.P.E.I. 1988, Cap. E-6.2, the Workers Compensation Act R.S.P.E.I. 1988, Cap. W-7.1, or any other laws that impose obligations in the nature of employers' obligations. The Contractor agrees to follow the Public Service Commission Human Resource Policies 9.05 Violence in the Workplace Policy; 9.08 Drug, Alcohol, and Medication Policy, and 11.01 Policy for the Prevention and Resolution of Harassment in the Workplace while working on Government sites, in Government vehicles or alongside Government staff.~~
- ~~— https://psc.gpei.ca/sites/psc.gpei.ca/files/HRPolicy/HRManual_9.05.pdf~~
- ~~— <https://psc.gpei.ca/sites/psc.gpei.ca/files/9.08%20DrugAlcoholAndMedicationPolicy.pdf>~~
- ~~— https://psc.gpei.ca/files/PDF%20Files/hrp-manual/hrppm_11.01.pdf~~
- ~~— The Contractor agrees to accept the full cost of doing those things required under this paragraph and will not charge or seek reimbursement from the Owner in any way, such costs having been taken into consideration and included in the rates of payment stipulated in this Agreement.~~

IN WITNESS WHEREOF the parties hereto have hereby caused these presents to be signed and sealed on the dates stated.

SIGNED, ~~SEALED~~ AND DELIVERED
by the Bidder on the [] day
of [], 20[].

BIDDER~~CONTRACTOR~~

.....
(Authorized Signing Officer)

In the presence of:

.....
(Witness Signature)

SIGNED, SEALED AND DELIVERED
by the Minister on the [] day
of [], 20[].

MINISTER

.....

~~In the presence of:~~

.....
(Witness Signature)

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

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101.01 Terminology

This document titled "General Provisions and Contract Specifications for Highway & Bridge Construction", hereinafter referred to as 'this Document', contains information which is relevant to the administration of highway construction contracts.

This Document is divided into Divisions (i.e. 100), Sections (i.e. 101), Provisions (i.e. 101.01) and Sub-Provisions (i.e. 101.01.01). Unless otherwise specified in the text, all references to Specifications, Divisions, Sections, Provisions, Sub-Provisions, Tables or Figures shall refer to this Document.

Whenever in this Document it is provided that anything is, is to be or to be done, if, as, when or where "contemplated", "required", "directed", "deemed necessary", "permitted", "suspended", "approved", "directed", "unacceptable", "suitable", "satisfactory", "unsatisfactory", or "sufficient", such expressions shall have the same force as if followed by the words "by the Engineer" or "to the Engineer" as the case may be.

101.02 Definitions

Wherever, in any part of the Contract, the following words, expressions, pronouns or abbreviations are used, the intent and meaning shall be as follows:

AAMP:

Association for Materials Protection and Performance

AASHTO:

American Association of State Highway and Transportation Officials

ACI

American Concrete Institute

ANSI

American National Standards Institute

ASTM:

American Society for Testing and Materials.

AWS:

American Welding Society

Addendum:

A change in a Tender issued prior to the time and date of Tender Closing, stated in the Advertisement, which has the effect of modifying the Tender. An addendum shall be considered as an integral component of the Tender Submission and shall be deemed to take precedence over all other components of the Tender Document.

Advertisement:

A public or private announcement stating the name of the tender, project location, and the time, date, and location of the opening. The announcement shall either be published on the Government's website www.gov.pe.ca/tenders, in the newspapers of P.E.I. or take the form of a letter of invitation.

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Agreement:

The Agreement is a legal document, signed and witnessed, between the Contractor and the Department, which covers the respective legal responsibilities in, among other things, performance of the work and furnishing of construction materials as well as payment for acceptable services rendered.

Bank Draft:

A cheque issued by a bank on behalf of the Bidder guaranteeing payment to the Department as described by the conditions in the Tender Form and Agreement if the agreement is executed by the Minister.

Bid:

A bid is a formal offer made by a contractor.

Bid Bond:

A bond issued by a surety company on behalf of a Bidder to guarantee to the Department that the Bidder will procure a Performance Bond and will carry out the work if the agreement is executed by the Minister.

Bidder:

A person, partnership or corporation, acting directly or through a duly authorized representative, submitting a Tender for the work contemplated.

Borrow:

An excavated material used in the construction of a subgrade; with the origin of the source being located either inside or outside the right-of-way.

Bridge:

Any structure having a span of 3 metres or more which carries pedestrian or vehicular traffic.

CAC:

Cement Association of Canada

CGSB:

Canadian General Standards Board

CISC:

Canadian Institute of Steel Construction

CPCI:

Canadian Precast Prestressed Concrete Institute

CSA International:

Canadian Standards Association

CSP:

Corrugated Steel Pipe

CWB:

Canadian Welding Bureau

CWC:

Canadian Wood Council

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Certificate of Final Acceptance:

A written statement prepared by the Engineer stating the date on which the work has been accepted by the Department and the warranty period has ended.

Certificate of Final Completion:

A written statement prepared by the Engineer stating the date on which the work has been completed.

Certificate of Final Quantities:

A written statement of final quantities prepared by the Engineer and agreed to by the Contractor in writing.

Certificate of Substantial Completion:

A written statement prepared by the Engineer stating the date on which the work has been substantially completed.

Certified Cheque:

A cheque issued by the Bidder and certified by a bank guaranteeing that the Bidder has sufficient funds on deposit to cover payment to the Department as described by the conditions in the Tender Form and Agreement if the agreement is signed by the Minister.

Construction Period:

That time referred to in the contract during which the work can be carried out.

Contract Document:

The Contract Document shall include the Advertisement, the Tender Document (which includes the Tender Submission), this Document and all Sections within, the Executed Agreement all drawings, sketches, reports, addendas and all other documents appended to the Tender Documents.

Contract Price:

The amount stated in the Contract to be payable to the Contractor for the Work, exclusive of applicable taxes.

Contract Limits:

The geographic locations of the beginning and end of a project.

Contract Time:

The number of working days, as stipulated in the contract document, to complete the work.

Contractor:

The party of the first part to the Contract acting directly or indirectly through agents or employees, who is primarily liable for the acceptable performance of the Contract and also for the payment of all legal debts pertaining to the work.

Culvert:

Any structure not classified as a bridge which provides an opening under a roadway.

Department:

The Department of Transportation and Infrastructure of the Province of Prince Edward Island.

Deputy Minister:

The Deputy Minister of Transportation and Infrastructure Energy of the Province of Prince Edward Island.

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Engineer:

The person assigned by the Department to be in charge of the work, who is a Member of Engineers PEI, acting directly or indirectly through a designated assistant or representative.

FHWA:

Federal Highways Association

Final Acceptance:

The date when the warranty period has ended and there are no warranty items.

Final Completion:

The date when there is no work remaining to be done under contract.

Final Inspection:

Inspection which will take place no sooner than 11 months from the date of substantial completion. A Final Inspection Letter will be forwarded to the contractor outlining any warranty issues (if any) which shall be addressed under this contract prior to release of the performance security.

Granular Base:

A layer of granular material of specified type and thickness between the sub-base and the base of the pavement surface.

GSI:

Geosynthetic Institute

Highway:

The right-of-way which is reserved for use in construction of the roadway and its appertaining structures.

ICRI:

International Concrete Repair Institute

Irrevocable Letter of Credit:

A written promise, issued by a bank on behalf of the Bidder, guaranteeing payment to the Department as described by the conditions in the Tender Form and Agreement and the irrevocable letter of credit if the agreement is signed by the Minister.

Labour and Materials Bond:

A bond issued by a surety company on behalf of the Contractor to guarantee to the Department that all claimants will be paid for labour and materials used on the work described in the terms of the Contract.

Local Material:

Material that has its source on Prince Edward Island.

Major Item:

A major item is any item of work which is required for the project to fully operate as intended and in a safe manner. For example, roadway granulars, asphalt, select borrow, pipe work, etc. would be considered a major item. Landscaping would not be considered a major item.

Minister:

The Minister of Transportation and Infrastructure of the Province of Prince Edward Island.

NACE:

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National Association of Corrosion Engineers

NGLA:

National Lumber Grades Authority

Overburden:

A layer of partially organic material located immediately below topsoil which is unacceptable for use in construction and also unacceptable as topsoil.

PCP:

Pre-cast Concrete Pipe

Pavement:

A layer or layers of asphaltic or Portland cement concrete placed over an existing pavement, base, sub-base or subgrade.

Performance Bond:

A bond issued by a surety company on behalf of the Contractor to guarantee to the Department proper performance of the terms of the Contract.

Plans/Drawings:

Any plans, profiles, typical cross-sections, supplemental drawings or exact reproductions thereof, which are approved or stamped by the Engineer and show the location, character, dimensions and/or detail of the work to be done and which are to be considered part of the Contract.

Principals:

The officers and individuals holding more than a 10% interest in a corporation; the partners in a partnership or the owners of an unincorporated firm.

Province:

The Province of Prince Edward Island.

RAP:

Reclaimed Asphalt Pavement

Roadbed:

That portion of the roadway extending from shoulder line to shoulder line; in other words, the subgrade and shoulders taken as a unit.

Roadway:

That portion of the highway included between the outside lines of gutters or ditches including all appertaining structures and all slopes, ditches, channels, and waterways necessary for proper drainage and protection.

RSIC:

Reinforcing Steel Institute of Canada

SADT:

Summer Average Daily Traffic

Security Deposit:

A deposit in the form of a certified cheque, bid bond, letter of credit or bank draft as security as described in the Tender Form and Agreement for due fulfilment of the Contract.

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Schedule:

A document whereby the contractor shows specific contract tasks being done on a timeline.

Slope:

Rise to run expressed as a percent or run to rise expressed as a ratio.

Snowtrap:

A field adjacent to the right-of-way with a terrain that causes snow to gather upon the roadway.

Specifications:

All written or printed descriptions or instructions pertaining to the method and manner of performing the work or to the quantities and qualities of the materials to be furnished and work to be carried out under the Contract; this includes the Tender, this Document, Supplemental Specifications, Special Provisions and Addenda, together with all written agreements made or to be made pertaining to the method or manner of performing the work or to the quantities or qualities of materials to be furnished and works to be carried out under the Contract.

Special Provisions:

Special directions containing requirements peculiar to the work not adequately provided for by the General Provisions and Contract Specifications for Highway & Bridge Construction.

SSPC:

The Society of Protective Coatings

Stop Work Order:

An order given in writing by the Engineer which directs the Contractor to stop work. An order communicated verbally or in writing by a Department Representative to the Contractor that directs the Contractor to immediately stop work. This shall be followed up with a formal written Stop Work Order from the Engineer. The written order will state the reason, the conditions and the deadline for compliance with the order.

Sub-base:

A layer of material or specified type and thickness between the Subgrade and the Base.

Sub-Contractor:

Any person, company or entity that provides a service to, or on behalf of, the Contractor in order to facilitate any aspect of the work

Subgrade:

The earth or rock surface, whether in cut or in fill, that is prepared for the sub-base and base.

Substantial Completion:

The state of a contract when the work or improvement is ready for use or is being used for the purpose intended and when the work remaining to be done under contract is capable of being complete or corrected at a cost of not more than ten percent (10%) of the final Contract price.

Supplemental Specifications:

Specifications which are supplemental to this Document.

Supplier:

A person, corporation or entity which supplies materials to be incorporated into the work by the Contractor or his affiliates.

Surplus Material:

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Any and all unused material the Department has placed a value on and may be stockpiled for future use or transported to another site.

Technician:

An assistant to the Engineer who is assigned to make inspection of work performed or being performed or of materials furnished or being furnished or to do such other work as assigned by the Engineer.

Tender Document:

The documents released by the Department for the Bidders to consider during the open tendering period. These may include; but, not be limited to: the Tender Form, Schedule 'A', Schedule of Special Provisions; Schedule 'B' Identification of Principals; Schedule 'C' Estimate of Items; Schedule 'D', Schedule of Equipment to be used on the Work; Schedule 'E', Schedule of Sub-Contractors; Schedule 'F', which includes this Document, supplemental specifications, drawings, safety documents, addenda, or any other supplemental information required for the Bidder to adequately estimate the project.

Tender Form:

The form for which Bidders are to sign, date and have witnessed. The Tender Form reflects the Bidders intent to enter into a formal Agreement with the Department if they are deemed successful in providing the winning tender submission.

Tender Submission:

An offer by the Bidder for work on which the Department requires formal bids to be prepared and submitted. Refer to Section 102, Cl. 102.04 for details.

Thickness:

The compacted depth of a lift or layer of material after placement within the roadbed.

Ticket:

A voucher, issued by a designated employee of the Department at the point of origin of a load to a truck driver and delivered to a designated employee of the Department at the work site, describing the quantity of material upon which payment of the load is to be based, showing the project number; road name; contractor; source number; scale number; truck owner/ truck driver; truck and trailer plate numbers with number of axles on each; open or closed haul; haul length; date; time loaded and unloaded; signatures of Department weigher and checker (who cannot be the same person;) and volume in cubic metres if measured by volume, or gross weight, tare weight, and net weight of material in kilograms or pounds if measured by weight. The ticket shall indicate that it is for either Pit to Stockpile, Stockpile to Road, Void, or, Non-pay Item.

Topsoil:

A fertile, friable soil of loamy character that contains a normal amount of organic matter.

Transportation and Infrastructure:

Transportation and Public Works or Transportation and Infrastructure Renewal or Transportation, Infrastructure & Energy, which may be stated within this document, shall mean Transportation and Infrastructure.

Warm Mix Asphalt (WMA):

Warm Mix Asphalt is a generic term for a variety of technologies that allow Hot Mix Asphalt producers to lower temperatures at which the material is mixed and placed on the road.

Warranty Period:

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Unless otherwise stipulated in the Contract Documents, the Warranty Period shall be defined as a period of 12 consecutive months from the date of substantial completion, as indicated in the Certificate of Substantial Completion.

Watercourse:

An area which has a sediment bed and may or may not contain water, and without limiting the generality of the foregoing, includes the full length and width of the sediment bed, bank and shore of any stream, spring, creek, brook, river, lake, pond, bay, estuary or coastal body, any water therein, and any part thereof, up to and including the watercourse boundary.

Watercourse boundary:

In a non-tidal watercourse, the edge of the sediment bed, and (ii) in a tidal watercourse, the top of the bank of the watercourse, and where there is no discernible bank, means the mean highwater mark of the watercourse.

Wetland:

A "wetland" shall be defined as (i) an area which contains hydric soil, aquatic or water-tolerant vegetation, and may or may not contain water, and includes any water therein and everything up to and including the wetland boundary, and (ii) without limiting the generality of the foregoing, includes any area identified in the Prince Edward Island Wetland Inventory as open water, deep marsh, shallow marsh, salt marsh, seasonally flooded flats, brackish marsh, a shrub swamp, a wooded swamp, a bog or a meadow;

Wetland Boundary:

Where the vegetation in a wetland changes from aquatic or water-tolerant vegetation to terrestrial vegetation or water-intolerant vegetation. A wetland by this definition is any area with hydric soils and aquatic/water tolerant vegetation which may/may not be on the inventory and may/may not contain water.

Waste Material:

A material of any form which is deemed of no use to the Department and is to be disposed of by the Contractor.

Weigh Scale:

A device used for the measurement of weight.

Work:

All of the work specified in the contract as contemplated.

Work Day:

Any calendar day from the time of commencement of the work until the completion of the work, other than Saturday, Sunday or Statutory holidays.

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102.01 Conformity of Work with Plans and Specifications

The Contractor shall perform all work and shall furnish all materials, unless specified elsewhere in the Contract, and complete the whole of the work in strict conformance with the plans and specifications.

102.02 Contents of Tender

The Department shall furnish the Bidder with a Tender Document which will show an estimate of the various quantities of work to be performed, materials to be furnished and the time before which the work must be completed.

All papers bound, attached or supplied with the Tender Document are a necessary part thereof and must not be removed from the Tender Package.

Special Provisions, which are issued as part of the Tender Document shall supersede all other components of the Tender; however, Addenda may be issued at any time prior to the time and date specified in the Advertisement for Tender Closing which may have the effect of modifying a Special Provision or any other component of the Tender Document.

Addenda issued within 24 hours of the closing date, which affect a change in scope to the contract, shall require an extension to the closing date of the Tender. The Engineer shall determine the effect of a change in scope and the appropriate extension to the closing date required due to the effect.

102.03 Bidder Investigations

The Bidder shall fully investigate the site and become acquainted with the location and character of the terrain upon which the work is to be undertaken. The Bidders shall also become familiar with the plans, profiles, specifications, both general and special provisions, soil borings and reports, and all other information concerning the work which may be supplied by the Department to those bidding the Contract.

No claims for extras will be entertained by the Engineer for failure to investigate the site conditions, unless it can be proved that the extra cost arose from unforeseen circumstances not covered by the information provided to Bidders by the Department, or not obvious to a prudent Bidder before entering into the Contract.

102.04 Preparation of Tender

The Bidder must submit their Tender Submission on the forms furnished by the Department.

Each tender submission must include the following:

- a) The Tender Form, duly signed, and witnessed;
- b) Completed Schedule 'B';
- c) Completed Schedule 'C';
- d) Security Deposit and
- e) All signed Addenda (if any).

The Tender Form must be dated and signed by person(s) having authorized signing authority. This shall be witnessed in the appropriate location.

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Schedule "B" shall identify the Contractor supplying the Tender Submission, including Registered name, address, contact information and the person or persons legally authorized to sign on behalf of the entity. If the Tender Form is made out by an individual, the individual's name and Post Office address must be shown; if it is made out by a firm or partnership, the name and Post Office address of each member of the firm or partnership must be shown; and if it is made out by a corporation, the person signing the Tender must show the name of the Province under the laws of which the corporation was incorporated and the names, titles, and business addresses of the President, Secretary and Treasurer.

Schedule 'C' is the Schedule of Items for Tender. The Bidder must write in ink the prices, both in words and numerals, for which the Bidder proposes to do each item of the work contemplated. The Bidder must extend the total for each item of the work and carry out a summation to the total value of the work to be done under the Tender.

See Section 102.07 for Security Deposit requirements.

Any addenda shall be signed and dated by the person(s) having authority to do so.

No other documentation is required for the Tender Submission.

102.05 Delivery of Tender

The Tender Submission must be received on or before the time and date of the Tender Closing specified in the advertisement. At the time of tender closing, should the Provincial offices at the tender location be closed due to inclement weather, the tender closing will be moved to the following business day at the same tender closing time and location. Each Tender Submission must be submitted in a sealed envelope and should be clearly marked:

"Tender for (Insert Project Name)."

The sealed and marked envelope is to be delivered to the Minister at the Tender Closing location identified in the tender documents.

Faxed, mailed or emailed submissions, edits, changes, etc. shall not be accepted.

102.06 Rejection of Tender

Tenders will be rejected if they show any omissions, form alterations, additions not called for, conditional or alternate bids, or irregularities of any kind, or if they contain a clause in which the Bidder reserves the right to accept or reject a Contract awarded. The right to reject any or all Tenders is reserved by the Minister. The lowest or any Tender will not necessarily be accepted.

102.07 Bid and Performance Security

Bid Security:

The Tender shall be accompanied by either:

- a) a certified cheque equal to or greater than the amount stipulated in Schedule A - Schedule of Special Provisions; or
- b) a bank draft equal to or greater than the amount stipulated in Schedule A - Schedule of Special Provisions; or

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- c) a bid format irrevocable standby letter of credit equal to or greater than the amount stipulated in Schedule A - Schedule of Special Provisions; or
- d) a bid bond equal to or greater than the amount stipulated in Schedule A - Schedule of Special Provisions. (The bid bond shall be from a surety company authorized to do business in Canada guaranteeing to supply a performance 103.02 (d))

The Bidder shall forfeit the bid security to the Minister if the Bidder fails to enter into a Contract when called upon to do so.

Performance Security:

Performance Security shall be as set forth in Section 103, Cl. 103.02.

All certified cheques, irrevocable standby letters of credit, bank drafts, and bonds are to be made payable to the Minister of Finance, Province of Prince Edward Island.

The Government approved templates for the Bid Format ~~and Performance Format~~ irrevocable standby letters of credit can be found in Appendix 1. Bidders who choose to use the letter of credit as security must provide them as shown on these approved templates. Any deviation from this standard template may be cause for rejection of the Tender. The letters shall be on the Bidder's preferred Financial Institutions letter head and shall be signed and sealed by personnel having proper authority.

102.08 Withdrawal of Tender

A bidder will be permitted to withdraw the Tender, unopened after it has been deposited, if a request is received by the Department in writing prior to the latest time for receiving tenders.

102.09 Unauthorized Multiple Bids

Each Bidder shall submit only one (1) Tender. Bidders who submit more than one (1) Tender shall have all bids disqualified.

102.10 Competency of Bidder

Bidders must be capable of performing the various items of work bid upon. Bidders shall, upon the request of the Department, provide a statement covering experience on similar work and a statement of their financial resources.

102.11 Scheduling of the Work

The Successful Bidder, upon receiving notification from the Department, shall submit a schedule prior to being awarded the Contract. After receiving the notification, the Successful Bidders shall have seven (7) working days to deliver an acceptable schedule. The schedule shall be limited to the number of working days as stipulated in the Schedule 'A' of the Tender documents and shall be within the construction period as defined in Section 101.02 Definitions. The Department reserves the right to ask the Contractor to revise the schedule prior to the time of commencement of the work or during the work progression. In no case, shall the scheduled completion date surpass the time of completion as stated in the Tender Documents unless approved by the Engineer.

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102.12 Errors or Omissions

The Bidders are to report any conflicts or omissions within the Tender Documents prior to Tender closing and as soon as they become apparent. The Engineer shall determine which is to be followed and how the work is to be carried out and advise Bidders through Addenda.

102.13 References

All reference to acts, regulations, codes, testing procedures, and methods shall be understood to be the latest update to such acts, regulations, testing procedures, and methods, unless stated differently in the Tender Documents.

102.14 Taxes

Harmonized Sales Tax. The Province is not exempt for Harmonized Sales Tax (HST) purposes. As a result, the aggregate amount of Tender for Department Contracts is subject to HST, however, prices submitted shall not include HST. The HST payable by the Department will be added as a separate item during Department processing of progress payments and, therefore, HST will not appear as a cost in the aggregate amount of Tender.

Bidders are advised that they are eligible to claim an Input Tax Credit (ITC) for a portion of the HST paid in relation to the Contract to the requirements of the Government of Canada.

102.15 Procedures for Tender Openings and Evaluations

102.15.1 Tender Opening

A preliminary check will be conducted at the Tender opening to ensure the following information has been included.

- a) Security Deposit. Each Tender is reviewed to ensure that a sufficient Security Deposit accompanies the Tender.
- b) Original Signatures/Acknowledgements. The Tender Document shall be completed, signed and witnessed as an acknowledgement of the receipt and understanding of the Tender documents.
- c) Completed Schedule B;
- d) All signed Addenda (if any).
- e) Aggregate Amount of Tender (Contract Price). Each Tender is reviewed to ensure the total aggregate amount of Tender (Contract Price) has been included.

Failure to meet these requirements shall result in rejection of the Tender and the Tender not being read at the Tender opening stage.

102.15.2 Tender Evaluations.

All Tenders not rejected at the Tender opening will be subject to a detailed evaluation by Department staff before a recommendation is made for award of Tender. This detailed review will take place as soon as possible after the Tender opening and will consist of the following:

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• Tender Submission	The Tender shall be submitted on the proper forms, supplied by the Department. Unit prices shall be written in ink or typewritten and shall be given in both words and numerals in the appropriate columns. Forms shall not be altered, unless called for in a Department Addendum.
• Bid Conditions	The Bidder is not permitted to include conditions with their Tender.
• Bid Security.	Bid Security, meeting the requirements of Clause 102.07, shall be included with the Tender.
• Signatures/Acknowledgements	The Tender Form shall be completed, signed and witnessed as an acknowledgement of the receipt and understanding of the Tender documents.
• Arithmetic Checks.	The Tender will be checked for arithmetic errors. In cases where the written unit price does not agree with the numeric price, the written unit price will be used. All mathematic errors will be corrected by Department staff and the rating of Tenders as to total Bid will be based on the corrected totals.
• Value Engineering	Provided that all the requirements stated above have been met, any VE proposals brought forth by the Bidders will be evaluated as per Cl. 103.08.

Failure to meet the requirements of the above items will result in the rejection of the Tender Submission.

- Unbalanced Bids. Each unit price in the Tender Submission shall represent its proportionate share of the total cost of The Work. Unbalanced Bidding is not permitted. The Minister reserves the right, in their sole and absolute discretion, to deem a Tender Submission unbalanced and may reject any and all Tenders, which they so deem, and for this purpose, to be unbalanced.
- Identical Bids. Where two or more acceptable Bids are identical, the successful Bidder shall be selected by means of a coin toss performed by the Department in the presence of the identical Bidders.

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103.01 Scope of Work

The Scope of the Work shall be determined from the Tender Documents, which are defined in Section 102, Clause 102.02.

The Successful Bidder, upon receiving notification from the Department, shall submit Performance Security prior to being awarded the Contract. After receiving the notification, the Successful Bidder shall have seven (7) working days to deliver an acceptable Performance Security as outlined in Section 103.02.

103.02 Performance Security

Before Work commences on the project a Performance Security shall be filed with the Department. This Security shall remain in place until the warranty period expires (one year after substantial completion). This Performance Security shall be either:

- (a) a certified cheque in the minimum amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year after substantial completion) has elapsed. Note: A certified cheque which has not been cashed shall be replaced within six months of the issue date; or
- (b) a bank draft in the minimum amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year after substantial completion) has elapsed.
- (c) a performance format irrevocable standby letter of credit on a government approved form in the minimum amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year after substantial completion) has elapsed. A performance standby letter of credit must have an automatic renewal clause within the body of the agreement; or
- (d) a performance bond equal to 50% of the Contract value, excluding HST and a labour and materials bond equal to 25% of the Contract value, excluding HST which shall be retained until the warranty period (one (1) year after substantial completion) has elapsed. The company issuing these bonds must be authorized to do business in Canada. A performance bond and/or a labor and materials bond which matures prior to the end of the warranty period shall be replaced, by the Contractor, with new Security of equal value, before maturity. The Minister may limit the performance security to bonds only to assure the completion of the work.

When a contract is to be completed over several construction years, and portions of the contract are considered by the Engineer as complete, but the entire Contract is not, the Engineer can issue a certificate of Substantial completion for those portions of the Work that are complete. Performance Security, however, which would be appropriate for that Work will only be released after the one-year warranty expires from the total contract's substantial completion date.

All certified cheques, irrevocable standby letters of credit, bank drafts, and bonds are to be made payable to the Minister of Finance, Province of Prince Edward Island.

The Contractor will forfeit the Performance Security to the Minister if the Contractor fails to carry out the Contract when called upon to do so.

The Government approved templates for the Performance Format irrevocable standby letters of credit can be found in Appendix 1. Bidders who choose to use the letter of credit

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as security must provide them as shown on these approved templates. Any deviation from this standard template may be cause for rejection of the Tender. The letters shall be on the Bidder's preferred Financial Institutions letter head and shall be signed and sealed by personnel having proper authority.

103.03 Quantities

The quantities set forth in Schedule C of the Tender Documents are based on estimated quantities. If when carrying out the work and/or supplying materials under the Contract, the quantities are foreseen to exceed the Contract amount, then the Contractor shall notify the Engineer.

Either party may request a price adjustment when quantities on major items, as stated within the Tender Documents, vary by more than 25% from the contract quantity. Adjustments to unit prices, in the case of an over-run, shall be applied only to that quantity that is over and above 125% of the original quantity.

103.04 Changes and Alterations

The Engineer may, in writing, at any time, alter the quantity of work to be done or materials to be supplied. The Contractor shall continue with the work and either party may request unit price adjustments in accordance with Provision 103.03.

In the case where the changes and alterations within the Contract affect methods of construction and procedures, then either party may request in writing negotiations to take place to determine the price adjustments to the Contract. The work shall not continue until these negotiations are finalized; unless, in the Engineer's opinion, a stop work order would affect the safety of the travelling public or the completion of the Contract.

103.05 Material Guarantee

Upon the request of the Department, the Contractor shall furnish a complete statement of the origin, composition and manufacture of all materials to be used in the construction of the work together with any manufacturers' instructions. Upon the request of the Department, the Contractor shall furnish samples of any or all materials to be used in the work; these samples may be subject to testing as required by the Department to determine their quality and fitness for the work.

103.06 Open Truck Haul

For all truck haul for which Department tickets are issued, the Contractor shall permit any person, partnership or corporation to supply trucks for haulage of material to be used in the Contract, without giving preference to the Contractor's own trucks. The Contractor shall pay for trucks employed to haul materials to a work site at rates not less than the current government rates which may be re-established from time to time by the Department.

For those materials which are weighed for payment, only those trucks which can be fully supported by the scales as required by Measurements Canada, shall be permitted to haul. These trucks must also conform to the Vehicle Configurations and Restrictions as provided in Section 907 of these specifications.

For those materials which are paid by volume, the trucks must conform to the Vehicle Configurations and Restrictions as provided in Section 907 of these specifications.

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The truck haul shall be considered to be that distance from the point of loading to the centre of the work being carried out in the Contract Agreement.

Truck haul shall be determined in advance of any material being delivered to the work site. The Department representative and the Contractor shall be in agreement with truck haul measurement, prior to commencing the work.

The Contractor shall limit the truck haul to those roads that can accommodate two-way traffic flow. In the case of the material source being located on a road that can not meet this requirement, the Contractor may be required to provide pull-off areas as directed by the Engineer.

The Contractor may stockpile materials one time only prior to their incorporation into the work. Stockpile sites shall be determined and approved in advance of the stockpiling of the materials. The Contractor shall install weigh scales in accordance with Section 107.03 at either the production site or the stockpile site. In the case of materials imported by floating vessel, the contractor may stockpile materials one time prior to their incorporation into the work.

In the case of materials imported by truck, the Contractor must stockpile materials one time only prior to their incorporation into the work. The haul from the stockpile to the work site shall be the open haul and no scales shall be required at the production site.

103.07

Extra Work

Work which can not be covered by any of the various items for which there is a bid price in the Contract shall be deemed as extra work. No additional work outside that which is included in the Contract shall be done by the Contractor except upon the written order of the Engineer.

Work that is deemed to be extra shall be paid in the order outlined below:

Firstly, the extra work will be paid for at rates agreed to by the Engineer and the Contractor prior to the extra work actually beginning.

Secondly, if the Engineer directs the Contractor to begin the extra work prior to rates of pay being agreed to by the Engineer and the Contractor, and a rate of pay for the item is contained within the regularly published PEI DTI Standard Prices - Unbid Jobs, then the rates published in the Standard Prices - Unbid Jobs shall be used as the basis for payment. Note, if the work is carried out by a Sub-Contractor, then the Contractor may add 5% to these rates.

Finally, if the Engineer directs the Contractor to begin the extra work prior to rates of pay being agreed to by the Engineer and the Contractor, and a rate of pay for the item is not contained within the regularly published PEI DTI Standard Prices - Unbid Jobs then the amount to be paid for the extra work shall be calculated as follows:

The Contractor shall keep accurate records, as agreed upon, of quantities or costs and present an account of the cost of the change in the work, together with vouchers where applicable. The Contractor shall present the valuation in detail giving actual material trade price (not list price) and actual labour costs (including unemployment insurance and workers compensation premiums, vacation pay, etc.) and the actual cost of equipment rental, if not covered in the Province of Prince Edward Island Machinery Rental Rates. To these prices the Contractor may add the following percentage amounts to determine the total cost to the Owner.

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- a) For work involving the General Contractor only, the General Contractor adds 10% to his costs.
- b) For work involving a sub-contractor only, the sub-contractor adds 10% to his costs, submits this price to the General Contractor who adds 5%.
- c) For work involving the General Contractor and a Sub-Contractor, the Sub-Contractor adds 10% to his costs, submits his price to the General Contractor who adds 5%; to this amount the General Contractor adds the cost of his own work plus 10% of the cost of his own work only. The General Contractor does not add a further 5% to the cost of his own work.

Note: If the extra work includes machinery rental costs which are covered within the above noted Machinery Rental Rates publication, then these costs shall be added to the subtotal of all other costs (IE. no markup will be allowed by the Contractor actually doing the work; however, the General Contractor may add 5% to a sub-contractor's machinery rental rates) as calculated in any of the above methods listed a) through c). Machinery costs which are not covered in the Machinery Rental Rates Publication will then be included in the calculations of the above methods listed a) through c).

The cost of any extra work shall not include the costs of service vehicles or the wages of supervisory personnel except under special circumstances authorized by the Engineer.

The Engineer may request the Contractor to provide vouchers for all labour and materials used for extra work. All provisions of the Contract shall apply to extra work and no extra work shall cancel or impair the Contract.

103.08

Value Engineering

The Department will entertain proposals brought forth by any Successful Contractor for Value Engineering (VE). The Department will review all proposals for technical merit and proposed cost savings. The Department will then advise whether or not the VE Proposal is feasible. The Department's decision shall be considered as final.

Proposal(s) from any Contractor shall be submitted any time after the Agreement has been Executed with the Minister.

Proposal(s) from any Contractor shall contain a detailed breakdown of all related work activities complete with associated costs (credits and debits), with the net cost savings clearly indicated.

Any proposals deemed acceptable to the Department will be eligible for cost savings sharing of 50% for the Department and 50% for the Contractor. There will be no compensation for those proposals which are deemed unacceptable.

Note the 50/50 cost savings sharing shall **not** be applied to any credits to the Contract nor unused quantities. The cost savings sharing shall **ONLY** be applied to VE Proposals brought forth by the Contractor and agreed to with the Department.

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All costs related to updating the Departments and/or Consultants drawings as a result of an accepted proposal shall be covered by the Contractor, independent from the 50/50 cost split items.

103.09 Final Cleanup

Before the work will be accepted in accordance with Provision 103.10, the Contractor shall assure that the area within the limits of the Contract are cleaned of all rubbish, excess material, equipment, and temporary structures except for long term environmental structures. In addition, all ground grades shall match the surrounding terrain. Final cleanup costs shall be considered incidental to the performance of the work.

103.10 Acceptance of the Work

The Engineer shall issue a Certificate of Substantial Completion and shall list any deficiencies to the Contract that need to be corrected by the Contractor.

The Engineer may accept any portion of the work when it is distinct and separate from the whole of the work.

The acceptance of any work does not alleviate the Contractor's responsibility for the quality of the work and materials supplied.

The Engineer shall issue a Certificate of Final Completion when all of the work has been completed, inspected and there are no identified deficiencies.

The Engineer shall issue a Certificate of Final Acceptance and release the Security Deposit following the expiration of the one-year warranty period and after any warranty issues have been rectified.

103.11 Subletting or Assigning of Contract

The Contractor may name any Sub-Contractors to the Contract under Schedule E of the Tender Form and Agreement.

This clause does not apply to the supply of materials but upon the award of Contract, the Contractor shall be required to name the suppliers in writing prior to commencing work.

The Department reserves the right to reject any Sub-Contractor due to non-performance or inability to do the work.

In no case, shall any assignment or subletting of the Contract relieve the Contractor from responsibility for due performance and completion of the work.

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104.01 Authority

The Engineer is the Department's representative and has authority to assure that the Contractor completes all work in accordance with the plans and specifications. The Engineer shall determine the quantities of the work that are to be paid for under the Contract and shall respond to all questions relating to the Contract.

The Engineer shall render decisions on all claims by the Contractor. The Contractor shall, at the Contractor's own expense, furnish all reasonable aid and assistance to the Engineer to enable proper inspection of the work.

Notwithstanding any Departmental inspections, the failure of the Engineer to condemn defective work or material shall not constitute a waiver of a specification or the acceptance of the defective work or material. The Contractor shall remain liable for any defective work or material and shall be responsible to correct any deficiencies.

104.02 Claims

All claims shall be submitted in writing to the Engineer prior to the acceptance of the work by the Department. The Contractor shall be required to submit in writing any additional information that may be requested for the purpose of assessing the claims. All claims for approved additional works shall be made within 30 days of the works being finalized. Failure to submit the additional information requested, in writing, will be sufficient cause for not accepting the claim.

104.03 Modification of Methods and Procedures

If at any time, the Engineer finds that the Contractor's methods, equipment and procedures are found to be unsafe or non-productive to the progress and quality of the work, then the Engineer may request in writing that the Contractor modify methods, equipment and procedures so that the safety, progress and quality of the work are maintained. Failure of the Contractor to comply with the Engineer's request may result in a stop work order being issued.

104.04 Plans and Working Drawings

Plans and drawings of the existing conditions with a comprehensive description of the construction contemplated shall be available and provided if the Department possess and when conditions warrant such plans.

Working drawings showing shop details, erection diagrams, falsework, formwork, and any other such details that may be required for the work shall be submitted and approved by the Contractor prior to submitting to the Department for review. All working drawings shall be reviewed by the Department prior to work commencing.

The review of any working drawings shall not alleviate the Contractor from the responsibility for the soundness of such working drawings or for the work they represent.

The Contractor shall not deviate from the contract plans or reviewed working drawings by the contractor without approval in writing from the Engineer.

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104.05 Interpreting Documents

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

In interpreting the Plans and Specifications:

- a) in the event of discrepancies or conflicts between the Plans and Specifications (including the Special Provisions), the Specifications (or Special Provisions) shall govern;
- b) in the event of discrepancies or conflicts between the Plans, the Plans drawn with the largest scale shall govern; and
- c) in the event of discrepancies or conflicts between figured dimensions and scaled dimensions, the figured dimensions shall govern.

104.06 Conflicts and Omissions

The onus is on the Contractor to report any conflicts or omissions within the Contract plans and specifications as soon as they become apparent. The Engineer shall determine which is to be followed and how the work is to be carried out. The Contractor shall not be entitled to additional compensation for work not specifically mentioned in the plans and specifications which is obviously necessary to complete the contracted work.

104.07 Lines and Grades

Unless noted otherwise in the Contract Documents, The Department will only set such stakes that are necessary to properly define the location, alignment, elevation and grade of the work. The Contractor shall give a reasonable notice of the time and place where the lines and grades will be needed.

All stakes, marks and reference points shall be carefully preserved by the Contractor.

The Contractor may be held responsible for the cost of replacing stakes, marks or reference points that, in the opinion of the Engineer, were disturbed unnecessarily when carrying out the work.

Whenever necessary, work shall be suspended for such reasonable time as may be necessary for the layout and inspection of any portion of the work. The Contractor shall not be allowed any extra compensation for this necessary suspension of the work.

104.08 Right of Entry

At any time during the work, the Department, its servants or agents, may enter the Contract limits for the purpose of constructing or installing such collateral works that are necessary for the completion of the work. The Contractor shall accommodate any collateral work by scheduling their work so as not to interfere.

In the case, where the Contractor has knowledge of the collateral work at the time of bidding or when the collateral work does not affect the Contractor's methods and procedures, no claim shall be allowed by the Contractor.

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104.09 Contractor's Responsibility

The Contractor shall continually give attention to the work while it is in progress. The Contractor shall identify and place a competent and reliable representative with authority to act for the Contractor in charge of the work.

The Contractor shall at all times supply a sufficient number of personnel and equipment to assure that the work is diligently completed in accordance with the specifications and the time specified.

104.10 Notice to Contractor

Any notice, order or direction given in writing by the Engineer to the Contractor or representative, shall be deemed 'given' whether delivered by hand, mail, facsimile or by email. Failure of the Contractor to respond to such notice, order or direction may result in a stop work order.

104.11 Damage by Vehicles and Other Equipment

If at any time damage is being done or is likely to be done to areas outside the limits of the Contract or to work already completed within the Contract, the Contractor, at the Contractor's own expense, shall make changes in the type of equipment or its use and shall alter loadings so as to remove the cause of such damage.

The Engineer may restrict the use of some local roads as haul routes in order to prevent damage to the road structures.

Any damage caused by the Contractor's vehicles or equipment while carrying out the work shall be repaired at the Contractor's own expense, unless such damage, in the opinion of the Engineer was unavoidable. Nevertheless, the Contractor shall take every reasonable step to avoid such damage.

104.12 Detours

No detour shall be established without the authorization of the Engineer.

The Engineer may indicate as a Special Provision to the contract that a detour will be put in place to divert traffic around the work zone. When such a provision is included in the Contract, all required traffic control devices will be erected, maintained and removed by the Department at the Department's expense. Other work required for the construction of such a detour shall be included in the bid items of the Contract.

Notwithstanding the proceeding paragraph, the Engineer may order that a detour be implemented to divert traffic around the work zone if, in the opinion of the Engineer, the work zone is unsafe for the travelling public. When such a detour is implemented, all required traffic control devices will be erected, maintained and removed by the Department. If the detour is due to the Contractor not carrying out the work in accordance with Provision 104.14 the costs will be billed to the Contractor.

The Engineer may direct that any detour be removed and subsequently re-established from time to time. The Contractor shall be responsible for removing barricades from the travelled portion of the roadway, removing from view all signs pertaining to the detour, replacing barricades and replacing the signs pertaining to the detour. Such temporary removal and replacement of any detour shall not be measured for payment but shall be considered as incidental to the work.

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104.13 Provision of a Road Through the Work

Unless otherwise provided, the Contractor shall, at the Contractor's own expense, make suitable provisions to accommodate all traffic, pedestrian or vehicular over any part of the highway upon which work is being performed under the Contract. The Contractor shall, with the least amount of inconvenience, provide for the safety of the travelling public during non- working hours, weekends and statutory holidays.

The work shall be completed progressively in order to assure a minimum disruption to the travelling public. The grading operation shall not proceed more than 1.5 km ahead of the placing of materials and in no case, shall more than 3 km of roadway remain unpaved within the Contract. Any work not affecting the original travelled way may proceed as directed by the Engineer.

104.14 Accommodating Traffic

Where pursuant to Provision 104.12, a detour is to be implemented to divert traffic around the work site, the Contractor shall provide traffic control persons to direct traffic through the detour as required to comply with the provisions of the latest edition of the PEI Temporary Workplace Traffic Control Manual of Appendix 3.

Where pursuant to Provision 104.13, a road is to be maintained through the work site, the Contractor shall provide, install, maintain and remove all traffic control devices, at the Contractor's own expense, as specified in the latest edition of the PEI Temporary Workplace Traffic Control Manual of Appendix 3. All traffic control signs, markings, devices and procedures used must conform to or exceed the intent of the applicable specifications of the latest edition of the PEI Temporary Workplace Traffic Control Manual. The Contractor shall also provide traffic control persons to direct traffic through the work site in accordance with the latest edition of the PEI Temporary Workplace Traffic Control Manual of Appendix 3.

The Contractor shall provide a Traffic Control Plan (as per the latest edition of the PEI Temporary Workplace Traffic Control Manual) which shall be completed and signed by a trained and accredited Traffic Control Manager. All Traffic Control Plan(s) must be approved by the Department prior to work commencing on site.

Without limiting the responsibility of the Contractor to properly notify the public of and protect it from traffic hazards, the Engineer may require the Contractor to provide additional notification or protection for the public.

If at any time the Contractor fails to provide safe passage and control of traffic on any existing road or detour for which the Contractor is responsible, and if the Contractor fails to immediately correct an unsatisfactory condition upon being directed, the Engineer may issue a stop work order and may immediately correct the unsatisfactory condition and take such other action as is deemed necessary to provide for the safe passage and control of traffic. The Engineer may deduct from any monies due to the Contractor on account of any cost. Failure to act on the part of the Engineer under this paragraph shall not relieve the Contractor from any contractual responsibilities.

104.15 Access to Adjoining Property

Adequate vehicular and pedestrian access to all properties adjacent to the work shall be provided at the Contractor's own expense.

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When interruptions are necessary due to the nature of the work, the Contractor shall notify the landowners 24 hours in advance of the disruption. The Contractor shall schedule the work to minimize the effect of such disruptions.

104.16 Protection of Utilities

The Contractor shall be responsible for determining the location of all utilities located within the work area prior to commencing the work. During the course of the Contract, it is the Contractor's responsibility to consult with municipal authorities or utility companies for further information in regard to the exact location of these utilities; to exercise the necessary care in construction operations; and to take such precautions as are necessary to safeguard the utility from damage. The Contractor shall, at the Contractor's own expense, dig excavation pits for the location of any underground utility.

The preceding paragraph shall in no way relieve the Contractor of any obligations under various provisions of the Contract dealing with the Contractor's responsibilities for damage claims.

Damage to any utility, that the Engineer deems to be unavoidable due to the prosecution of work, shall be handled as Extra Work in accordance with Provision 103.03. No claims will be allowed for additional work required in locating any utility or for damage caused by the Contractor that, in the opinion of the Engineer, was avoidable.

104.17 Use of Explosives

The use of explosives are not permitted

104.18 Protection Against Royalties and Patented Inventions

The Contractor shall indemnify and save harmless the Department from all and every claim for damages, royalties or fees for the infringement of any patented invention or copyright occasioned in connection with work done or material furnished under the Contract.

104.19 Protection of Survey Monuments

The Contractor shall be responsible for the cost of replacement of any geodetic benchmark, survey monument or property marker which is disturbed or destroyed in the course of the work unless such disturbance or destruction is previously authorized in writing by the Engineer.

104.20 Excess Loading of Motor Vehicles

The Contractor shall not cause or permit vehicles to be loaded beyond the legal limits as specified in the Roads Act Vehicle Weights and Dimensions Regulations whether such vehicle is owned by the Contractor or otherwise.

Vehicles hauling materials to the work site which are weighed by Department personnel will not be issued a ticket if such weight is in excess of the specified legal limits.

104.21 Defective Work and Materials

No material shall be used in the work until it has been approved by the Engineer. All rejected material shall be removed and replaced with approved material at the Contractor's own expense.

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If the Contractor fails to remove the defective work or material within 24 hours, the Engineer may issue a stop work order. The failure of the Engineer to disapprove of any defective work or materials does not alleviate the Contractor from responsibility for the work.

If any failure due to poor workmanship or defective material occurs within the warranty period, as stipulated in Clause 101.02, then the Contractor, at their own expense, shall repair the deficiency.

104.22 Materials Supplied by the Department

When the Department is supplying material under the Contract, the Contractor shall give the Department sufficient notice for the delivery of the material. When the Department is supplying materials, the Contractor shall pick up the materials from the source designated in the Contract. If any damage is done to the material by the Contractor after delivery, it shall be repaired or replaced at the Contractor's own expense.

104.22.01 Materials Supplied by the Contractor

When the Contractor supplies the material under the contract, the material shall meet all specifications and manufacturing standards for the type of material supplied. The unit bid price for the supply of material shall include all manufacturing costs, freight charges, royalties, duties and applicable provincial taxes.

104.23 Utilization of Surplus Material and Disposal of Waste Material

All material which is not re-used on a project will be considered surplus unless the Engineer deems it to be waste. The Department will retain ownership and responsibility of all surplus material even if it is to be used outside the contract limits. If the Contractor is requested by the Engineer to move surplus material off site or to stockpile and reload the surplus material, the Contractor shall be compensated for the haul off site and/or the additional work of reloading the material.

For waste material, once it is removed from the project site by the Contractor, the Contractor assumes ownership and responsibility of the waste material including responsibility for proper disposal or reuse of the material. The Contractor shall ensure that the material is disposed of in compliance with all associated environmental acts and regulations such as the provincial *Environmental Protection Act* and the federal *Fisheries Act*.

The unit bid price shall be full compensation for the proper disposal or reuse of the material.

104.24 Pit Requirements

Prior to hauling of any material from any pit, the Contractor will make sure that the pit has a valid permit issued by the Department of Environment, Water and Climate Change. No material shall be hauled from any pit to the work site without this permit in place.

The Contractor is also required to maintain the entrance to a pit to allow safe passage of Departmental staff vehicles and trucks hauling material. Any damage caused by the failure to do so will be repaired at the Contractor's expense.

The Contractor is required to operate and maintain all pits in accordance with all associated environmental acts and regulations including the provincial *Environmental Protection Act* and the federal *Fisheries Act*.

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104.25 Use of Tarpaulins

The Contractor shall assure that all trucks hauling material to and from the work site are equipped with tarpaulins which are installed as part of a rail mounted system or they are of such size that they can fully cover the truck box. The Engineer may direct that any or all loads entering or leaving the work site shall be covered from the point of loading to the point of unloading. Failure of the trucker to carry out the direction of the Engineer may restrict the trucker from hauling to the work site.

104.26 Environmental Protection

The Contractor shall carry out the work on the contract according to the Plans and Specifications and the Approval to Proceed issued by the Environmental Management Section in such a manner so as to be in compliance with various environmental Acts and Regulations of the Province of Prince Edward Island and/or the Government of Canada which concern the protection of the environment, and any approvals or permits issued to the owner or Contractor in accordance therewith. The Contractor shall carry out any extra work, as directed by the Engineer, to protect the environment in accordance with provision 103.037.

All Work shall be carried out in accordance with the following documents:

1. Specifications Manual Division 800 - Environment
2. Environmental Requirements, Appendix A2.
3. PEI Transportation and Infrastructure Environmental Protection Plan

If the Contractor fails to protect the environment in accordance with the above, then a suspension of the work may be ordered as per Section 3 of Appendix A2- Environmental Requirements.

The Engineer may employ others to do whatever work is necessary for the protection of the environment and shall deduct the cost from any monies owed to the Contractor. Failure of the Engineer to act shall not relieve the Contractor of any contractual responsibility.

All pits or plants from which material is taken or produced for use in the work shall comply with the regulations of the Environmental Protection Act and Regulations now in place and with the Environmental Requirements of Appendix 2.

104.27 Concrete Washout Pits

On projects which require them, the Contractor shall carry out all works associated with excavating, constructing, supplying, and installing environmental controls complete with their continued maintenance, clean out and disposal of waste material, decommissioning, removal of environmental controls, filling in, levelling out, and full reinstatement of washout pits to be used for cleaning the concrete trucks' chutes.

The Contractor shall account for the quantity of pits required based on the location of concrete truck delivery relative to the site. The location of pit(s) shall be coordinated with a Department representative. The Contractor shall arrange, obtain permission, and pay for, any pits which may have to be located on adjacent privately owned land.

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This shall be considered incidental to the works and no additional compensation shall be provided for any labour and/or equipment related to the construction and decommissioning of washout pits.

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105.01 Contractor Liable for Risks

Contractor shall assume all risks and contingencies in connection with the work and shall bear all loss or damage. If any such loss or damage shall occur before final completion, delivery and acceptance of the work, the Contractor shall immediately, at the Contractor's own expense, repair, restore and re-execute the damaged work within the specified time for completion. The Contractor shall repair, at the Contractor's own expense, all deficits and failures from any causes whatsoever whether such deficits or failures are due to the negligence of the Contractor or due to bad workmanship; and the Contractor shall indemnify and save harmless the Minister from any and all claims, losses or damages in respect thereof.

105.02 Contractor Liable for Damages

The Contractor shall use due care that no person or property is injured and that no rights are infringed in the prosecution of the work. The Contractor shall be solely responsible for all claimable damages. The Contractor shall, at the Contractor's own expense, shall make such temporary provisions as may be necessary to ensure the avoidance of any such damage, injury or infringement; to prevent the interruption of, or damage or menace to, the traffic on any public or private road; and to secure to all persons and corporations the uninterrupted enjoyment of all their rights during the performance of the work. The Contractor shall indemnify and save harmless the Minister from and against all claims and demands, losses, costs, damages, actions, suits or other proceedings.

105.03 Mailboxes

The Contractor, at the Contractor's own expense, shall carefully remove and satisfactorily replace any mailboxes in order to carry out the Contract.

Any mailboxes damaged by the Contractor shall be repaired or replaced at the Contractor's own expense.

105.04 Insurance Requirements

The Contractor shall, without limiting its obligations for liabilities herein and at the Contractor's own expense, provide and maintain the following insurances in forms and amounts acceptable to the Minister.

Comprehensive General Liability in an amount not less than \$3,000,000.00 inclusive per occurrence against bodily injury and property damage. The Government of Prince Edward Island is to be added as an insured under this policy. Such insurance shall include but is not to be limited to the following:

- a) Products and Completed Operations Liability
- b) Owner's and Contractor's Protective Liability
- c) Blanket Written Contractual Liability
- d) Contingent Employer's Liability
- e) Personal Injury Liability
- f) Non-owned Automobile Liability
- g) Cross Liability
- h) Employees as Additional Insured
- i) Broad Form Property Damage
- j) Operation of Attached Machinery
- k) Shoring, blasting, excavating, under-pinning, demolition, removal, pile driving and caisson work, work below ground surface, tunnelling and grading as application.

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I) Elevator and Hoist Liability

In addition to Contractor's General Liability insurance, projects which require an engineering component for the supply and installation of engineered systems (water, sewer, structure, etc), then the Contractor shall ensure that their Engineer of Record has Professional Liability Insurance for Errors and Omissions (E&O), subject to limits not less than Two Million (\$2,000,000.00) Dollars per occurrence, with Two Million (\$2,000,000.00) Dollars Aggregate.

Automobile Liability in an amount not less than \$2,000,000.00 on all vehicles owned, leased, operated or licensed in the name of the Contractor.

All the foregoing insurance shall be primary and shall not require the sharing of any loss by any insurer of the Province and shall preclude subrogation by the Insurer against the Government of Prince Edward Island.

105.04.01 Proof of Insurance

A certified copy of the required insurance certificate(s) shall be submitted prior to commencing work and shall be subject to the Engineer's approval for adequacy of protection. Approval by the Engineer of any policy filed by the Contractor shall in no way relieve the Contractor of its obligations to provide the insurance referred to in the Contract, nor shall it imply that the policies are in accord with the terms of the agreement.

All required insurance shall be endorsed to provide the Government with 60 days advance notice of cancellation or material change.

The Contractor shall ensure that the Products and Completed Operations coverage, as applicable, shall be in force for the duration of the warranty period.

The Contractor hereby waives all rights of recourse against the Province with regard to damage to the Contractor's property.

The Contractor shall require and ensure that each Sub-contractor submits a certified copy of the required insurance in accordance with provision 105.04 Insurance Requirements and shall provide copies to the Department upon request.

105.05 Certificate of Authorization

On projects which require the supply and installation of an engineered component for which drawings with the Engineers seal and signature are required, the Contactor shall ensure that the design of engineered components (structural, municipal, electrical, mechanical) shall be performed by a company registered to practice engineering in PEI.

The Contractor shall submit to the Department a copy of their design company's Certificate of Authorization (COA) as granted by Engineers PEI.

105.06 Occupational Health and Safety Act

The Contractor is required to carry out the work in accordance to the Occupational Health and Safety Act of Prince Edward Island. The Contractor will not be entitled to any extension of time or additional monies due to delays arising from a stop work order issued under the Occupational Health and Safety Act.

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In the event that the Department is issued a stop work order under the Occupational Health and Safety Act in relation to the contract, the Engineer will then issue a stop work order to the Contractor as per section 106.07. Failure of the Contractor to comply with the conditions of the stop work order shall result in a \$5,000 per day penalty.

The Contractor shall submit to the Department a copy of all Occupational Health and Safety (OH&S) reports (independent of report content) related to the contract. The Contractor shall also submit to the Department written documentation of corrective/remedial measures taken to address any issue identified as requiring such in an OH&S report.

105.06.01 Safety Certificates

Upon the request of the Engineer, the Contractor shall provide the following documentation to the Department for their files. The documents are not limited to the following:

- a) Project Specific Hazard Assessment Form
- b) Contractors Safety Checklist
- c) Crane/Boom Truck Certificates (both on and off site)
- d) Inspection certificates of all equipment (including sub-contractors) or, where inspection certificates are not available, a letter from the Contractor stating that all equipment has been maintained and in good working order
- e) Statement from the contractor that all personnel employed on site are trained in their respective equipment and operations.

105.07 Workers' Compensation Insurance

Prior to commencing the work and prior to receiving payment on the Certificate of Substantial Completion, the Contractor shall provide evidence of compliance with the requirements of the Province with respect to Workers Compensation Insurance including payment due thereunder.

At any time during the term of the Contract, when requested by the Engineer, the Contractor shall provide such evidence of compliance.

105.08 Work Conditions

The *Contractor* agrees to accept sole responsibility to comply with all federal, provincial and municipal legislation which may have application to the *Work* and agrees to comply with all provincial and federal legislation affecting conditions of work and wage rates including the Employment Standards Act R.S.P.E.I. 1988, Cap. E-6.2, the Workers Compensation Act R.S.P.E.I. 1988, Cap. W-7.1, or any other laws that impose obligations in the nature of employers' obligations. The *Contractor* agrees to follow the Public Service Commission Human Resource Policies 9.05 Violence in the Workplace Policy; 9.08 Drug, Alcohol, and Medication Policy, and 11.01 Policy for the Prevention and Resolution of Harassment in the Workplace while working on Government sites, in Government vehicles or alongside Government staff.

https://psc.gpei.ca/sites/psc.gpei.ca/files/HRPolicy/HRManual_9.05.pdf
<https://psc.gpei.ca/sites/psc.gpei.ca/files/9.08%20DrugAlcoholAndMedicationPolicy.pdf>
https://psc.gpei.ca/files/PDF%20Files/hrp-manual/hrppm_11.01.pdf

The *Contractor* agrees to accept the full cost of doing those things required under this paragraph and will not charge or seek reimbursement from the *Owner* in any way, such

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costs having been taken into consideration and included in the rates of payment stipulated in this Agreement.

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106.01 Time and Order of Completion

The Engineer may direct the Contractor, in writing, as to the time, precedence or order in which any work is to be done under the Contract.

106.02 Time of Commencement

The contractor shall commence work in accordance to the Schedule of Work submitted under Section 102.11, unless directed otherwise by the Engineer, and shall proceed continuously, diligently and with all reasonable dispatch consistent with the proper execution of the work until final completion. The rate of progress shall be such to ensure its final completion within the specified time.

After the schedule has been reviewed, any changes to the date of commencement shall require a minimum of one week's notice to the Engineer and approval from the Engineer to allow for the proper utilization and scheduling of Department workers. Revised schedules must be signed by the Contractor and approved by the Department prior to starting work.

The Contractor shall advise both the Project Manager and Materials Testing Lab no later than 3pm the previous day from when work on a project is to start or when the work plan changes where Department staff are required. Failure to do this may result in the work for that day not being permitted.

106.03 Time of Completion

The Whole of the work to be done under the Contract shall be completed in accordance to the Schedule of Work submitted under Section 102.11. In no case shall the time of completion exceed the completion of work date as specified in the Contract Document.

106.04 Extension of Time

An extension of time may be granted in writing by the Engineer in the event of the work being delayed due to a change of scope in the work, a significant unit quantity increase, loss of production due to above average weather conditions, delays in material supplied by others and any other causes beyond the Contractor's control. Such extensions shall be for such time as the Engineer may prescribe, and the Engineer shall fix the terms on which the said extension may be granted. Any existing E.M.S. permit pertaining to this control may need to be extended and changes to it may be necessary. An application by the Contractor for an extension of time as herein provided shall be made to the Engineer, in writing, prior to the end of the specified contract time. Where applicable, all bonds or other surely furnished to the Department by the Contractor shall be amended where necessary at the expense of the Contractor to provide coverage beyond the date of any extension of time granted, and the Contractor shall furnish the Department with evidence of such amendment of the bonds or other surety.

Any extension of time that may be granted to the Contractor shall be so granted and accepted without prejudice to any rights of the Department whatsoever under the Contract. All such rights shall continue to be in full force and in effect after the specified construction period.

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106.05 Liquidated Damages

The Contractor shall pay liquidated damages for each working day beyond the number of working days and/or the completion date as both specified in the Contract or beyond any extension of time that may be granted in accordance with Provision 106.04.

The liquidated damages for work being carried out on Arterial Highways shall be assessed at \$1,500.00 per day. For work carried out on other highways or within any tendered project outside of highway limits liquidated damages shall be assessed at \$1,000.00 a day.

106.06 Non-Fulfilment of the Contract

If the Contractor fails to complete or carry out the work under the terms of the Contract, the Engineer may notify the Contractor in writing to discontinue all work. The Engineer may employ such other means that may be necessary to complete the work and, in such case, the Contractor shall have no claims for further payment for loss or damage against the Department. If the cost for completing the work exceeds the sum which would have been paid under the Contract, then the Department shall deduct the additional cost from any monies due or surety that the Contractor has in place.

106.07 Suspension of Work

The Contractor shall, upon verbal or written notice by way of a stop work order from a Department Representative, discontinue or delay any or all work and the work shall not be resumed until the Engineer directs so in writing.

106.08 Termination of Contract

The Minister may at any time, by notice in writing to the Contractor, terminate the work or any portion thereof and the Contractor shall thereupon be entitled to payment for all work performed by the Contractor as of the date of termination.

106.09 Labour Disputes

Except to the extent that relief is granted under Provision 106.04, the Contractor shall bear the risk and responsibility of any loss, damage or expense to the work or to the Contractor arising from strikes or labour disputes other than such loss, damage or expense caused by the failure of the Department to meet its contractual obligations.

106.10 Character and Employment of Workers

Whenever the Engineer informs the Contractor, in writing, that any person or persons involved in the work are, in the opinion of the Engineer, not following the PEI Public Service Commission Human Resource Policies 9.05 Violence in the Workplace Policy; 9.08 Drug, Alcohol, and Medication Policy, 11.01 Policy for the Prevention and Resolution of Harassment in the Workplace or who is incompetent, abusive, unsafe or disorderly, such person or persons shall be discharged from the work and shall not again be employed on the work without the consent, in writing, of the Engineer.

https://psc.gpei.ca/sites/psc.gpei.ca/files/HRPolicy/HRManual_9.05.pdf

<https://psc.gpei.ca/sites/psc.gpei.ca/files/9.08%20DrugAlcoholAndMedicationPolicy.pdf>

https://psc.gpei.ca/files/PDF%20Files/hrp-manual/hrppm_11.01.pdf

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106.11 Permits and Licenses

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

No extension of time for completion of the work will be allowed due to a delay in the Contractor obtaining any licenses or permits.

106.12 Limitation of Operations

Except for such work as may be required to maintain the travelled roadway in a safe and satisfactory condition for traffic, the Contractor shall not carry out operations under the Contract between a half ($\frac{1}{2}$) hour before sunset and a half ($\frac{1}{2}$) hour after sunrise on any working day, or at any time on Saturday, Sunday or statutory holidays.

The Engineer may require the Contractor to work on Saturdays, Sundays or Statutory holidays to assure the safety of the travelling public. In addition, the Engineer may require the Contractor to work on Saturdays in order to complete the work.

The Engineer may in writing require the Contractor to cease or limit operations under the Contract, on any working day or days, if the operations are of such nature, or if the work is so located, or if the traffic is of such volume that the Engineer deems it necessary or expedient to do so.

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107.01 Payments to the Contractor

Progress payments equal to 85% of the value of work completed, as determined by the Engineer, will be made monthly to the Contractor as the work progresses. Such progress payments shall be based on a written progress estimate prepared by the Engineer. The 15% holdback is to meet the requirements of the Mechanics' Lien Act. The Contractor shall supply a statutory declaration that 80% of the monies the Contractor owes in carrying out the work to date has been paid for the second and each subsequent progress payment.

The Engineer shall deduct any liquidated damages from all payments made to the Contractor.

The Engineer shall make a deduction for any defective or deficient work from all payments made to the Contractor, except the final payment. The Engineer shall deduct either double the Engineer's estimated costing for the defective or deficient work or an amount set at the Engineers discretion for the repair of any defective or deficient work.

Notwithstanding the foregoing, no payment shall be construed to be an acceptance of any defective work or material.

The Engineer may release the holdback no less than 60 days after the date of substantial completion, provided that the Contractor has submitted a statutory declaration stating that all monies the Contractor owes in carrying out the work have been paid. The Contractor shall also provide evidence of compliance with the requirements of Workers' Compensation insurance.

When a contract is to be completed over several construction years, and portions of the contract are considered by the Engineer as complete, but the entire Contract is not, the Engineer can issue an Interim Certificate of Substantial Completion for those portions of the Work that are complete. The Engineer may release the portion of holdback no less than 60 days after the date of interim substantial completion, provided that the Contractor has submitted a statutory declaration stating that all monies the Contractor owes in carrying out the work have been paid. Performance Security, however, which would be appropriate for that Work will only be released after the one year warranty expires from the total contract's substantial completion date.

After the Engineer is satisfied that all work associated with the contract has been completed, a Certificate of Final Completion will be issued and a Certificate of Final Quantities will be presented to the contractor. Final payment, ensuring that all quantities in the contract will be paid at 100% of their value will be made once the Contractor accepts the Certificate of Final Quantities.

107.02 Measurement of Excavated Materials by Volume

Whenever the Contract requires the payment for excavation at a price per cubic metre, the volumes shall be measured in their original position and computed in cubic meters by comparing the original triangulated three dimensional surface (in CADD) to the excavated or graded triangulated three dimensional surface (in CADD). These two surfaces combine to form an enclosed volume. The number generated for this volume in cubic metres represents the excavation quantity.

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107.03 Measurement of Weighed Materials

Where the Contract includes tender items that require measurement for payment by weighing, the Contractor, shall provide, install and maintain as necessary, weigh scales meeting the requirements of the Government of Canada Weights and Measures Act and Regulations, and in accordance with the Weigh Scale Procedures of Appendix 4.

Where an individual line item for granular material exceeds 3,000 tonnes, the contractor shall ensure that scales of a minimum of 18.3m (60ft) are used to weigh the material. Split weighing shall not be permitted.

If the contractor has more than one certified scale at the source, the longer scale shall be the scale of record. In the event the shorter scale is equal or greater than 18.3m (60ft) either scale can be considered the scale of record.

Weight measurements shall be made by the weigher supplied by the Department.

When a platform scale is being used on the Contract, the tares of the hauling vehicles will be determined before work commences and as required by the Engineer. Vehicles which are being weighed for the tare, shall contain the normal hauling complement of a driver and accessories such as spare tires and tools. Each truck and each coupled vehicle combination shall have a distinguishing number prominently displayed where it will be readily visible to the weigher. The distinguishing number shall be a minimum of 125mm high and located at the top front corner on both sides of the trailer box of all pup trailers, semi-trailers, belly dump trailers and flow-boy trailers. The distinguishing number for a trailer must be the same as the number plate issued by Highway Safety Division for that trailer.

All costs of providing, installing, maintaining and testing weighing equipment in accordance with this specification and the cost of any delay and inconvenience which may result shall be borne by the Contractor as part of the work to be carried out at the Contract price for the items which are measured for payment by weighing; however, the Contractor will not be charged for labour and equipment supplied by the Department to carry out tests and checks.

107.04 Measurement of Quantities Delivered by Volume

When roadway materials are being paid for by volume delivered, payment will be based on truck measurement.

When concrete materials are being paid for by volume, the volumes shall be the ticket volume supplied by the ready-mix plant and agreed to with the Department. The Engineer reserves the right to determine the amount paid for partial loads delivered and placed into the works.

107.05 Payment of Workers

At minimum, the Contractor shall be compensated for signallers (as required under Section 901) employed for the purpose of this Contract, at least the current rate from the latest Standard Negotiated Rates as established by the Minister of Transportation and Infrastructure. Should the rate change between the time of bid closing and construction, a pay adjustment shall be applied to make up the difference.

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The Contractor shall, in addition to any fringe benefits, pay all other workers employed by the Contract at wage rates, not less than those established by the Minimum Wage Order, issued under authority of the Labour Act. The Contractor shall pay workers employed on the work at intervals of not less than twice a month.

The Contractor shall require each Sub-Contractor, or other person doing any part of the work, to covenant with the Department that workers employed on the work by such Sub-Contractors, will be paid at the wage rates and intervals in accordance with this Provision.

Where any person employed by the Contractor or any Sub-Contractor, or other person on work contemplated by this Contract, is paid less than the amount required to be paid under this Contract, the Department may deduct from any monies payable to the Contractor under this or any other Contract, and pay to such person a sum sufficient to bring that person's wages up to the amount required.

No claim for extra payment from the Contractor will be considered by the Department concerning any change in the Minimum Wage Order which may occur during prosecution of the Contract.

107.06 Haulage

The cost of open truck haul, in accordance with Provision 1023.4206 shall be included in the unit bid price for all bid items measured in tonnes or cubic metres. If the truck haul rate should change after the tender call, then the unit bid prices shall be adjusted to accommodate the change.

107.07 Records of Contractor Open for Inspection

The Contractor shall keep proper accounts and records of the cost to the Contractor of the Work and of all expenditures or commitments made by the Contractor under Contract including the related invoices, receipts, vouchers, bill of ladings and statements. Such accounts, invoices, receipts, vouchers, bill of ladings and statements shall, at all times, be open to audit, copying, extracting information and inspection by the authorized representatives of Government. The Contractor shall provide all facilities for the audits, inspections, copying and extractions and shall provide Government and its authorized representatives with all information that is requested from the accounts, records, invoices, receipts, vouchers, bill of ladings and statements.

Subject to statutory limitations, the Contractor shall not, without the written consent of Government, dispose of the accounts, records, invoices, receipts, vouchers, bill of ladings and statements related to the Contract, but shall preserve and keep the same available for audit, copying, extracting information and inspections at any time.

107.08 Pay Adjustments

The \$1.00 added for transporting hot mix asphalt as described in the Trucking Rates table in the PEI Standard Negotiated Rates document shall be included in the fuel adjustment calculations. The intent of this dollar is compensation for tarping and cleaning the truck box.

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GENERAL CONDITIONS AND AGREEMENT

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**HIGHWAY & BRIDGE
CONSTRUCTION SERVICES AGREEMENT**

THIS AGREEMENT made this XXxx day of Xxxxxxx, 20XX.

BETWEEN:

(Insert name and address of contractor here)

(hereinafter called the "Contractor")

PARTY OF THE FIRST PART

AND:

GOVERNMENT OF PRINCE EDWARD ISLAND, as represented by
the Minister of Transportation and Infrastructure (hereinafter called the "Minister")

PARTY OF THE SECOND PART

WHEREAS the Minister is responsible for the capital construction and maintenance of public roadways and bridges in the Province of Prince Edward Island and occasionally requires services from private contractors in furtherance of that responsibility;

AND WHEREAS the Contractor can provide such services, as well as any required equipment and materials, as may be required by the Minister;

AND WHEREAS the Parties are desirous of entering a contract for the supply of services, equipment and materials to the Minister in furtherance of the Minister's responsibility to provide roadway and bridge construction in the Province of Prince Edward Island;

THEREFORE, THIS AGREEMENT WITNESSETH that the Parties to this Agreement, in consideration of the mutual covenants contained herein, hereby agree to enter into said agreement for the following Project:

(Insert brief project description here.....)

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GENERAL CONDITIONS AND AGREEMENT

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DEFINITIONS AND TERMINOLOGY

108.01 Terminology

This Agreement Document is comprised of the General Conditions set forth in Division 100, Sections 101 through to 107 inclusive.

The remaining Divisions (IE Division 200 through to 1300 inclusive), hereinafter referred to as the "Contract Specifications", are considered to be part of the Contract Documents, to which this Agreement binds the Party of the First Part and the Party of the Second Part.

Whenever in this Document it is provided that anything is, is to be or to be done, if, as, when or where "contemplated", "required", "directed", "deemed necessary", "permitted", "suspended", "approved", "directed", "unacceptable", "suitable", "satisfactory", "unsatisfactory", or "sufficient", such expressions shall have the same force as if followed by the words "by the Engineer" or "to the Engineer" as the case may be.

108.02 Definitions

Refer to Section 100, Cl. 101.02 for all definitions associated with this Contract.

108.03 Law of the Contract

The laws and regulations of Prince Edward Island shall be used to interpret the contents of the Contract Document.

108.04 Contract Binding

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

108.05 No Implied Obligation

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

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**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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202	Grubbing
203	Roadway Excavation
204	Topsoil Removal and Reinstatement
205	Borrow from Adjacent Land
206	Borrow From Pit
207	Granular Base
208	Fine Grading
209	Compaction
210	Preparing Shoulders
211	Shoulder Material
212	Topsoil for Landscaping
213	Random Rip Rap
214	Tap Drain Installation
215	Ditching
216	Culvert End Cleanout
217	Trench Excavation and Backfilling
218	Geotechnical Fabric
219	Geogrid Reinforcement
220	Bedding Material

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CLEARING**201**

201.01 Description

Clearing shall consist of the removal and disposal of all trees, shrubs, fallen timber, logs and other surface litter within the right-of-way and other areas as directed and designated by the Engineer.

Refer to Section 3.1 Vegetation, Clearing, and Disposal of TIE's Environmental Protection Plan.

201.02 Construction Method

Areas to be cleared shall be marked or staked by the Engineer prior to any clearing operation.

All brush and trees shall be cut off at a height no greater than 300 mm above ground. Timber of any value shall be cleared of limbs and piled neatly outside the right-of-way unless otherwise directed by the Engineer. All timber shall be the property of the Department.

All brush and other debris resulting from the clearing shall be disposed of at the Contractor's own expense. Burning shall only occur at the discretion of the Engineer. Any burning shall be in accordance with the Provisions of the Fire Prevention Act and Regulations. The Contractor shall take precautions to prevent the fires from spreading and shall be liable for any damages caused in the performance of this work.

201.03 Method of Measurement

The quantity to be measured under this Section shall be the number of hectares actually cleared derived from measurements made by the Engineer.

201.04 Basis of Payment

Clearing shall be paid for at the unit bid price per hectare and this price shall be full compensation for tools, machines, labour and incidentals necessary to perform the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GRUBBING**202**

202.01 Description

Grubbing shall consist of the removal and disposal of all stumps and roots and other debris, hereinafter referred to as debris.

Refer to Section 3.2 Grubbing, Stripping, and Materials Excavation of TIE's Environmental Protection Plan.

202.02 Construction Method

Environmental protection measures shall be installed if possible prior to beginning any excavation. Otherwise, materials for environmental protection measures shall be on-site prior to excavation work and shall be installed at the earliest appropriate opportunity in consultation with the County Environmental Officer. All work carried out under this Section shall be done in accordance with the Environmental Requirements of Appendix 2.

Grubbing shall be carried out for a distance of not more than 1 km ahead of grading operations. The work shall consist of grubbing within the right-of-way and other areas as designated by the Engineer. Areas to be grubbed shall be marked or staked by the Engineer prior to grubbing.

Grubbing will not be required under embankments of 2 m or more.

Debris shall become the property of the Contractor, and shall be disposed of at the Contractor's own expense. Application for and acquisition of, relevant permits, permission from landowners and compliance with applicable laws, regulations and codes shall be the responsibility of the Contractor. A copy of any documents related to the foregoing shall be forwarded to the Engineer.

202.03 Method of Measurement

The quantity to be measured under this Section shall be the number of hectares actually grubbed.

202.04 Basis of Payment

Grubbing shall be paid at the unit bid price per hectare derived from measurements made by the Engineer of the designated and actually grubbed areas. All tools, machines, labour and incidentals shall be fully compensated for in the unit bid price for grubbing.

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EXCAVATION

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203.01 Description

This work consists of excavating materials within the Contract limits. Included would be the hauling and placement of suitable material for use within the contract, the hauling and stockpiling at a location determined by the Contractor of surplus material for future use, and the hauling and disposal of waste material. This work is to be undertaken in accordance with Section 104.14. Refer to Section 3.2 Grubbing, Stripping, and Materials Excavation of the Department's Environmental Protection Plan.

203.02 Classification of Excavated Materials

All excavated materials shall be classified for purposes of payment as rock, muck, earth or pavement as described herein. All decisions concerning classification of excavated material will be made by the Engineer.

203.02.01 Rock Excavation

Material classified as rock shall include material excavated from solid masses or ledges of igneous, sedimentary or metamorphic rock in their original or stratified bed or position and all boulders and detached fragments which measure one (1) m³ or more in volume.

203.02.02 Muck Excavation

Material classified as muck may include bog and underlying material, tree stumps, roots and/or organic matter. Muck shall be in a saturated, flowable state, high in silt or clay content, requiring a water tight truck box to haul the material preventing drainage unto the haul road.

203.02.03 Pavement Excavation

Material classified as pavement shall be asphaltic concrete, Portland cement concrete and Portland cement stabilized soil (i.e. soil cement), which may occur in a layer or in combinations of layers.

203.02.04 Common Earth Excavation

Material classified as common earth excavation shall include all other materials of whatsoever nature that may not be defined as rock, muck or pavement. This classification of material shall apply to all roadway and drainage construction work except culverts, storm sewers and other underground pipe or conduit.

203.02.05 Earth Excavation for Pipe

Material classified as earth excavation for pipe shall include all other materials of whatsoever nature that may not be defined as rock, muck or pavement which result from the installation or replacement of roadway culverts.

203.03 Construction Method

Prior to carrying out any work, the Contractor shall locate all underground services and shall take all necessary precautions to mitigate damage.

Environmental protection measures shall be installed, if possible, prior to beginning any excavation. Otherwise, materials for environmental protection measures shall be on-site prior to excavation work and shall be installed at the earliest appropriate opportunity in

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consultation with the County Environmental Officer. All work carried out under this Section shall be done in accordance with the EMS Approval to Proceed and the Environmental Requirements of Appendix 2.

The Contractor shall not excavate materials until cross-section measurements necessary to satisfy Provision 203.04 have been taken.

The Contractor shall perform all excavation operations in such a manner that flooding of embankment materials and roadway foundation materials is avoided; either by providing effective surface drainage during all stages of the work or by placing backfill material as soon as practicable after excavation in the case of sub-excavation and stripping operations, where provision for surface drainage is not feasible.

All materials that are to be incorporated in the work may be subject to testing by the Engineer to determine suitability for use.

The Contractor shall consult with the Engineer for instruction regarding use of excavated materials which may be incorporated in the work, disposed of due to poor quality or stockpiled to be used for other work. The Engineer shall determine what material is waste, and the Contractor shall dispose of the material in accordance with provision 104.14.

When embankments less than 2 m in height are to be built, the Contractor shall first strip unsuitable materials from the foundation area.

Should the Contractor excavate to a depth greater than provided for in this Provision, the Contractor shall be required to backfill such excavations at the Contractor's own expense and no payment shall be made for the backfill material or work required.

All excavated material used in the construction of the roadway shall be spread in uniform layers not exceeding 200 mm in thickness over the full width of the embankment. Embankments shall be constructed such that the first lift, when sloped, forms the toe of the slopes and each subsequent lift shall be completed to the full width prior to placing the next lift. Rock and rock fragments shall be uniformly distributed and broken to a maximum size of 100 mm. Each layer shall be shaped to the design cross-section and shall be thoroughly compacted in accordance with Section 209 to 95% Standard Proctor Density.

Grading of excavated materials shall be performed within a tolerance of 25 mm.

Excavations which are potentially hazardous to the travelling public shall not proceed more than 300 m in advance of the backfilling operation; such excavations shall be backfilled with the specified material and compacted prior to closing down operations each day.

203.04

Method of Measurement

The quantity to be paid for under this Section shall be the number of cubic metres of excavated material as shown on the cross-section sheets between the original position of the ground lines as cross-sectioned and the lines of the completed and accepted excavation as computed by the average end area method. Whenever material is to be excavated, the Contractor shall notify the Engineer so that proper measurements or cross-sections can be made. No allowance will be made for material excavated before such measurements or cross-sections have been made. No allowance for excavated

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material will be made beyond the slope lines as indicated on the Plans or as directed by the Engineer.

203.05

Basis of Payment

The measured volume of excavation shall be paid for at the unit bid price per cubic metre for excavation of rock, muck, pavement or earth material as the case may be, and this price shall be full compensation for all the work including hauling and disposal of waste materials, hauling and stockpiling of surplus material, hauling and placement of suitable material, including compaction, equipment, tools, labour, water for compaction and incidentals necessary to complete the work.

Common earth excavation shall be divided into two payment line items:

Common Earth Excavation: suitable/surplus - hauling and placement of suitable material and/or the hauling and stockpiling (on-site) of surplus material for future use, and
Common Earth Excavation: waste - hauling and disposal of waste material

Topsoil removal and reinstatement shall be paid for under Section 204. Environmental protection measures shall be paid for in accordance with the Section for the type of environmental protection installed.

Should the Contractor fail to demonstrate diligent care in locating and protecting underground services, all resulting repairs shall be the responsibility and the expense of the Contractor.

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TOPSOIL REMOVAL AND REINSTATEMENT

204

204.01 Description

This work shall consist of the excavation, stockpiling and redistribution of topsoil and overburden as necessary.

204.02 Construction Method

Environmental protection measures shall be installed if possible prior to beginning any excavation. Otherwise, materials for environmental protection measures shall be on-site prior to excavation work and shall be installed at the earliest appropriate opportunity. All work carried out under this Section shall be done in accordance with the Environmental Requirements of Appendix 2.

The Contractor shall remove all topsoil and overburden to the depth specified by the Engineer and shall neatly and separately stockpile the material at a site approved by the Engineer.

After removal and stockpiling of topsoil and overburden, the Contractor shall ensure that no other material is added to the topsoil and overburden stockpiles.

When the material is to be replaced on adjacent land, the overburden and topsoil shall be spread in uniform layers. When the material is to be reinstated within the right-of-way, the Contractor shall place each layer to the depth determined by the Engineer.

Prior to reinstatement, the area shall be scarified, harrowed and cleared of all loose rocks and stones.

204.03 Method of Measurement

The quantity to be paid for under this Section shall be the number of cubic metres of topsoil and overburden actually removed and replaced. Typically, cross-section drawings will be prepared for computation by the average end area method. No allowance will be made for material removed prior to the measurement of the original cross-sections.

204.04 Basis of Payment

Topsoil removal and reinstatement shall be paid for at the unit bid price per cubic metre and this price shall be full compensation for all work, tools, equipment, labour and incidentals necessary to complete the work.

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BORROW FROM ADJACENT LAND

205

205.01 Description

This work shall consist of the removal of borrow material from land adjacent to the work. Included would be the hauling and placement of suitable material for the construction of embankments within the contract limits, the hauling and stockpiling (on-site) of surplus material for future use, and the disposal of unsuitable or waste material.

205.02 Construction Method

Environmental protection measures shall be installed if possible prior to any excavation. Otherwise, materials for environmental protection measures shall be on-site prior to excavation work and shall be installed at the earliest appropriate opportunity. All work carried out under this Section shall be done in accordance with the Environmental Requirements of Appendix 2.

The Contractor shall enter into an agreement with the land owner authorizing the Contractor to excavate material from the land and, upon request, shall show proof of such an agreement.

The construction method shall be performed in accordance with Section 203 and as specified herein.

Topsoil and overburden shall be removed and reinstated in accordance with Section 204. The adjacent land shall be cross-sectioned prior to stripping of the topsoil and overburden and cross-sectioned again prior to the removal of any borrow material. The extent of the topsoil and overburden removal shall be limited by the right-of-way and a line perpendicular to the right-of-way of a minimum 10:1 slope projected from the design ditch grade to the surface unless otherwise specified by the Engineer.

Borrow material taken from adjacent land shall be approved by the Engineer prior to placement on the work and rejected material shall be considered as waste to be disposed of by the Contractor.

205.03 Method of Measurement

The quantity to be measured under this Section shall be the number of cubic metres of borrow material as shown on the cross-section sheets and as computed by the average end area method. No allowance will be made for material excavated before measurements or cross-sections have been made.

205.04 Basis of Payment

The measured volume of borrow from adjacent land shall be paid for at the unit bid price per cubic metre and this price shall be full compensation for all work, material, transportation, equipment, tools, labour, water for compaction and incidentals necessary to complete the work.

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BORROW FROM PIT

206

206.01 Description

When sufficient quantities of material suitable for highway embankments are not obtainable from excavation within the right-of-way in accordance with Section 203 or from land adjacent to the work in accordance with Section 205, the Contractor shall provide borrow material from pits.

* Refer to 8.7 Excavation Pits of TIE's Environmental Protection Plan.

206.02 Material

Borrow material specified in the work shall be of the type indicated in Schedule C of the Tender according to the following:

All borrow that is to be incorporated in the work shall be subject to tests by the Engineer to determine its suitability. Such tests may involve chemical or physical analysis to determine the organic content, bearing capacity, density and stability. The Engineer reserves the right to reject any material based on the test results or on the basis of field performance.

206.02.01 Common Borrow

Common Borrow shall be non-plastic and free from lumps of clay or other deleterious material and shall have a maximum of 35% passing the 75 µm Sieve. Regardless of the properties, use of common borrow shall be subject to the approval of the Engineer.

206.02.02 Select Borrow

Select Borrow shall be non-plastic, well graded, and composed of clean, uncoated particles free from lumps of clay or other deleterious material with a maximum particle size of 100 mm, and a maximum of 30% of the material passing the 4.75 mm Sieve shall pass the 75 µm Sieve.

206.02.03 Premium Borrow

Premium Borrow shall be non-plastic, well graded, and composed of clean, uncoated particles free from lumps of clay and other deleterious material with a maximum particle size of 100 mm, and a maximum of 20% of the material passing the 4.75 mm Sieve shall pass the 75 µm Sieve.

206.03 Construction Method

The Contractor, before entering any borrow pit site for operation purposes shall comply with Provision 104.15. All work carried out under this Section shall be done in accordance with the Environmental Requirements of Appendix 2.

The Contractor shall clear and grub borrow areas and shall remove and stockpile topsoil and overburden.

Where the borrow material is to be measured for payment by weight, the Contractor shall provide for weighing in accordance with Provision 107.03.

The Contractor shall ensure that the pit is excavated in such a manner as to avoid flooding of borrow material.

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BORROW FROM PIT

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All borrow used in the construction of the roadway shall be spread in uniform layers not exceeding 450 mm in thickness over the full width of the embankment. Embankments shall be constructed such that the first lift, when sloped, forms the toe of the slopes and each subsequent lift shall be completed to the full width prior to placing the next lift. Rock and rock fragments shall be uniformly distributed and broken to a maximum size of 100 mm. Each layer shall be shaped to the design cross-section and shall be thoroughly compacted in accordance with Section 209 to 95% of the Standard Proctor Density.

All completed embankments shall truly conform to the lines and grades given by the Engineer within a tolerance of 25 mm.

206.04 Method of Measurement

Measurement for payment under this Section shall be the number of cubic metres or tonnes of borrow. The units of measurement shall be as indicated in Schedule C of the Tender.

When borrow material is to be supplied by the cubic metre, the unit of measure for payment shall be by the volume of the truck box actually filled with borrow material.

Where borrow is to be measured for payment by weight, the quantity to be paid for under this Section shall be the number of tonnes of borrow material weighed in accordance with Provision 107.03.

206.05 Basis of Payment

Borrow from any pit, shall be paid for at the unit bid price per cubic metre or tonne and this price shall be full compensation for all work, royalty payments to land owners, crop damage, removal and stockpiling of topsoil and overburden, trimming of pit slopes, replacement of overburden and topsoil on the pit, all equipment, tools, labour and incidentals necessary to complete the work.

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GRANULAR BASE	207
207.01	<u>Description</u> This item shall consist of the supply and placement of aggregate to produce a granular base for the roadbed.
207.02	<u>Material</u> The material to be supplied under this item shall be in accordance with Section 401 and shall be of the classification specified in the Tender.
207.03	<u>Construction Method</u> The Contractor shall prepare the subgrade or sub-base to receive the granular base by scarifying, scraping and compacting as necessary to conform to the lines and grades given by the Engineer, within a tolerance of 25 mm and to provide compaction to 95% Standard Proctor Density in accordance with Section 209. The Contractor will be completely responsible for ensuring the aggregate supplied is consistent with respect to particle size distribution and all physical properties as specified in Section 401. The Engineer may reject material received and may refuse any production source if the material lacks consistency or is proven to perform poorly. Aggregate supplied to the work shall not vary significantly in moisture content. Saturated aggregate will not be accepted for use in the work. The Contractor shall provide for weighing of the gravel in accordance with Provision 107.03. Placement of aggregate as granular base shall be within a tolerance of 25 mm to the lines and grades given by the Engineer. Notwithstanding the acceptable tolerance, work specified elsewhere may require more precise grading to ensure successful achievement of the work (i.e. pavements). Unless specified elsewhere, all aggregate used in the construction of the granular base shall be spread in uniform layers not exceeding 300 mm in thickness over the full width of the roadway. Each layer shall be shaped to the design cross-section and shall be thoroughly compacted, in accordance with Section 209 to a minimum of 98% Standard Proctor Density, prior to the placement of the next layer.
207.04	<u>Method of Measurement</u> Measurement for payment under this Section shall be the number of cubic metres or tonnes of aggregate for granular base. The units of measurement shall be as indicated in Schedule C of the Tender. When granular base material is to be supplied by the cubic metre, the unit of measure for payment shall be by the volume of the truck box actually filled with aggregate. When granular base is specified by the tonne, the aggregate shall be weighed in accordance with Provision 107.03.
207.05	<u>Basis of Payment</u> Granular base shall be paid for at the unit bid price per cubic metre or tonne and this price shall be full compensation for all work, aggregate, material, tools, equipment, labour and incidentals necessary to perform the work.

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FINE GRADING

208

208.01 Description

Fine grading shall consist of shaping the roadway surface as shown on the contract Drawings or as directed by the Engineer, to a final cross-section and profile in preparation for paving.

208.02 Construction Method

The required widths and lengths of the roadway surface shall be scarified, unless otherwise directed by the Engineer, up to a depth of 150 mm to produce the specified grade and cross- section and shall be compacted in accordance with Section 209 to a minimum of 98% Standard Proctor Density.

Where insufficient material is obtained in the scarifying or blading operation to bring the cross-section and grade to within the specified tolerance, the Contractor shall provide additional material as provided for elsewhere in the Contract and such material shall be placed to ensure homogeneity with the surrounding material.

The surface to be fine graded shall be to the width specified by the Engineer, but shall not be less than the width of the proposed pavement plus 500 mm on either side. The maximum acceptable deviation from grade at any location shall be 10 mm of that specified.

The shaping and compaction operations shall continue until the surface conforms to the specified requirements and shall be repeated as required to maintain the surface until it is covered by pavement.

The equipment used, shall consist of a rubber tired motor grader with a fully functional blade. Prior to fine grading, the blade shall be inspected with a string line or straight edge to ensure the edge is true and not worn or cupped. If the edge is worn, cupped or damaged, it shall be replaced or repaired prior to use for fine grading.

208.03 Method of Measurement

The area of roadway surface actually fine graded as herein provided shall be measured for payment in square metres.

208.04 Basis of Payment

Fine grading shall be paid for at the unit bid price per square metre and this price shall be full compensation for all work, including scarifying and regrading, equipment, tools, labour, water for compaction and incidentals necessary to complete the work.

Payment for additional materials provided will be paid in accordance with the section for the type of material supplied.

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COMPACTION**209**

209.01 Description

This work shall consist of the compaction required on the subgrade, sub-base and base course materials.

209.02 Construction Method

The Contractor shall provide the necessary compaction equipment to achieve the required compaction.

The required compaction shall be indicated in the various specifications for supply and placement of material.

The test method to assure that the required density is achieved shall be ASTM D-698 for the supply and placement of all materials except for Granular A and B as defined in Section 401 which shall be AASHTO T-99 (Method A) and T-224.

The Contractor shall take appropriate measures to ensure that the moisture content of the subject material is appropriate to achieve the specified density. This may require reworking the material and air-drying or the application of water to the material.

209.03 Method of Measurement

There shall be no measurement for payment under this Section.

209.04 Basis of Payment

No payment shall apply to this Section.

Compaction shall be supplied and paid for according to the various specifications for sub-grade, sub-base and base materials.

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PREPARING SHOULDERS

210

210.01 Description

This work shall consist of excavating unsuitable material from the unpaved shoulder to the bottom of the asphaltic concrete in preparation for placement of new shoulder material.

210.02 Construction Method

The Contractor shall excavate the existing unpaved shoulders to the lines and grades indicated by the Engineer. Surplus shoulder material shall be disposed of in accordance with Provision 104.14. The excavated surface shall be shaped to slope away from the pavement at a rate of 4% and shall be compacted in accordance to Section 209 to 95% of Standard Proctor Density.

Excavations shall not be left open overnight.

Waste material from the excavation shall be disposed of by the Contractor. The allowable deviation from grade shall be 25 mm.

210.03 Method of Measurement

The quantity to be measured under this Section shall be the number of square metres of shoulders actually prepared.

210.04 Basis of Payment

Preparing shoulders shall be paid for at the unit bid price per square metre and this price shall be full compensation for excavation and disposal of material, grading, compaction, and tools, equipment, labour and incidentals necessary to complete the work.

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SHOULDER MATERIAL

211

211.01 Description

This work shall consist of the supply and placement of aggregate, milled asphalt pavement, borrow or topsoil on the shoulders of the roadway.

211.02 Material

The material to be supplied under this Section shall be of the type specified in Schedule C of the Tender and shall be approved by the Engineer prior to placement.

Aggregate shall meet all specifications for the class specified in Section 401 and Section 412. Borrow material shall be in accordance with Sub-Provision 206.02.02 and Topsoil shall be in accordance with Section 212 with the additional requirement that 100% of all shoulder materials shall pass the 50 mm Sieve.

211.03 Construction Method

The Contractor shall prepare the shoulder, as provided for elsewhere in the Contract, and shall ensure that any debris has been removed.

Shoulder material shall be placed by a shouldering machine approved by the Engineer.

The Contractor shall produce a final graded surface having a uniform 4% cross-slope toward the ditch except on the outer edge of a super-elevated curve where the Contractor shall consult with the Engineer for direction.

Where shoulder material is to be placed after paving, compaction of aggregate and borrow shall be achieved using an appropriate rubber-tired roller in accordance with Section 209 to 95% of the Standard Proctor Density. The Engineer may approve the use of an alternative type of roller if safe operation of a rubber-tired roller can not be achieved. Topsoil shall be compacted to the satisfaction of the Engineer. Excess shoulder material shall be removed at the Contractor's own expense. All handwork required at driveways and intersecting roadways ,etc. must be completed immediately following the shouldering process or the liquidated damages shall come in to effect.

The Contractor shall sweep any excess material from the paved surface.

The Contractor shall be responsible for repairing to the satisfaction of the Engineer, at the Contractor's own expense, any damage caused to the paved surface by the shouldering operation.

211.04 Scheduling and Liquidated Damages

Shoulder material placement shall commence:

- (i) for a one year project: no later than four working days after the final lift of asphalt is placed and ready for shouldering or a number of days greater than four at the discretion of the Engineer.
- (ii) for a multiple year project: no later than four working days after the final lift of asphalt is ready for shouldering in each year or a number of days greater than four at the discretion of the Engineer.

Liquidated damages of \$300.00 per day shall be assessed for each day beyond four days after the final lift of asphalt is placed and ready for shouldering or the number of days is

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SHOULDER MATERIAL

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greater than four at the discretion of the Engineer. This shall apply regardless of whether paved shoulders exist.

211.05 Method of Measurement

The quantity to be measured under this Section shall be the number of tonnes of shoulder material placed.

211.06 Basis of Payment

Shoulder material shall be paid for at the unit bid price per tonne for supply and placement of shoulder material and this price shall be full compensation for all work, royalty payments to land owner, equipment, tools, labour and incidentals necessary to complete the work

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TOPSOIL AND LANDSCAPING

212

212.01 Description

This work shall consist of the supply and placement of topsoil for in areas designated by the Engineer.

212.02 Material

Topsoil shall be a fertile, friable, loamy soil. Topsoil shall not contain excessive amounts of roots, stones, sods, clods or other foreign matter. Topsoil shall come from a source which does not contain past or current evidence of invasive plants or seed. The Engineer shall accept or reject topsoil based on the overall quality and/or source of the material.

212.03 Construction Method

Areas to be landscaped with topsoil shall be scarified or tilled to a depth of 50 mm and then uniformly graded such that after topsoil placement the areas shall blend in with the adjoining topography.

Topsoil shall be spread on the prepared areas to a uniform depth of 100 mm unless otherwise directed. Stones and all other deleterious materials shall be removed to the satisfaction of the Engineer. The final product shall be considered landscaped and ready for seeding.

The Contractor shall perform a cleanup of excess topsoil spilled outside of the areas designated for landscaping.

212.04 Method of Measurement

The quantity to be measured for payment under this Section shall be the number of tonnes, in accordance with Provision 107.03, or the number of cubic metres by truck box measure.

212.05 Basis of Payment

Topsoil shall be paid for at the unit bid price per tonne or cubic metre and this price shall be full compensation for the supply of topsoil, and all work including but not necessarily limited to landscaping, scarifying, tilling, grading, land levelling, raking, tools, equipment, labour and incidentals necessary to complete the work.

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RANDOM RIP RAP

213**213.01** Description

This item consists of the supply and placement of Class 1 and Class 2 random rip rap in accordance with the plans or as directed by the Engineer.

*Refer to Section 7.1.10 Rip Rap of TIE's Environmental Protection Plan.

213.02 Material

Materials shall be supplied by the Contractor after being approved by the Engineer. The Engineer shall be notified of rip rap sources in writing at least 14 days prior to the Contractor obtaining material. The rock shall be free of splits, seams, laminations, weak cleavages or defects likely to impair its soundness during handling and placing or result in undesirable weathering and disintegration from the action of air, water and ice. Any Rip Rap with features such as seams, joints, lenses and bands of similar or different lithological material (e.g. conglomerates) that tend to form planes of weakness along which the stone material breaks or separates shall be rejected. Random rip rap material supplied under this item shall be a well-graded mixture and shall meet the gradation sizes as specified in Table 213-1. The least dimension of any rock shall not be less than one half of the greatest dimension. In addition, random rip rap shall satisfy the following physical requirements:

Class 1 - Class 1 random rip rap shall consist of clean hard, durable quarried stone having a density of not less than 2.6 tonne/m³ and a maximum petrographic number of 150. The rock material, if subjected to the Los Angeles Abrasion Test (ASTM C131), shall have a loss not greater than 35%. When tested for soundness, five cycles of magnesium sulphate (ASTM C88), the rock material shall have a loss not greater than 15%. Sandstone rock will not be acceptable for use as Class 1 random rip rap. Rock when tested by the Freeze/Thaw test method in accordance with MTO LS - 614, shall have a loss not greater than 15%.

Class 2 - Class 2 random rip rap shall consist of clean, hard, durable field or quarry stone free of overburden and organic soil and approved for use by the Engineer. Rock with visible planes of weakness and/or subject to distinct deterioration by water or weather will not be accepted.

The contractor shall always use Class 1 random rip rap unless otherwise specified.

213.03 Construction Method

The Contractor shall provide for the weighing of random laid rip rap material in accordance with Provision 107.03. Before placing random rip rap, grades and slopes of underlying material shall be shaped as shown on the Plans or as directed by the Engineer. Random rip rap shall be placed in areas shown on the plans or as directed by the Engineer. The random rip rap shall be placed by procedures and equipment approved by the Engineer until specified dimensions are obtained. No pushing of the stones by bulldozers or other equipment will be allowed.

The random rip rap shall be placed in such a manner that underlying slopes are not disturbed and material is not wasted. The rip rap shall be placed such that each rock is stable, secure and supported by rocks below and the placement shall be controlled to

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RANDOM RIP RAP

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ensure that a uniform and continuous cover is achieved. When random rip rap is placed on top of a geotextile, the Contractor shall take due care to prevent damage to the geotextile material.

213.04 Quality Control/Quality Assurance

The acceptability of the rock for use shall be determined based on available service records and/or laboratory/field test results. Any additional prequalification testing shall be carried out at the discretion of the Engineer. Control of gradation of material as delivered to the site shall be by visual examination. Any difference in opinion between the Engineer and the Contractor shall be resolved by testing carried out by qualified personnel in accordance with ASTM D5519 Test Method A. The Contractor shall provide the equipment, a sorting site and any labour required to undertake such testing.

The cost associated with any required prequalification testing shall be borne by the Contractor. The cost of the provision of materials, labour and equipment to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the material does not conform to the specified gradation, otherwise the Owner shall bear the cost of the testing. The cost of any retesting to resolve the supply of the specified material gradation shall be borne by the Contractor.

213.05 Method of Measurement

Measurement for payment of random rip rap shall only include material supplied and placed in accordance with the provisions of this Section and acceptable to the Engineer.

The quantity to be measured under this Section shall be the acceptable number of tonnes of random rip rap weighed in accordance with Provision 107.03.

213.06 Basis of Payment

Random rip rap material shall be paid for at the unit bid price per tonne and this price shall be full compensation for supply and placement including labour, tools, equipment, loading, delivering, stockpiling, transporting both to the site and on site, as required.

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RANDOM RIP RAP

213

Table 213-1 Random Rip Rap Gradation

	Finer by Mass(%)						
Size (mm)	R-5	R-25	R-50	R100	R250	R500	R1000
1300	-	-	-	-	-	-	100
1100	-	-	-	-	-	-	70-90
1000	-	-	-	-	-	100	-
900	-	-	-	-	-	70-90	40-55
820	-	-	-	-	100	-	-
710	-	-	-	-	70-90	40-50	-
600	-	-	-	100	-	-	-
570	-	-	-	-	40-55	-	-
530	-	-	-	70-90	-	-	-
480	-	-	100	-	-	-	-
420	-	-	70-90	40-55	-	-	0-3
380	-	100	-	-	-	-	-
330	-	50-90	0-20	-	-	0-3	-
260	-	0-20	-	0-3	0-3	-	-
220	100	0-5	0-5	-			
190	70-90	-	-	-			
150	40-55	-	-	-			
120	-	-	-	-			
75	0-3	-	-	-			
Thickness¹ (mm)	300	500	600	800	1100	1400	1600

- (1) Measured perpendicular to the prepared surface
 (2) The titles R-5, R-25, etc. refer to minimum average mass in Kg.

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TAP DRAIN INSTALLATION

214

214.01 Description

This work shall consist of construction of diversion ditches outside of the roadway, hereafter referred to as tap drains.

* Refer to Section 7.1.11.1 Tap Drains of TIE's Environmental Protection Plan.

214.02 Construction Method

Environmental protection measures shall be installed, if possible, prior to beginning any excavation. Otherwise, materials for environmental protection measures shall be on-site prior to excavation work and shall be installed at the earliest appropriate opportunity. All work carried out under this Section shall be done in accordance with the Environmental Requirements of Appendix 2.

The Engineer shall lay out the line and grade of the tap drain prior to excavation. The tap drain shall be constructed to have a minimum 1 m wide flat bottom and side slopes not steeper than 1:2 unless otherwise directed by the Engineer.

Clearing, grubbing and topsoil removal and reinstatement, as required, shall be performed in accordance with the respective Provisions 201.02, 202.02 and 204.02.

Hay mulch shall be supplied and placed on all bare soil surfaces on a daily basis.

Excavated material deemed as surplus may be reused or stockpiled for future use. The Contractor shall transport this material within the job site to a location indicated by the Engineer.

Excavated material deemed as waste shall be disposed of in accordance with Provision 104.14

214.03 Method of Measurement

The quantity to be measured for tap drain construction shall be the number of linear meters of tap drain constructed.

214.04 Basis of Payment

Payment under this Section shall be at the unit bid price per linear meter and this price shall be full compensation for all work, clearing, grubbing, excavation, stockpiling, and topsoil removal and reinstatement, equipment, labour and incidentals necessary to perform the work.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

DITCHING**215**

215.01 Description

This work shall consist of excavating and regrading the existing ditch within the roadway, and removing sediment build-up around inlets and outlets of roadway and driveway culverts located within the limits of the work.

Refer to Section 3.3 Ditching of TIE's Environmental Protection Plan.

215.02 Construction Method

Environmental protection measures shall be installed, if possible, prior to beginning any excavation. Otherwise, materials for environmental protection measures shall be on-site prior to excavation work and shall be installed at the earliest appropriate opportunity in consultation with the County Environmental Officer. All work carried out under this Section shall be done in accordance with the EMS Approval to Proceed and the Environmental Requirements of Appendix 2.

The excavation shall proceed in the upstream direction.

The ditch shall be reshaped to have a 1 m wide flat bottom with side slopes not steeper than 2:1. In cases where the available right-of-way is insufficient in width to achieve the desired cross-section, the Engineer shall direct the Contractor on a case specific basis.

Immediately upon completion of the ditching or, as a minimum, at the end of the day, and if so directed by the Engineer disturbed slope areas within 10m of a culvert shall be stabilized as indicated in Section 312 - Culvert End Treatment.

Hay mulch shall be supplied and placed on all bare soil surfaces as required by the Engineer.

Excavated material deemed as surplus may be reused or stockpiled for future use. The Contractor shall transport this material within the job site to a location indicated by the Engineer. Excavated material deemed as waste shall be disposed of in accordance with Provision 104.14.

215.03 Method of Measurement

Measurement for payment under this Section shall be the number of linear metres of ditch reshaped.

No measurement for payment will be made under this section for culvert end treatments but shall be made under Section 312.

215.04 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre and this price shall be full compensation for all work including excavation, tools, labour, equipment and incidentals necessary to perform the work.

Payment for culvert end treatments shall be in accordance with Section 312.

Payment for environmental protection measures shall be paid for in accordance with the section for the type of protection required.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CULVERT END CLEANOUT

216

216.01 Description

The work to be carried out under this Section involves excavation of earth build-up near the ends of drainage culverts. This item is essentially a maintenance measure designed to correct accumulated sediment build-up from local sources of soil erosion

216.02 Construction Method

The Contractor shall excavate excess material from within the ditch and culvert using appropriate hand and power tools. Handwork shall be required in many cases to avoid damage to the culverts.

The Contractor shall dig a sump at the downstream end of the culvert. Sediment or rock deposits inside the culvert shall be removed.

Damage to culverts as a result of this work shall be repaired to the satisfaction of the Engineer at the expense of the Contractor.

Upon completion, the original ditch profile and cross-section shall be restored to allow unobstructed drainage and the transition to the existing ditch shall be smooth.

The Engineer may specify a location within the job for surplus material to be deposited for re- use; if not re-used, waste material shall be disposed of by the Contractor.

Excavation under this Section shall not exceed 10 m in length at any culvert end.

Immediately upon completion of the culvert end clean out extension or, as a minimum, at the end of the work day, disturbed slope areas within 10m of the culvert shall be stabilized as indicated in Section 312 - Culvert End Treatment.

216.03 Method of Measurement

The quantity to be measured for payment under this Section shall be the number of culvert ends improved.

No measurement for payment will be made under this section for culvert end treatments but shall be made under Section 312.

216.04 Basis of Payment

Payment under this Section shall be at the unit bid price per culvert end improved and this price shall be full compensation for all work, tools, labour, equipment and incidentals necessary to perform the work.

Payment for culvert end treatments shall be in accordance with Section 312.

Payment for Random Rip Rap shall be in accordance with Section 213.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TRENCH EXCAVATION AND BACKFILLING

217

217.01 Scope

This Section specifies the requirements to perform excavation of all types of material, to dispose of unsuitable and surplus material, to place bedding material, to place excavated material as backfill, and to furnish backfill material.

The work generally includes, but is not necessarily limited to the following items:

- Trench excavation and backfilling for pipelines, conduits and appurtenances.
- Structure excavation and backfilling for manholes, catch basins, chambers, signal pole bases and controller cabinet bases.
- Supply and placement of bedding material.
- Control of water in trench excavations by de-watering.
- Removal and disposal of surplus and/or unsuitable material.
- Sheet piling, shoring, trench boxes and bracing to support trench walls, sides of excavations, existing structures or utilities.

217.02 Existing Structures and Underground Services

Furnish temporary support, adequate protection and maintenance for all underground and surface structures, drains, forcemains, water systems, sewers, trees, utility poles and other obstructions under the direction of the Engineer.

Restore, upon completion of the work, structures which have been disturbed.

Wherever obstructions not shown on Drawings are encountered that interfere with the work, the Engineer shall have the authority to change the Drawings and order a deviation from the line and grade or arrange with the owner to remove, relocate and reconstruct the obstructing structure. The Contractor shall have no claim for any delays resulting from unforeseen obstructions encountered during the progress of the work.

The Contractor shall proceed with caution in excavation and preparation of trenches so that the exact location of all buried pipes and services and underground structures may be determined. The Contractor shall be responsible for any repair of pipes, services and structures, when broken or otherwise damaged.

During the work, the Contractor shall not unreasonably interfere with flow of sewage or water in any existing sewer or drain nor jeopardize public health in any way. Wherever a sanitary sewer is pumped or diverted, it shall be carried entirely in closed pipes. Temporary diversion of sanitary sewerage through an open channel shall not be permitted.

Whenever it is necessary to explore and excavate to determine the location of existing underground utilities, it shall be at the Contractor's own expense.

217.03 Support of Excavation

Suitably slope or properly shore sides of excavations according to site conditions and use support where necessary.

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TRENCH EXCAVATION AND BACKFILLING

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The choice of any method of support shall be the responsibility of the Contractor; however, drawings and calculations for the method of support, designed by a qualified professional Engineer in accordance with the Provincial Safety Requirements, are to be submitted to the Engineer for approval.

If it is desirable that any support, other than that which may be shown on the Drawings, be left in the excavations, then the Engineer will issue instructions accordingly.

Every precaution shall be taken against slips or falls; if a slip or fall occurs the Contractor shall execute remedial work, as the Engineer considers necessary, including filling with approved granular material.

217.04 Material

Select backfill material: approved material from site excavation. Such material shall be free from stumps, trees, roots, sod, muck or other deleterious material, and shall not contain rock, boulders or masonry larger than 150 mm in diameter. The material shall be free from frost and it shall not be placed on frozen ground or in water.

Bedding material shall be the class specified, in accordance with Sections 401 and 402.

217.05 Construction Method - General

Compute amounts and nature of excavation required and excavate all materials encountered on the work site.

Protect property or structures above or below ground.

Where excavation is to be performed through existing pavement, cut pavement in accordance with Section 710.

Found excavated surfaces on solid undisturbed ground. If the excavated surface, is unsuitable, the Engineer will determine what work is required to secure a proper foundation. If such work is due solely to the nature of the ground, then the Engineer will measure the work, but if such work is due to any act or default of the Contractor resulting in disturbance of natural ground conditions, then the Contractor shall execute the work at no additional cost to the Contract.

Any excavation to a depth greater than shown on the Drawings shall be at no additional cost to the Contract, unless ordered by the Engineer. Make good trench bottoms with approved granular material adequately compacted, as approved by the Engineer, or with concrete as may be necessary for the safety or stability of the work.

Pile excavated material so it will not endanger personnel or the work, reduce sight distances or obstruct roadways.

Leave utility controls unobstructed and accessible at all times.
Do not obstruct drainage ditches or natural watercourses.

Remove all waste material, with the Engineer's approval, from the site at no additional cost to the Contract.

The Engineer reserves the right to re-use surplus material for embanking, general grading or other improvements or uses on site.

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TRENCH EXCAVATION AND BACKFILLING

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Control grading so that the surface of the ground will be properly sloped to prevent water from running into excavated areas.

217.05.01 Draining, Pumping and Thawing

Keep all excavations and trenches free of water at all times. Control excavations to prevent surface water running into excavated areas and promptly remove any accumulated water.

Supply and maintain pumps, in number and capacity sufficient to keep all excavations dry and free from water at all times. Operate all equipment for as long as necessary.

Dispose of water removed from excavations in a manner that will prevent damage to public health, private property or the work. Pumping of water containing silt or other suspended material into streams or drainage courses is prohibited.

Ensure that all sub-drains, sump holes, wells or the like do not endanger the stability of the work. On completion of the work completely backfill and consolidate any excavations.

Excavate, remove or thaw out frozen ground as necessary.

217.05.02 Structure Excavation

Extend excavations a sufficient distance from foundations to allow the placement and removal of forms, installation of services and inspection.

217.05.03 Trench Excavation

Trenches for piping and related excavations shall be of sufficient width and depth at all points to allow pipes to be laid, joints to be formed and appurtenant structures to be built. When needed, allow for sheeting and shoring, pumping, draining and removal and replacement of materials unsuitable for foundations.

Excavate trenches so pipe can be laid to the alignment and depth required. Excavate only so far in advance of pipe laying as permitted by the Engineer; in most cases this shall be only what can be backfilled in the same day. Brace and drain trench so workmen can work safely and efficiently.

Remove all organic material and soft deposits until medium dense to dense materials are encountered or to a depth as specified by the Engineer.

Do not stockpile excavated materials alongside trenches if the bearing soil will cause trench side failure or bottom uplift.

217.05.04 Bedding - General

Bear foundations of all structures including pipe surrounds on 150 mm granular bedding material unless otherwise shown on the Drawings. The bedding material shall be compacted to 95% Standard Proctor Density except when under existing or proposed asphalt which shall be compacted to a minimum of 98% Standard Proctor Density in accordance with Section 209. In confined areas of the excavation, bedding shall be compacted using suitable hand or plate tampers. Neatly finish all bearing surfaces to the required levels and grades.

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TRENCH EXCAVATION AND BACKFILLING

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217.05.05 Backfilling - General

After pipelines and structures have been built, backfill trenches and other excavated areas as specified with materials shown on the Drawings. Remove all timber and debris from excavations before backfilling. Do not cover or put out of view any work until it has been examined, approved and measured by the Engineer. If any work is covered without approval of the Engineer, it must be uncovered for examination.

Any stones greater than 100 mm shall not be placed within 300 mm of the structure or pipe.

217.05.06 Backfilling Structures

After installation of structures and after authority to proceed, backfill excavations using select backfill material.

Place backfill in horizontal layers not more than 200 mm deep.

Compact each layer to obtain a minimum density of 98% Standard Proctor Density in accordance with Section 209.

Bring backfill up evenly on all sides to a suitable elevation above grade to allow anticipated settlement.

217.05.07 Backfilling Trenches

Backfill trench from top of bedding to top of subgrade using materials shown on the Drawings.

Place backfill in 200 mm layers and compact in accordance with Section 209 to 95% Standard Proctor Density with the exception of under existing or proposed asphalt which shall be compacted in accordance with Section 209 to a minimum of 98% Standard Proctor Density.

During backfilling, keep trenches free of water at all times and control water to prevent surface water from running into excavated areas. Remove any silty materials which become wetted and subsequently liquid or extremely plastic.

Leave surfaces of backfill initially high and make good any settlement of trench backfilling.

217.06 Method of Measurement

There shall be no measurement for payment under this Section.

217.07 Basis of Payment

No payment shall apply to this Section.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GEOTECHNICAL FABRIC

218

218.01 Description

This work involves supplying and placing of geotechnical fabric to be used as a separation layer between successive layers of distinct materials.

218.02 Material

The plastic yarn of the geotechnical fabric and the threads used in sewing operations shall consist of a long chain synthetic polymer composed of at least 85% by mass of propylene, ethylene, ester, amide or vinylidene-chloride, and shall consist of stabilizers or inhibitors added to the base plastic to make the filaments resistant to deterioration by ultraviolet and heat exposure.

Type N1, N2, N3 and N4 fabric shall be a previous sheet of non-woven plastic yarn.

Type W1 and W2 fabric shall be a sheet of woven plastic yarn.

The geotechnical fabric shall conform to the requirements as listed in Table 218-1

The material shall be handled and protected as per the manufacturer's instructions and recommendations, until incorporated into the work.

The Contractor shall submit in advance of the work a mill certificate for the geotechnical fabric to be supplied, as well as the manufacturer's recommended procedures for installation and instructions for handling of the selected geotextile.

218.03 Construction Method

The Contractor shall carry out the work as indicated in the contract documents and/or as directed by the Engineer.

Install geotechnical fabric on a surface that has no stumps, brush, limbs or other material that may tear or puncture the fabric.

The fabric shall be layered in accordance with the manufacturer's recommendations. Fabric that is damaged shall be replaced immediately.

218.04 Method of Measurement

The quantity to be measured under this Section shall be the area in square metres of geotechnical filter fabric placed.

218.05 Basis of Payment

Payment for the work under this Section shall be the unit bid price per square metre for each type of geotechnical fabric supplied and installed. It shall be the full compensation for the material, the cost, the labour, tools, equipment and incidentals necessary to complete the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GEOTECHNICAL FABRIC

218

Table 218-1 Requirements of Non-Woven and Woven Geotechnical Fabrics

Type of Fabric

Property (Note 1)	Unit	ASTM	N1	N2	N3	N4	W1	W2
Mullen Burst Strength	kPa	D3786	1100	1600	2200	3800	1500	3500
Tearing Strength (Trapezoid Method)	N	D4533	160	250	310	500	200	500
Grab Tensile Strength (Both Directions)	N	D4632	400	600	790	1200	400	1200
Elongation At Break	%	D4632	50	50	50	50	25 max	25 max
Apparent Opening Size	µm	D4751	50 to 250	50 to 250	50 to 250	50 to 250	840 max	Note 2
UV Degradation	%Ret.	D4355					70 min.	Note 2
Permittivity	Sec -1	D4491	1.75 to 3.50	1.25 to 2.75	1.00 to 2.50	0.50 to 2.50	0.01 min.	Note 2
Thickness	mm						2.5 min.	

Note 1 Values above the heavy line are Minimum Average Roll Values (MARV)

Note 2 Special Requirement defined in the Contract Documents

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GEOGRID REINFORCEMENT

219

219.01 Description

This work includes the supply and placement of geogrid which will serve to strengthen the roadbed.

219.02 Material

Biaxial Geogrid:

Biaxial geogrid to be BX1100 or BX1200 as manufactured by Tensar or equivalent in terms of physical properties and strength. Biaxial geogrid shall be a regular grid structure; resistant to ultra-violet degradation, to damage under normal construction practices, and to all forms of biological or chemical degradation normally encountered in the material being reinforced. It shall also have the characteristics outlined in Table 219-1.

Table 219-1 Requirements for Geogrid Reinforcement

Property	Type 1 Minimum	Type 2 Minimum	Test
Aperture Stability for Punched and Drawn (m-N/deg)	0.32	0.65	ASTM D7864/ D7864M-15
Aperture Size along Roll Length (mm)	25	25	Calipered
Open Area(%)	70	70	Calipered
Rib Thickness at Ribs (mm)	0.76	1.27	Calipered
Polypropylene Material (%)	98	98	ASTM D-4101
Flexural Rigidity along Roll Length(mg/cm)	250,000	750,000	ASTM D-7748/ 12
Strength at Junctions (kg/m)	1,116		ASTM D-7737- 11
Tensile Strength @ 2% Strain MD/XMD (kN/M)	4.1/6.6	6.0/9.0	ASTM D-6637- 10
Tensile Strength @ 5% Strain MD/XMD (kN/M)	8.5/13.4	11.8/19.6	ASTM D-6637- 10
Efficiency of Junctions (%)	93	93	ASTM D-7737- 11

GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS FOR HIGHWAY & BRIDGE CONSTRUCTION

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GEOGRID REINFORCEMENT

219

Triaxial Geogrid:

Triaxial geogrid to be TX140 or TX160 as manufactured by Tensar or equivalent in terms of physical properties and strength. Triaxial geogrid shall be a triangular grid structure; resistant to ultra-violet degradation, to damage under normal construction practices, and to all forms of biological or chemical degradation normally encountered in the material being reinforced. It shall also have the characteristics outlined in Table 219-2.

Table 219-2 Requirements for Triaxial Geogrid Reinforcement

Property	Type 1	Type 2	Test
Rib Pitch (mm)	Longitudinal: 40	Longitudinal: 40	Nominal Dimensions
Mid-Rib Depth (mm)	Diagonal: 1.5 Transverse: 1.1	Diagonal: 1.6 Transverse: 1.4	Nominal Dimensions
Mid-Rib Width (mm)	Diagonal: 1.1 Transverse: 1.1	Diagonal: 1.0 Transverse: 1.2	Nominal Dimensions
Rib Shape	Rectangular	Rectangular	
Aperture Shape	Triangular	Triangular	
Junction Efficiency %	93	93	GRI-GG2-87 GRI-GG1-87
Aperture Stability (kg-cm/deg@5.0kg-cm)	3.0	3.6	Torsional Rigidity
Radial Stiffness at Low Strain (kN/m@0.5%strain)	225	300	ASTM D6637-01

219.03 Construction Method

The Contractor shall supply material in standard rolls for general application where designated by the Engineer.

The geogrid shall be laid on the prepared surface as indicated on the contract Drawings or as directed by the Engineer.

Geogrid shall be laid in accordance with manufacturer's recommendations. Cut and overlap geogrid to accommodate curves, underground structures and other protrusions. Secure geogrid to prevent separation and to provide anchorage in accordance with manufacturer's recommendations.

219.04 Method of Measurement

The quantity to be measured under this Section shall be the number of square metres of geogrid actually used.

219.05 Basis of Payment

Geogrid shall be paid for at the unit bid price per square metre and this price shall be full compensation for the material, the work, labour, tools, equipment and other incidentals necessary to complete the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

BEDDING MATERIAL	220

220.01 Description

This work involves the supply, placement and compaction of granular bedding material for trenches, catch basins, storm sewers, sidewalks, conduits or similar work.

220.02 Material

Bedding material shall be the material specified in the Tender document and it shall be in accordance with Section 401 or 402.

220.03 Construction Method

Bedding material shall be placed and compacted to 95% Standard Proctor Density except when under existing or proposed asphalt which shall be compacted to a minimum of 98% Standard Proctor Density in accordance with Section 209.

220.04 Method of Measurement

Measurement for payment of bedding material shall be the number of tonnes or cubic metres placed.

220.05 Basis of Payment

Payment for bedding material shall be at the unit bid price per tonne or per cubic metre supplied, placed and compacted.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DRAINAGE		300
301	Storm Sewer Pipe Installation	
302	Catch Basin Installation	
303	Catch Basin, Manhole and Valve Adjustment	
304	Drain Tile Installation	
305	Roadway Culvert Installation	
306	Driveway Culvert Placement	
307	Culvert Extension	
308	Culvert Removal	
309	Timber Box Culvert (RESCINDED 2021)	
310	Concrete Box Culvert (RESCINDED 2021)	
311	Multi-Plated Corrugated Steel Arch (RESCINDED 2021)	
312	Culvert End Treatment	

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

STORM SEWER INSTALLATION**301**

301.01 Description

The work of this Section shall consist of storm sewer installation of Pre-cast Concrete Pipe (PCP), Corrugated Steel Pipe (CSP), Double Walled Polyethylene Pipe (DWP) or Poly Vinyl Chloride Pipe (PVC), excavation of trenches, placement of bedding material, dewatering and backfilling.

301.02 Material**301.02.01** Pre-cast Concrete Pipe (PCP)

Unless specified otherwise in the Tender document, all concrete storm sewer pipes, outfall pipes, catch basin leads and flexible gaskets are to be supplied by the Contractor.

Concrete storm sewer pipe, outfall pipe, and catch basin lead are to be to ASTM C-76, Class III reinforced concrete pipe designed for flexible rubber gasket joints to ASTM C-443 and to the diameter indicated on the Drawings.

301.02.02 Corrugated Steel Pipe (CSP)

Unless specified otherwise, all corrugated steel storm sewer pipes, outfall pipes, catch basin leads and couplings are to be supplied by the Department in accordance with Provision 104.13.

301.02.03 Double Walled Polyethylene Pipe DWP

Unless specified in the Tender Agreement, all Double Walled Polyethylene Pipe (DWP) and all pipe fittings and gaskets are to be supplied by the Contractor.

High density polyethylene pipe shall meet the requirements of the latest CAN/CSA Standard B182.8 with a minimum stiffness of 320 kPa, joined together with an integral gasketed bell connection. The gasket is to be Type 2 (silt tight).

Double Walled Polyethylene Pipe (DWP), 300mm to 900mm diameter, has a smooth-walled interior and a corrugated exterior wall that is manufactured in standard lengths of approximately six metres.

301.02.04 Poly Vinyl Chloride Pipe (PVC)

Unless specified in the Tender Agreement, all Poly Vinyl Pipe (PVC), pipe fittings and gaskets are to be supplied by the Contractor.

Poly Vinyl Pipe, up to 450mm diameter, shall meet the requirements of the latest CAN/CSA Standard B182.1 and B182.2. The pipe shall be able to be joined by an integral gasketed bell and spigot connection. The gasket is to be Type 2 (silt tight).

301.02.05 Galvanized Steel Grate

Unless specified in the Tender Agreement, all galvanized steel grates and fasteners are to be supplied by the Contractor.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

STORM SEWER INSTALLATION

301

All steel grates and fasteners shall be hot-dipped galvanized steel with a minimum coating of 720 g/ m² squared as per ASTM A123/A123M.

301.03 Construction Method - General

The Contractor shall begin work at the downgradient end of the section to be installed. Trench excavation, bedding and backfill shall be in accordance with Section 217. The excavated width of the bottom of the trench shall not be less than 300 mm nor more than 600 mm greater than the diameter of the pipe. At the location of any bends, the trench shall be shaped to accommodate bends.

All excavated trenches shall conform to the Prince Edward Island Occupational Health and Safety Act and Regulations with particular note to Part 12 and Part 50.

Bedding material shall be placed by hand, in layers not exceeding 150 mm, under the bottom one third (1/3) of the pipe for PCP and CSP pipes. DWP and PVC pipes shall be backfilled with bedding material to 300 mm above pipe or pipe diameter whichever is less.

Pipes are to be installed with the use of laser or survey equipment specifically manufactured for pipe installation. Pipes which are not true in alignment or which show improper installation shall be taken out and relaid at the Contractor's own expense.

Exposed inlets and outlets of storm sewer systems shall be tapered 3:1 (horizontal:vertical). Pipes 450 mm or greater in diameter and connected to closed storm sewer systems shall require galvanized steel grates to restrict access to the system. Open ended pipes 450 mm or greater in diameter and greater than 24 metres in length shall require galvanized steel grates to be fastened at the inlets and outlets. Bars shall be orientated vertically at inlets and horizontally at outlets.

Installation of storm sewer grates shall be in accordance with Figures 301-1 and Figure 301-2.

301.03.01 Pre-cast Concrete Pipe (PCP)

For PCP installation, recesses shall be excavated for the bells. The bell ends shall be placed up-grade with the spigot end fully entered into the bell.

301.03.02 Corrugated Steel Pipe (CSP)

CSP shall be installed in such a manner so that the inside circumferential laps point downstream. Corrugated steel pipe couplings shall be placed so that the joint of the couplings are near horizontal. The bolted joint connection on the coupling should be overlapped from the top and should be located on the lower half of the culvert (i.e. between 3 and 9 o'clock').

301.03.03 Double Walled Polyethylene (DWP) and Poly Vinyl Chloride Pipe (PVC)

For Polyethylene and PVC installation, recesses shall be excavated for bells. The bell ends shall be placed upgrade with the spigot end fully entered into the bell.

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STORM SEWER INSTALLATION

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301.04 Method of Measurement

Measurement for PCP, CSP, DWP or PVC under this Section shall be the number of linear metres of pipe installed for each diameter of pipe used in the work.

Bedding material supplied under this Section shall be measured for payment in accordance with Section 220.

Measurement for galvanized steel grates under this section shall be the number of grates installed for each diameter specified in the contract.

Additional material supplied for backfill shall be measured in accordance with the respective specification.

301.05 Basis of Payment - General

Payment under this Section shall be at the unit bid price for each diameter of pipe installed and this price shall be full compensation for excavation, disposal of waste or surplus material, shoring, bracing, placement of pipe, tapering exposed inlets and outlets, dewatering, backfilling, compaction, equipment, tools, lasers or survey equipment, labour, water for compaction and incidentals necessary to perform the work.

Payment for supply of bedding material and additional backfill material will be made in accordance with the respective specification.

Payment for the supply and installation of fittings such as couplings, and crosses shall be included in the unit bid price for each diameter and type of pipe installed. This shall also include any top grates installed at the inlet of the drain pipes, galvanized inlet and outlet steel grates and all incidentals necessary to perform the work. Elbows, tees and wyes shall be paid for by the specified unit rate.

301.05.01 Pre-cast Concrete Pipe (PCP)

The unit bid price for PCP installation as defined in Provision 301.05 shall also be full compensation for the supply of the concrete pipe, outfall pipe, catch basin leads and gaskets unless specified otherwise in the Tender document.

301.05.02 Corrugated Steel Pipe (CSP)

The unit bid price for CSP installation as defined in Provision 301.05 shall not include compensation for the corrugated steel pipe, outfall pipe, catch basin leads or couplings; as these will be supplied by the Department in accordance with Provision 104.13 unless specified otherwise in the Tender document.

301.05.03 Double Walled Polyethylene (DWP) and Poly Vinyl Chloride Pipe (PVC)

The unit bid price for Polyethylene and PVC pipe installation, as defined in Provision 301.05 shall be full compensation for the supply of the pipe, gaskets and incidentals required to perform the work.

301.05.04 Galvanized Steel Grate

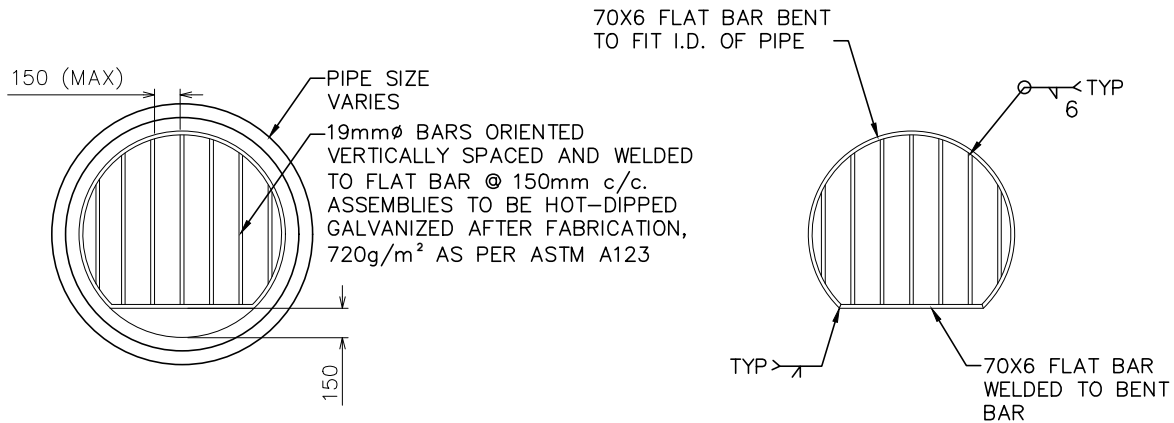
**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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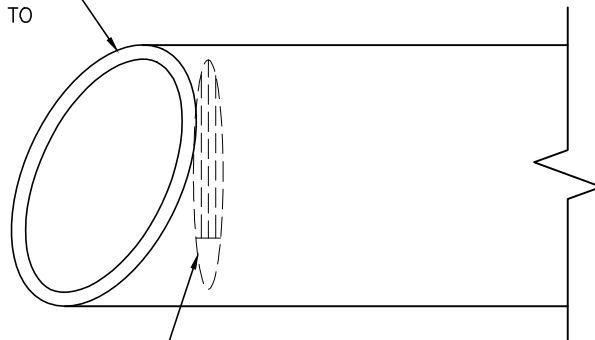
STORM SEWER INSTALLATION

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The unit bid price for galvanized steel inlet and outlet grates, as defined in Provision 301.05, shall include full compensation for the supply and installation of the grate and all incidentals required to perform the work.



PIPE TO BE CUT OFF SMOOTH AT AN ANGLE AS TO MATCH DITCH SLOPES. CONTRACTOR IS TO GROUT CUT AREA TO ELIMINATE ROUGH EDGES



GRATES ARE TO BE PRE-FABRICATED AND PLACED PERPENDICULAR TO PIPE WALL INSIDE PIPES WHERE REQUIRED. CONNECTION DESIGN BY CONTRACTOR TO BE REVIEWED BY TIE.

FIGURE 301-01 INLET GRATE (N.T.S.)

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CATCH BASIN INSTALLATION

302

302.01 Description

The work of this Section shall consist of the installation of precast concrete (PCP - Pre-cast Concrete Pipe) or corrugated steel (CSP - Corrugated Steel Pipe) catch basins, grade rings, adjusting rings, frames and covers including excavation, placement of bedding material, dewatering, backfilling and compaction.

302.02 Material

302.02.01 Pre-cast Concrete (PCP) Catch Basin

Unless specified otherwise in the Tender document, all pre-cast catch basins, grade rings, adjusting rings, frames, and covers are to be supplied by the Contractor.

Precast catch basin sections for municipal services are to be to ASTM C-478, circular, with a flat top section and opening offset. Catch basins shall be constructed with a precast or cast-in-place base.

Adjusting rings shall be precast or cast-in-place as indicated on the Drawings or as directed by the Engineer and shall be the same shape as the frames and covers. The outer size of the adjusting rings must be at least as large as the frames and covers but shall not extend beyond the edge of the catch basin. Multiple adjusting rings shall be of identical shape and diameter, and shall be installed in true vertical alignment with no overhanging edges.

Whenever possible, catch basins must be constructed to allow for a minimum 230 mm depth of adjusting rings. Every effort shall be made to minimize the number adjusting rings used for each catch basin.

Joints are to be made watertight using bituminous gaskets or neoprene O-rings.

Frames and covers are to be standard, tough, grey cast iron to ASTM A-48 and are to be the type and manufactured as indicated on the Drawings. Bearing surface of covers are to be cast or machined to give continuous contact over the entire surface.

302.02.02 Corrugated Steel (CSP) Catch Basin

Unless specified otherwise in the Tender document, all corrugated steel catch basins, rings and covers are to be supplied by the Department in accordance with Provision 104.13. Adjusting rings shall be steel ring inserts made to the specific height required and made to fit inside the existing frame and to accept cover. The design of the steel ring insert shall be approved by the Engineer prior to the manufacturing.

302.03 Construction Method - General

The Contractor shall excavate to the invert elevation and undercut the elevation by 150 mm. The minimum dimension of a catch basin excavation shall be no less than 1 m larger than the diameter of the catch basin.

The granular bedding material shall be placed and compacted such that an area is created

300 mm larger than the diameter of the catch basin.

Backfilling and excavation shall be done in accordance with Section 217 and as specified herein.

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CATCH BASIN INSTALLATION

302

The Contractor shall seal all connections between the catch basin and the base, inlets or outlets of storm drains prior to backfilling. When grouting is required to seal these connections, it shall be completed on both the inside and outside of the catch basin.

302.03.01 Pre-cast Concrete (PCP) Catch Basin

Pre-cast bases shall be placed on the bedding material and levelled. If the base is to be cast in place, the Contractor shall ensure a proper surface is formed to accept the intermediate sections.

The Contractor shall place a ring of mortar on the pre-cast or cured in-place base to the circumference of the catch basin. The first pre-cast catch basin section shall be placed in the mortar so that it is level and so that the joint is completely sealed. The subsequent pre-cast intermediate or top sections will be placed and sealed using rubber o-rings or ram-nek and properly orientated to ensure the specified inlets and outlets. Precast adjusting rings shall be placed on top of the catch basin structure using ram-nek or other approved sealant and shall be oriented properly to match the longitudinal and cross slopes required. Cast-in-place adjusting rings shall be formed and poured in place in a manner to provide a watertight seal. Ram-nek or other approved sealant shall be used to join the adjusting ring and frame.

302.03.02 Corrugated Steel (CSP) Catch Basin

The Contractor shall place 3 level concrete bricks or blocks 100 mm in height around the circumference of the corrugated steel catch basin. The top of the corrugated steel catch basin when placed shall be at the specified grade and shall be orientated to ensure proper inlet and outlet connections. Cast-in-place concrete shall be placed inside and outside the corrugated steel catch basin to a minimum thickness of 250mm and shall be given sufficient time to cure prior to backfilling. If height adjustment is required due to improper manufacturing or improper placement of catch basin, the contractor shall supply and place adjusting rings as required.

302.04 Method of Measurement

Measurement under this Section shall be the number of pre-cast concrete (PCP) or corrugated steel (CSP) catch basins installed for each diameter specified.

302.05 Basis of Payment - General

Payment under this Section shall be at the unit bid price for the number of catch basins installed for each diameter and this price shall be full compensation for installation, excavation, dewatering, undercutting, shoring, bracing, placement of bedding material, construction of forms, construction of bases, placement of backfill, compaction and equipment, cement, concrete, tools, labour, water for compaction and incidentals necessary to perform the work.

Payment for supply of bedding material and additional backfill material will be made in accordance with the respective specification.

302.05.01 Pre-cast Concrete (PCP) Catch Basin

The unit bid price for pre-cast concrete catch basin installation as defined in Provision 302.05 shall also be full compensation for the supply of the pre-cast concrete catch

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CATCH BASIN INSTALLATION

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basins, adjusting rings, frames and covers unless specified otherwise in the Tender document.

302.05.02 Corrugated Steel (CSP) Catch Basin

The unit bid price for corrugated steel catch basins as defined in Provision 302.05 shall not include compensation for the corrugated steel catch basins, frames or covers; as these materials will be supplied by the Department unless otherwise specified in the Tender document. The unit bid price shall include full compensation for the supply and installation of adjusting rings if they are required due to improper installation by the Contractor.

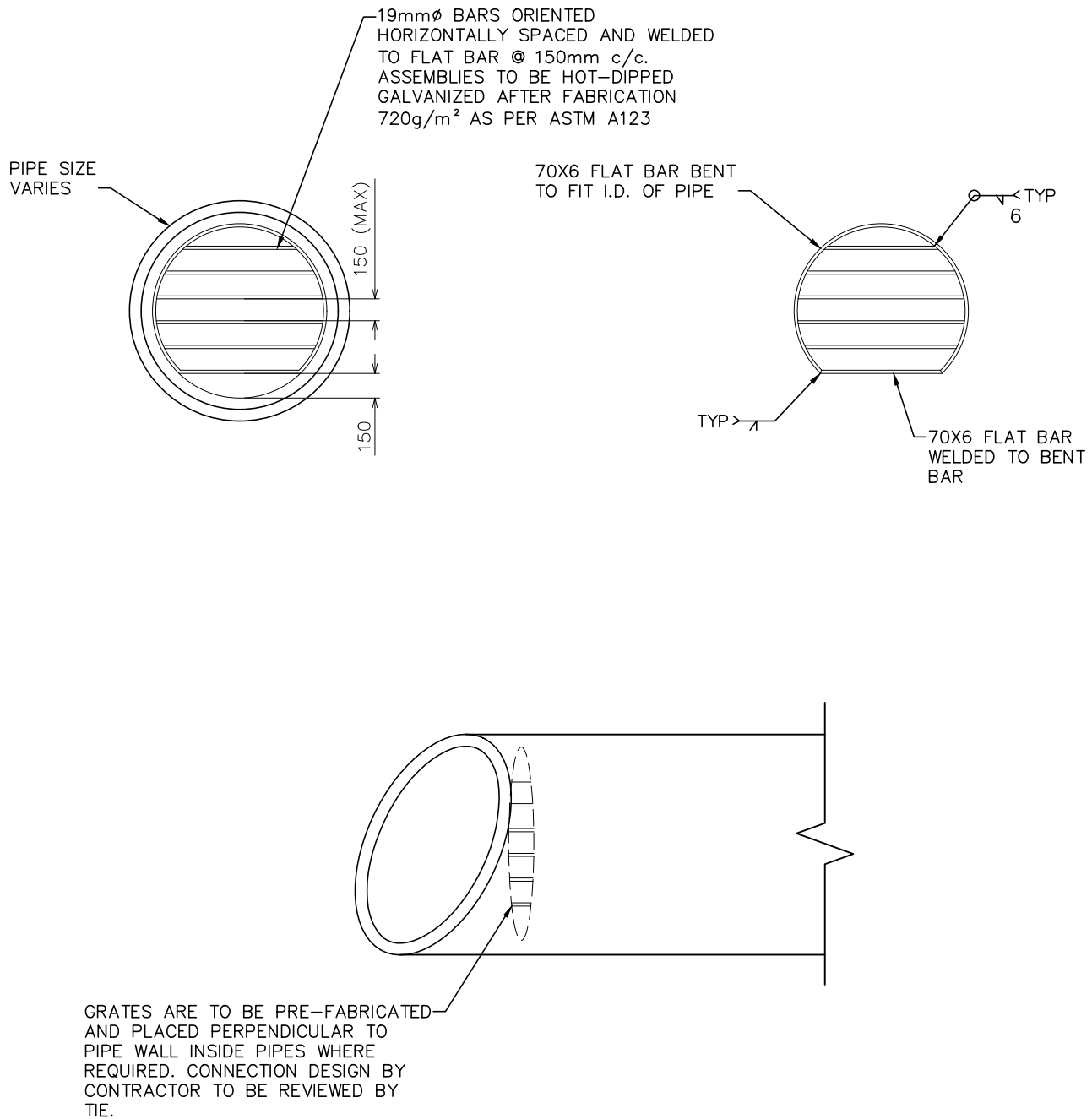


FIGURE 301-02 OUTLET GRATE (N.T.S.)
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CATCH BASIN, MANHOLE AND VALVE ADJUSTMENT

303

303.01 Description

This work shall consist of raising, lowering or rotating existing concrete catch basins and concrete manholes or valve boxes to meet the final pavement elevation.

303.02 Material

The Contractor shall supply the appropriate type of material to perform the required work.

Adjusting rings for precast concrete structures shall be precast or cast-in-place as indicated on the Drawings or as directed by the Engineer and shall be the same shape as the frames and covers. The outer size of the adjusting rings must be at least as large as the frames and covers but shall not extend beyond the edge of the catch basin.

Adjusting rings for corrugated steel catch basins shall be steel ring inserts made to the height required specifically to fit inside the seat of the existing frame and also to accept the cover. The design of the steel ring insert shall be approved by the Engineer prior to manufacturing.

Adjustable manhole frames and covers shall be C-50M1 Cone Shaped Frame / Autostable as manufactured by Bibby-Ste-Croix, or approved equivalent, meeting the requirements of CSA B70.1 and shall be as shown on Detail Drawing No. 303-01.

303.03 Construction Method

The Contractor, when raising existing corrugated steel catch basins, shall determine the height required to meet the new grade and shall manufacture a steel ring insert to raise the catch basin cover to the desired grade.

The Contractor when lowering existing corrugated steel catch basins shall cut and remove any existing pavement around the catch basin, excavate around the catch basin to a depth sufficient to adjust the catch basin to the desired elevation. The Contractor shall cut the catch basin vertically to remove the ring and cover and shall reset the ring and cover into the corrugation at the new pavement elevation. The Contractor shall insure that the ring and cover are secure and will not pop out under traffic.

The Contractor, when raising existing concrete catch basins or manholes, shall use concrete grade rings or shall supply cast-in-place concrete to the appropriate depth to meet the new grade. When lowering concrete catch basins or manholes, the Contractor will remove grade rings to meet the new grade.

The Contractor shall use the available adjustment of the valve boxes, or supply extension pieces or modify existing, to raise or lower the valve box to the appropriate elevation.

The Contractor shall ensure methods and materials are acceptable to the appropriate utility owners.

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CATCH BASIN, MANHOLE AND VALVE ADJUSTMENT

303

303.04 Method of Measurement

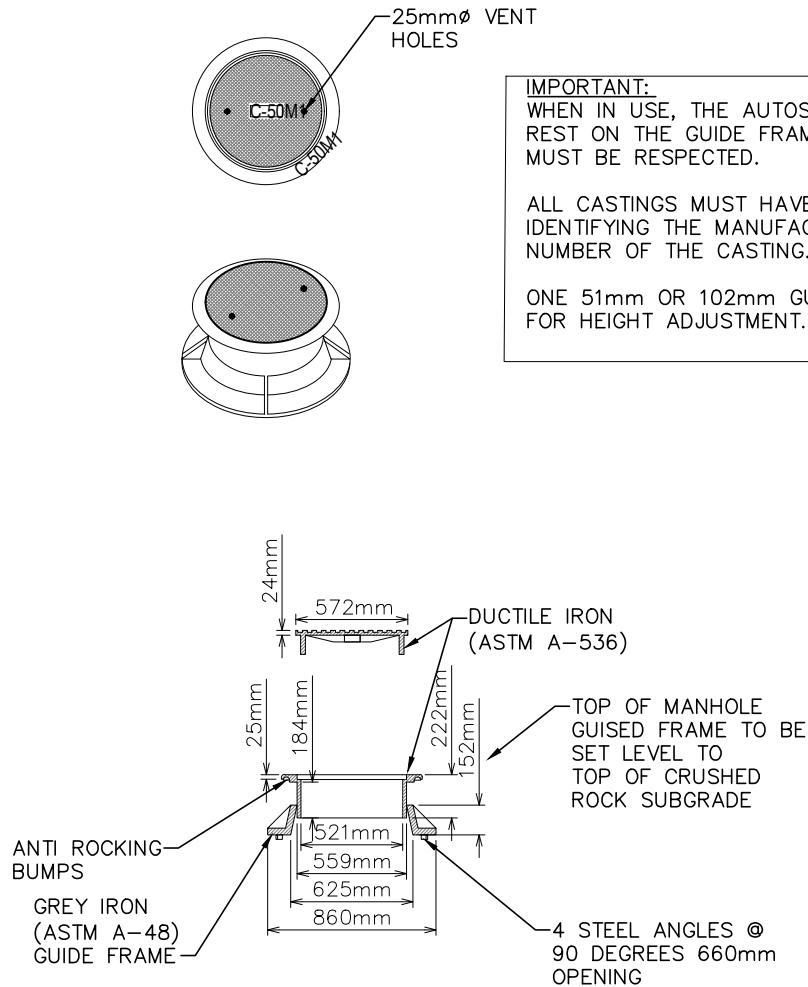
The quantity to be measured under this Section shall be the number of catch basins, manholes or valve boxes actually raised or lowered.

Pavement placed while performing this work shall be measured for payment in accordance with Section 709.

303.05 Basis of Payment

Payment under this Section shall be at unit bid price per catch basin or manhole actually lowered or raised and this price shall be full compensation for all adjustment rings, equipment, tools, labour, and incidentals necessary to complete the work.

Payment of pavement restoration shall be made in accordance with Section 709.



NOTES:

1. MINIMUM WEIGHT
COVER 55kg
FRAME 98kg
2. ADJUSTABLE FRAME AND COVER TO HAVE MACHINED SEATS.
3. ASPHALT DENSITY UNDER THE FRAME IS OF UTMOST IMPORTANCE.

FIGURE 303-01 ADJUSTABLE MANHOLE COVERS (N.T.S.)

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DRAIN TILE INSTALLATION

304

304.01 Description

This specification applies to the supply and installation of drain tile in the shoulder region of the highway.

304.02 Material

The drain tile is to be 100 mm diameter, Type 2, perforated corrugated plastic tubing in compliance with CGSB 41-GP-29 Ma.

304.03 Drain Tile Location

The drain tile is to be placed in the shoulder of the highway along a line parallel to the outside edge of the pavement, or as outlined in the plans or drawings or as directed by the Engineer.

304.04 Drain Tile Depth and Grading

The drain tile shall be placed 1 m below the normal grade of the edge of the asphalt surface, or as outlined in the plans or drawings or as directed by the Engineer.

The constructed grade should not deviate from the design grade by more than 15% of the drain tile diameter. It is intended that the drain tile be located at a consistent depth in the cross-section. Reverse grades are not allowed.

304.05 Laying Drain Tile - Open Trench Installation

The method of installation is to be with trencher, Ditch Witch or equivalent, equipment. A backhoe with a 300 mm wide bucket may be used; however, extra costs for drainage aggregate shall be incidental.

The equipment shall construct a smooth bottomed open trench 300mm in depth. The width of the opening shall conform closely to the outside diameter of the drain tile.

The drain tile shall be placed in the bottom of the trench and the remainder of the trench shall be filled with Class D drainage aggregate. The drain tile must be protected from deformation during placement of the Class D aggregate.

Following placement of the Class D aggregate the trench shall be covered with the Granular Base prior to the road being opened to traffic to provide additional protection to the drain tile.

Drain tile shall not be stretched more than 7% of its normal length. Directional changes in drain tile can be made without the use of fittings, provided the centre-line radius of the bend is not less than 5 times the tube diameter.

This is the preferred method of drain tile installation.

304.06 Laying Drain Tile - Plow Installation

The method of installation is to be with drainage plow equipment. This is not the preferred method of installation and shall be approved only if the Contractor can demonstrate to the Engineer that the installation is acceptable

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DRAIN TILE INSTALLATION

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The drainage plow equipment should construct a smooth bottomed opening in the soil and maintain the opening until the flexible drain tile has been properly installed.

The size of the opening should conform closely to the outside diameter of the drain tile.

Drain tile must be protected from deformation and from floating in wet trenches.

The inside of the drain tile shall be kept clean during construction. All soil and debris shall be removed before additional tubing is laid.

Drain tile shall not be stretched more than 7% of its normal length. Directional changes in drain tile can be made without the use of fittings, provided the centre-line radius of the bend is not less than 5 times the tube diameter.

304.07 Connections

Where lengths of drain tile are to be joined, the ends must be square and all ragged or burred edges removed. A plastic coupling shall be used to secure the ends of the drain tile in proper alignment and to prevent the joint from separating during installation.

304.08 Backfilling

At the end of each day, the exposed end of the drain tile is to be covered to prevent entry of debris or sediment. During this process, care shall be taken to ensure that the drain tile is not damaged from excessive traffic or equipment loads.

304.09 Filter Envelopes

The drain tile is to be installed with an envelope material surrounding the drain tile to restrain the entry of base soil particles.

304.10 Outfall

Drains will be located at regular 400 m outfall intervals and will discharge into the roadside ditch subject to a minimum freeboard distance of 300 mm as shown on the contract Drawings. Where the 300 mm freeboard between the end pipe invert and the ditch bottom is not achievable, the Engineer will determine the location of the drain; in some cases, the drain may have to be relocated or omitted for this reason.

The outfall end pipe is to be 100 mm in diameter of rigid non-perforated pipe complete with a hinged grate. The joint between the end pipe and the drain tile shall be securely sealed.

304.11 Method of Measurement

The quantities to be measured for payment under this Section shall be the number of linear metres of drain tile installed and the number of outfalls installed.

No measurement for payment will be made under this Section for drain tile or outfall installations required as a result of faulty placement.

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DRAIN TILE INSTALLATION

304

304.12

Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre of drain tile and per outfall and this price shall be full compensation for all work, including excavation, materials, labour, equipment and incidentals necessary to carry out the work.

Payment for the supply of drainage aggregate shall be accordance with Section 220. Excess drainage aggregate required to fill trench created by backhoe and bucket shall not be measured for payment.

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ROADWAY CULVERT INSTALLATION

305

305.01 Description

The work to be carried out under this Section shall include the removal of existing roadway culverts, all excavation, and the installation of new roadway culverts. This may also include the installation of watercourse culvert installations, see Section 7.2 of DTI's Environmental Protection Plan.

305.02 Material

305.02.01 Pre-cast Concrete Pipe (PCP)

Unless specified otherwise in the Tender document, all concrete pipes and flexible gaskets are to be supplied by the Contractor.

Concrete pipe is to be to ASTM C-76, Class III reinforced concrete pipe designed for flexible rubber gasket joints to ASTM C-443 and to the diameter indicated on the Drawings.

305.02.02 Corrugated Steel Pipe (CSP)

Unless specified otherwise, all corrugated steel pipes and couplings are to be supplied by the Department in accordance with Provision 104.13.

305.02.03 Double Walled Polyethylene (DWP) or Poly Vinyl Chloride Pipe (PVC)

Unless specified in the Tender Agreement, all Double Walled Polyethylene or PVC Pipe, pipe fittings and gaskets are to be supplied by the Contractor.

Double Walled Polyethylene Pipe, 300mm to 900mm diameter, has a smooth-walled interior and a corrugated exterior wall that is manufactured in standard lengths of approximately six (6) metres to class R 320 (320 kPa) and is joined together with integral gasketed snap bell connection or integral gasketed bell and spigot connection and which meets the requirements of CSA B182.6 or CSA B182.8.

For diameters up to 450 mm a PVC pipe (SDR 35) with integral gasketed bell and spigot joints can be used which meets the requirements of CSA B182.1, and CSA B182.2

305.03 Construction Method

Unless approved by the Engineer, the Contractor shall make provisions for two-way traffic during the work. All work carried out under this Section shall be done in accordance with the EMS Approval to Proceed and the Environmental Requirements of Appendix 2.

Excavation shall begin at the downstream end of the pipe, and shall be performed in accordance with Section 203 and shall comply with the Occupational Health and Safety Act and Regulations.

Watercourse culverts must be installed in compliance with the PEI Watercourse and Wetland Alteration Guidelines (PEIWWAG), see Appendix 2, section 9. Unless otherwise specified watercourse culvert installations may only occur between June 1 and September 30 of any given year. The watercourse must be isolated during installation of the culvert (unless specified otherwise in the EMS Approval to Proceed). The pipe shall be laid parallel to flow on a uniform slope of 200:1 unless otherwise specified, and shall have the inlet and outlet embedded 0.2D of the culvert, and at a slope of not more than

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ROADWAY CULVERT INSTALLATION

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0.5% (unless specifically authorized). A pre-construction survey in accordance with the PEIWWAG must be completed prior to any work taking place. A surveyor must be onsite during the installation of the culvert to ensure proper slope is achieved.

The Contractor shall excavate the roadbed to the specified line and grade to a width of 600 mm on both sides of the pipe. The excavated material shall be conserved for re-use as directed by the Engineer, and it shall be stockpiled in a manner and location which will not endanger the work or delay the travelling public.

Existing roadway culverts shall be removed in accordance with Section 308.

Bedding material shall be placed to a depth of a 150 mm below the pipe and in layers not exceeding 150 mm under the bottom of the pipe. Bedding material shall be compacted to a minimum of 98% Standard Proctor Density in accordance with Section 209. In confined areas of the excavation, bedding shall be compacted using suitable hand or plate tampers. In the case of concrete pipe, the bed shall be shaped to ensure uniform load bearing around the bell end.

Prior to backfilling, the work shall be inspected. Backfilling shall be by hand under the bottom half of the pipe. Machine backfilling is acceptable for the remaining work provided compaction is achieved on individual layers not exceeding 200 mm. Backfill material shall be that approved by the Engineer. Stones larger than 100 mm shall not be placed within 300 mm of the pipe.

Exposed inlets and outlets of the roadway culvert shall be tapered 3:1 (horizontal:vertical). Pipes 450 mm or greater in diameter and connected to closed storm sewer systems shall require galvanized steel grates to restrict access to the system. Open ended pipes 450 mm or greater in diameter and greater than 24 metres in length shall require galvanized steel grates to be fastened at the inlets and outlets. Bars shall be orientated vertically at inlets and horizontally at outlets.

Compaction shall be achieved in accordance with Section 209 to a minimum of 98% Standard Proctor Density.

Immediately upon completion of culvert installation or, as a minimum, at the end of the work day, disturbed slope areas within 10 m of the culvert shall be stabilized as indicated in Section 312 - Culvert End Treatment.

Where directed by the Engineer, old roadbed culverts shall be removed and relayed, extended or renewed in the same manner as specified for new culverts.

All pipe placed under this Section which is not in true alignment or which shows any settlement after laying shall be taken out and relayed at the Contractor's own expense.

305.03.01 Pre-cast Concrete Pipe (PCP)

For PCP installation, recesses shall be excavated for the bells. The bell ends shall be placed up-grade with the spigot end fully entered into the bell. All joints are to be as tight as possible.

305.03.02 Corrugated Steel Pipe (CSP)

CSP shall be installed in such a manner so that the inside circumferential laps point downstream. Corrugated steel pipe couplings shall be placed so that the joint of the

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ROADWAY CULVERT INSTALLATION

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couplings are near horizontal. The bolted joint connection on the coupling should be overlapped from the top, and should be located on the lower half of the culvert (i.e. between 3 and 9 o'clock').

Helical corrugated steel pipe shall be placed so the helix angle is constant for the total length of the installation and each pipe section in a series shall be installed so the lock seam forms a continuous helix.

305.03.03 Double Walled Polyethylene (DWP) and Poly Vinyl Chloride Pipe (PVC)

For Polyethylene and PVC installation, recesses shall be excavated for bells. The bell ends shall be placed upgrade with the spigot end fully entered into the bell.

305.04 Method of Measurement

Measurement for PCP, CSP, DWP or PVC under this Section shall be the number of linear metres of pipe installed for each diameter of pipe used in the work.

New material supplied for backfilling roadway culverts shall not be measured for payment under this Section but shall be included elsewhere in the Contract.

No measurement for payment will be made under this section for culvert end treatments but shall be made under Section 312.

305.05 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre for each size and type of culvert supplied and installed and this price shall be full compensation for the supply, unloading, laying, tapering inlets and outlets, dewatering, backfilling, compacting, equipment, labour and all incidentals necessary to perform the work.

Payment for the supply of backfill material required under this Section shall be in accordance with the respective specification.

Payment for the supply of bedding material shall be in accordance with Section 220.

Excavations with depths less than 2 metres measured from centreline grade to the invert of the pipe at centreline shall be considered incidental to the work and shall not be measured or paid for. The contractor shall ensure that excavation measures are conducted in strict accordance with WCB and OH&S regulations.

Payments for excavations with depths greater than 2 metres measured from centreline grade to the invert of the pipe at centreline shall be in accordance with Section 203 but the volume to be measured for payment for pipe excavation shall not exceed the volume calculated by the product of the depth equal to the nominal pipe diameter plus 1.2 metres. All other excavation required or directed by the Engineer to facilitate a smooth transition shall be paid at the price of common roadway excavation price.

Payment for the supply and installation of fittings such as couplings, elbows, tees, wyes and crosses shall be included in the unit bid price for each diameter and type of pipe installed. This shall also include any top grates installed at the inlet of the drain pipes, galvanized inlet and outlet steel grates and all incidentals necessary to perform the work.

Payment for removal of culverts shall be in accordance with Section 308.

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Payment for culvert end treatments shall be in accordance with Section 312.

305.05.01 Pre-cast Concrete Pipe (PCP)

The unit bid price for PCP installation shall also be full compensation for the supply of the concrete pipe, grates, gaskets and incidentals required to perform the work unless specified otherwise in the Tender document.

305.05.02 Corrugated Steel Pipe (CSP)

The unit bid price for CSP installation shall not include compensation for the corrugated steel pipe and couplings; as these will be supplied by the Department in accordance with Provision 104.13 unless specified otherwise in the Tender document.

305.05.03 Double Walled Polyethylene (DWP) and Poly Vinyl Chloride Pipe (PVC)

The unit bid price for Polyethylene and PVC pipe installation shall be full compensation for the supply of the pipe, grates, gaskets and incidentals required to perform the work unless specified otherwise in the Tender document.

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DRIVEWAY CULVERT PLACEMENT

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306.01 Description

The work to be carried out under this Section shall include the installation and backfilling of driveway culverts.

306.02 Material

306.02.01 Pre-cast Concrete Pipe (PCP)

Unless specified otherwise in the Tender document, all concrete pipes and flexible gaskets are to be supplied by the Contractor.

Concrete pipe is to be to ASTM C-76, Class III reinforced concrete pipe designed for flexible rubber gasket joints to ASTM C-443 and to the diameter indicated on the Drawings.

306.02.02 Corrugated Steel Pipe (CSP)

Unless specified otherwise, all corrugated steel pipes and couplings are to be supplied by the Department in accordance with Provision 104.13.

306.02.03 Double Walled Polyethylene (DWP) or Poly Vinyl Chloride Pipe (PVC)

Unless specified in the Tender Agreement, all Double Walled Polyethylene or PVC Pipe, pipe fittings and gaskets are to be supplied by the Contractor.

Double Walled Polyethylene Pipe, 300 mm to 900 mm diameter, has a smooth-walled interior and a corrugated exterior wall that is manufactured in standard lengths of approximately six (6) metres to class R 320 (320 kPa) and is joined together with integral gasketed snap bell connection or integral gasketed bell and spigot connection and which meets the requirements of CSA B182.6 or CSA B182.8.

For diameters up to 450 mm a PVC pipe (SDR 35) with integral gasketed bell and spigot joints can be used which meets the requirements of CSA B182.1, and CSA B182.2

306.03 Construction Method

The Contractor shall excavate the area to the lines and grades specified.

On the direction of the Engineer, the Contractor shall undercut the location of a driveway culvert to a specified depth. When no undercutting is specified, the Contractor shall grade the ditch uniformly and shall compact the ditch bottom to a depth of 300 mm, in accordance with Section 209 to 95% of Standard Proctor Density.

Backfill material shall be approved by the Engineer and shall be placed by hand under the bottom half of the culvert. The top half of the culvert may be backfilled by machine in layers not exceeding 200 mm.

The top of the driveway shall be constructed to a width of not more than 6.1 m unless otherwise directed by the Engineer. Exposed inlets and outlets of the roadway culvert shall be tapered 3:1 (horizontal:vertical). The backfill material at each end of the culvert shall be neatly graded and shaped to provide a uniform slope not steeper than 3:1 (horiz:vert).

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DRIVEWAY CULVERT PLACEMENT

306

Immediately upon completion of culvert installation or, as a minimum, at the end of the work day, disturbed slope areas within 10 m of the culvert shall be stabilized as indicated in Section 312 - Culvert End Treatment.

Where directed by the Engineer, old driveway culverts shall be removed and relayed, extended or renewed in the same manner as specified for new culverts.

All pipe which is not in true alignment or which shows any settlement after laying, shall be taken out and replaced.

306.03.01 Pre-cast Concrete Pipe (PCP)

For PCP installation, the bed shall be shaped to ensure uniform load bearing around the bell ends. The bell ends shall be placed upgrade and the spigot ends are to be fully entered into the bells. All joints are to be as tight as possible.

306.03.02 Corrugated Steel Pipe (CSP)

CSP shall be installed in such a manner so that the inside circumferential laps point downstream. Corrugated steel pipe couplings shall be placed so that the joint of the couplings are near horizontal. The bolted joint connection on the coupling should be overlapped from the top, and should be located on the lower half of the culvert (i.e. between 3 and 9 o'clock').

Helical corrugated steel pipe shall be placed so the helix angle is constant for the total length of the installation and each pipe section in a series shall be installed so the lock seam forms a continuous helix.

306.03.03 Double Walled Polyethylene (DWP) and Poly Vinyl Chloride Pipe (PVC)

For Polyethylene and PVC installation, recesses shall be excavated for bells. The bell ends shall be placed upgrade with the spigot end fully entered into the bell.

306.04 Method of Measurement

Measurement for PCP, CSP, DWP or PVC under this Section shall be the number of linear metres of pipe installed for each diameter of pipe used in the work.

New material supplied for backfilling driveway culverts shall not be measured for payment under this Section but shall be included elsewhere in the Contract.

No measurement for payment will be made under this section for culvert end treatments but shall be made under Section 312.

306.05 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre for each size and type of culvert supplied and installed and this price shall be full compensation for the all work, supply, unloading, excavation, laying, tapering inlets and outlets, dewatering, backfilling, compacting, equipment, labour and all incidentals necessary to perform the work.

Payment for the supply of backfill material required under this Section shall be in accordance with the respective specification.

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DRIVEWAY CULVERT PLACEMENT

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Payment for the supply of bedding material shall be in accordance with Section 220.

Payment for culvert end treatments shall be in accordance with Section 312.

306.05.01 Pre-cast Concrete Pipe (PCP)

The unit bid price for PCP installation shall also be full compensation for the supply of the concrete pipe, grates, gaskets and incidentals required to perform the work unless specified otherwise in the Tender document.

306.05.02 Corrugated Steel Pipe (CSP)

The unit bid price for CSP installation shall not include compensation for the corrugated steel pipe and couplings; as these will be supplied by the Department in accordance with Provision 104.13 unless specified otherwise in the Tender document.

306.05.03 Double Walled Polyethylene (DWP) and Poly Vinyl Chloride Pipe (PVC)

The unit bid price for Polyethylene and PVC pipe installation shall be full compensation for the supply of the pipe, grates, gaskets and incidentals required to perform the work unless specified otherwise in the Tender document.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CULVERT EXTENSION

307

307.01 Description

The work to be carried out under this Section relates to the restoration of, or extension of, drainage culverts. This work is intended to be a maintenance measure where it is more economical to extend service life of an existing culvert than to replace it.

This may also include the extension of watercourse culverts, see Section 7.2 Culverts of DTI's Environmental Protection Plan.

307.02 Material

All couplings and corrugated steel pipe or polyethylene pipe used to make the restoration shall be supplied by the Department in accordance with Provision 104.13.

All new concrete pipe to ASTM C-76 Class III reinforced concrete pipe designed for flexible rubber gasket joints to ASTM C-443 shall be supplied by the Contractor.

307.03 Construction Method

Watercourse culvert extensions must be installed in compliance with the PEI Watercourse and Wetland Alteration Guidelines (PEIWWAG), see Appendix 2, section 9. Unless otherwise specified watercourse culvert extensions may only occur between June 1 and September 30 of any given year. The watercourse must be fully isolated during construction activities unless otherwise specified on the EMS Approval to Proceed. A pre-construction survey in accordance with the PEIWWAG must be completed prior to any work taking place. A surveyor must be onsite during the installation of the culvert to ensure proper slope is achieved.

The Contractor shall excavate the existing fill material from around the end of the culvert and reserve it for re-use. Damage to the ends of the culvert, if present, shall be cut-off with a method approved by the Engineer. The result shall be a smooth, distortion-free, straight edge perpendicular to the line and grade of flow (i.e. gradient).

The Contractor shall excavate existing fill material from around the end of the concrete culvert to expose a full intact bell or spigot joint. The joint shall be completely cleaned prior to placing lubricant and gaskets and additional concrete pipe materials.

A length of corrugated steel pipe will be joined using a coupling band and the total exposed pipe shall be backfilled and shaped as necessary to restore the original drainage course. This may result in a culvert slightly longer or shorter than the original.

The culvert to be joined onto must be cleaned of soil and debris to ensure the culvert functions properly and to enable an effective coupling with the extension pipe.

The extension pipe shall be placed on a similar line and grade as the original pipe unless otherwise specified by the Engineer. The Contractor will ensure that this alignment is maintained throughout the work.

Couplings shall be placed so that the joint of the coupling is near horizontal. The joint should occur at mid-length of the coupling. The bolted joint connection on the coupling should be overlapped from the top, and should be located on the lower half of the culvert (i.e. between "3 and 9 o'clock").

Exposed inlets and outlets of the roadway culvert shall be tapered 3:1 (horizontal:vertical).

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CULVERT EXTENSION

307

Backfilling by hand is necessary below the mid-elevation of the culvert circumference, but may be done by machine for the upper regions.

All backfill material shall be approved by the Engineer and shall be compacted to 95% Standard Proctor Density except when under existing or proposed asphalt which shall be compacted to 100% Standard Proctor Density. Stones larger than 100 mm shall not be placed within 300 mm of the culvert.

Immediately upon completion of the culvert extension or, as a minimum, at the end of the work day, disturbed slope areas within 10m of the culvert shall be stabilized as indicated in Section 312 - Culvert End Treatment.

307.04 Method of Measurement

The quantity to be measured under this Section shall be the number of linear metres of culvert extension placed.

No measurement for payment will be made under this section for culvert end treatments but shall be made under Section 312.

307.05 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre and this price shall be full compensation for loading, material transportation, excavation, removal of damaged pipe sections, if any, coupling of culverts, tapering inlets and outlets, supply or reinstatement of backfill material, compaction of backfill, shaping of backfill, and all equipment and labour necessary to complete the work.

Payment for supply of pipe shall be included in unit bid price per size when materials are supplied by the Contractor.

Extra backfill, if required, may be supplied at no additional cost from ditching or from surplus earth excavation generated within the work site. If the Engineer chooses to use a foundation material such as borrow it shall be paid for in accordance with the respective specification.

Payment for culvert end treatments shall be in accordance with Section 312.

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CULVERT REMOVAL	308
308.01	<u>Description</u> This work shall consist of the removal of roadway culverts and driveway culverts.
308.02	<u>Construction Method</u> When the Engineer directs that roadway culverts or driveway culverts are to be removed from the roadway, the Contractor shall excavate the surrounding material and remove the culvert without damage. The interior of the pipe shall be cleared of any accumulated sediment, rocks or debris. Re-usable culverts shall be stockpiled for pickup by the Department. Culverts which in the opinion of the Engineer are not worthy of salvage shall be disposed of by the Contractor. The Engineer shall establish the limits of material to be removed in order to recover any culvert and the Contractor shall not excavate beyond the limits established by the Engineer.
308.03	<u>Method of Measurement</u> Measurement for payment under this Section shall be the number of linear metres of culvert salvaged or disposed of. No measurement for payment will be made for excavation of materials required for the removal of driveway culverts. Measurement for payment will be made for excavation of materials required for the removal of roadway culverts.
308.04	<u>Basis of Payment</u> Removal of culverts shall be paid for at the unit bid price per linear metre and this price shall be full compensation for removal, cleaning and stockpiling of the reusable culverts, disposal of un-salvageable culverts, equipment, tools, labour and incidentals necessary to complete the work. Excavations with depths less than 2 metres measured from centreline grade to the invert of the pipe at centreline shall be considered incidental to the work and shall not be measured for payment. The contractor shall ensure that excavation methods are conducted in strict accordance with WCB and OH&S regulations. Payments for excavations with depths greater than 2 metres measured from centreline grade to the invert of the pipe at centreline shall be in accordance with Section 203 but the volume to be measured for payment for pipe excavation shall not exceed the volume calculated by the product of the depth equal to the distance from the underside of bedding to the underside of common roadway excavation by the width equal to the nominal pipe diameter plus 1.2 metres. All other excavation required or directed by the Engineer to facilitate a smooth transition shall be paid at the price of common roadway excavation price. All other excavation required or directed by the Engineer to facilitate a smooth transition shall be paid at the price of common roadway excavation price.

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CULVERT REMOVAL

308

Suitable excavated materials will be reinstated at no additional cost as per Section 207.

Additional backfill materials will be paid under the respective section.

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TIMBER BOX CULVERT

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309.01 Description

This work consists of the building of a timber box culvert as shown in Figure 309-1 with pressure treated wood as shown on the Plans or as designated by the Engineer.

If this work includes a watercourse refer to Section 7.2 Culverts of the Department's Environmental Protection Plan.

309.02 Material

The material shall be eastern hemlock graded to NLGA Rule 1 structural grade lumber (up to 25% may be Rule 2 structural) treated in accordance to CAN/CSA-080.1 M and with minimum preservative retention as per CAN/CSA 080.14.

Where non-treated lumber is specified as part of the construction it shall be hemlock and shall be approved by the Engineer before being used in the structure.

Hardware including pins, bolts, washers, nails and all other items necessary to be incorporated into the work shall be as shown on Figure 309-1 or as specified by the Engineer.

Borrow, bedding material, rip rap and other materials required for backfilling and bedding for the structure shall meet the respective specifications for that item.

309.03 Construction Method

All work carried out under this Section shall be done in accordance with the EMS Approval to Proceed and the Environmental Requirements of Appendix 2.

Timber boxes that carry watercourses must be installed in compliance with the PEI Watercourse and Wetland Alteration Guidelines (PEIWWAG), see Appendix 2, section 9. Unless otherwise specified watercourse structure installations may only occur between June 1 and September 30 of any given year. The watercourse must be isolated during installation of the timber box (unless specified otherwise in the EMS Approval to Proceed). A pre- construction survey in accordance with the PEIWWAG must be completed prior to any work taking place. A surveyor must be onsite during the installation of the timber box to ensure proper slope is achieved.

The Contractor shall place signs and other warning devices and keep such in place and in good repair until the work is completed. Such warning devices shall meet the requirement of the respective specifications for that item. All work carried out under this Section shall be done in accordance with the Environmental Requirements of Appendix 2.

All asphalt pavement in the work area shall be cut and removed by the Contractor before the excavation is started. Existing culverts shall be removed and disposed of as part of this work.

The excavation shall be to an elevation as established by the Engineer to provide a hard bottom suitable to support the box structure.

Excavation to a depth of 1 m below the bottom of the sills shall be included in the bid price for the construction of the box. Excavation beyond the 1 m depth below the bottom of the sills shall be paid for as foundation excavation and shall be included in the unit bid price for this Section. In calculating this excavation quantity use the depth of the

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TIMBER BOX CULVERT

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excavation below the 1 m, times the length of the box plus 2 m, times the width of the box plus 1 m on each side of the box.

Both during the excavation if required and after the excavation, all exposed soil on the slopes of the excavation shall be covered with a suitable material to prevent the potential of soil erosion and deposition into the stream.

The Contractor shall dismantle the existing structure and pile the used material in such a manner to facilitate its removal from the site. This material will be picked up by the Department and returned to the bridge stock yard or disposed of as directed by the Engineer.

The excavated hole shall be kept free of water during the placement of bedding material, sills and abutments for the new structure. This cost shall be included in the bid price.

The Contractor shall supply all labour and material necessary for the proper execution of the work as well as all necessary false work that may be required for the safety of the workmen.

The bedding material shall be compacted to 95% Standard Proctor Density except when under existing or proposed asphalt which shall be compacted to a minimum 98% Standard Proctor Density in accordance with Section 209. The surface of the bedding material shall have a uniform compacted surface. In confined areas of the excavation the bedding shall be compacted using suitable vibratory hand or plate tamper.

The treated wood culvert shall be laid out and the timber shall be placed and fastened as shown on the construction Drawings and as directed by the Engineer.

The sills on which the box is constructed must be located accurately to line, grade and span in accordance with the construction Drawings.

Assembly is performed on site directly on the prepared sills. Holes for drift pins shall be 3 mm less than the diameter of the pin and drilled to a depth of 50 mm less than the length of the pin. The heads of all pins shall be driven sufficiently into the timber that the overlaying timber will have a proper bearing on the timber beneath. Holes for the bolts shall be bored to the proper size so that the bolt can be driven without damage to the lumber. All bolts shall have 2 washers - 1 under the head and 1 under the nut.

Backfill to the top of the structure with select borrow in accordance with Sub-Provision 206.02.02. It shall be placed in layers of not more than 200 mm and compacted to a minimum of a minimum 98% of Standard Proctor Density. It shall be placed on both sides of the structure to approximately the same elevation simultaneously. From the top of the structure to the subgrade elevation the original excavated material shall be placed in layers and compacted to 100% Standard Proctor Density. If the excavated material is deemed to be unsuitable for backfill material (i.e. moisture content too high) then additional material as approved by the Engineer will be used in its place. The unsuitable material will be disposed of as per the Engineer's approval.

Random rip rap, R-25, in accordance with Section 213, shall be supplied and placed by the Contractor as directed by the Engineer. This shall include all work necessary to prepare the area to be rip rapped.

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Unless approval is granted by the Engineer to establish a detour which would have to be signed according to Department specifications, two-way traffic must be maintained at all times.

309.04 Method of Measurement

Measurement for payment under this Section shall be by the FBM (Foot Board Measure) for all wood work.

Measurement for payment for excavation shall be in accordance with Section 203 and Provision 309.03.

Measurement for borrow, bedding material and rip rap shall be made in accordance with the respective specification.

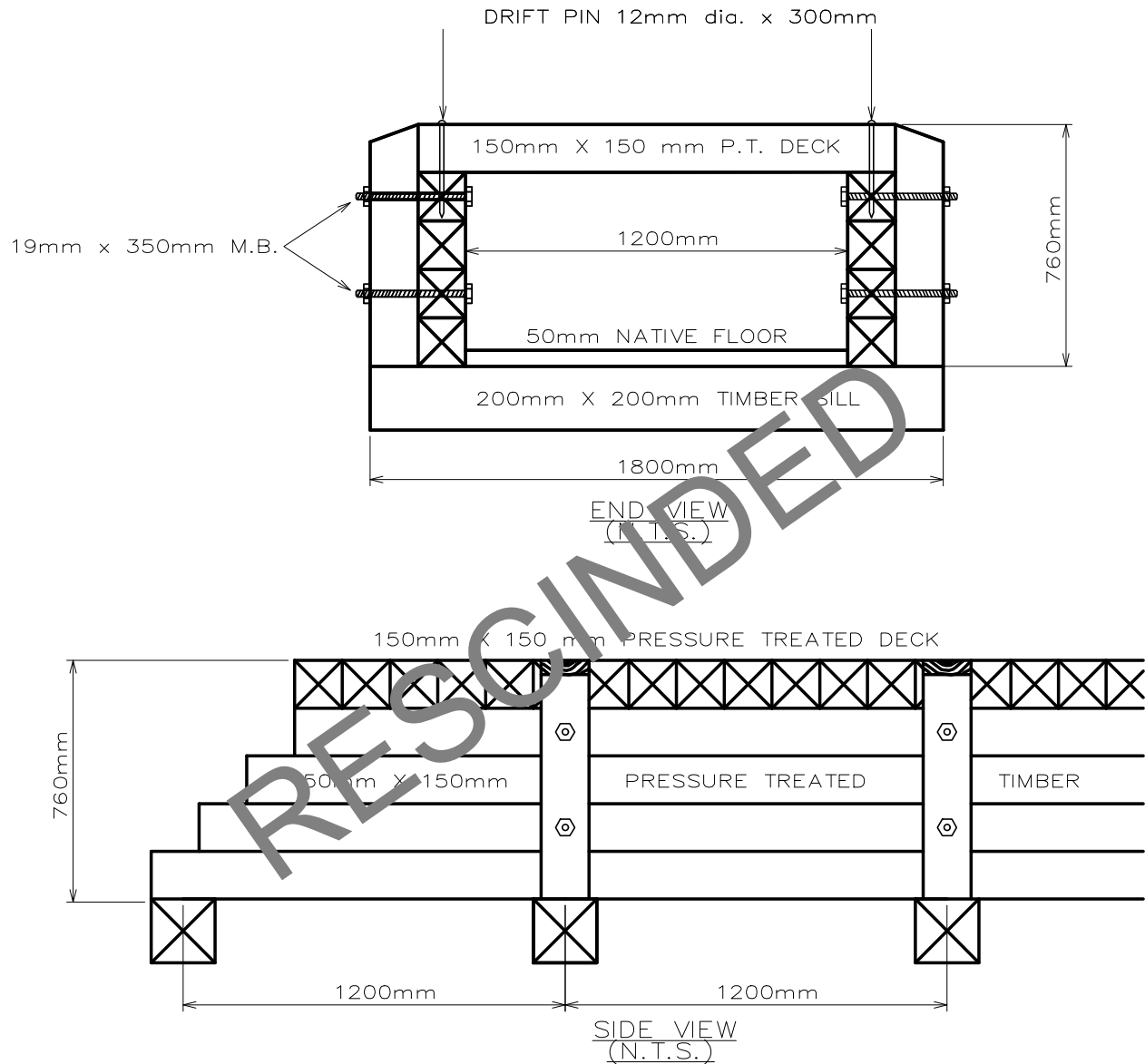
309.05 Basis of Payment

Payment under this Section shall be at the unit bid price measured in FBM and this price shall be full compensation for all tools, equipment, labour, materials and other incidentals necessary to perform the work.

Payment for excavation except for the 1 m below the bottom of the sills under this Section shall be made in accordance with Section 203. Payment for the 1 m of excavation below the bottom of the sills shall be based on cubic metres as measured in accordance with Provision 309.03.

Payment for bedding material shall be made in accordance with Section 220.

Payment for borrow under this Section shall be made in accordance with Section 206.



- NOTES: 1. Sills submerged in water to be native hemlock.
2. Sills on dry boxes to be pressure treated timber.
3. Slopes on culvert end to match foreslope.
4. Slope on driveway culvert ends to be a minimum 3H:1V

FIGURE 309-01 PRESSURE TREATED TIMBER BOX CULVERT
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CONCRETE BOX CULVERT

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310.01 Description

Work under this Section will require the removal of an existing structure and replacement with a concrete box culvert manufactured in accordance with ASTM C-789.

If this work includes a watercourse refer to Section 7.2 Culverts of TIE's Environmental Protection Plan.

310.02 Material

Bedding material shall be as specified in accordance with Sections 401 and 402.

Backfill material shall be select borrow in accordance with Sub-Provision 206.02.02.

Concrete box culvert is a product manufactured in accordance with ASTM C-789 to the size and dimensions as shown on the Plan.

310.03 Construction Method

All work carried out under this Section shall be done in accordance with the EMS Approval to Proceed and the Environmental Requirements of Appendix 2.

Concrete boxes that carry watercourses must be installed in compliance with the PEI Watercourse and Wetland Alteration Guidelines (PEIWWAG), see Appendix 2, section 9. Unless otherwise specified watercourse structure installations may only occur between June 1 and September 30 of any given year. The watercourse must be isolated during installation of the concrete box (unless specified otherwise in the EMS Approval to Proceed). A pre- construction survey in accordance with the PEIWWAG must be completed prior to any work taking place. A surveyor must be onsite during the installation of the concrete box to ensure proper slope is achieved.

The Contractor shall organize the work such that the removal and replacement of any length of section is completed in the same day. The Contractor shall be required to set up adequate traffic control measures to the satisfaction of the Engineer prior to construction. The existing guiderail shall be dismantled and reinstalled by the Contractor. All work carried out under this Section shall be done in accordance with the Environmental Requirements of Appendix 2.

The asphalt shall be cut in a clean and vertical fashion. The asphalt shall be deemed as waste. Excavated material shall be piled such that it does not produce a traffic hazard. Surplus excavated material shall be deemed as waste material. The Contractor shall dewater the excavation in order to install the new box culvert and place the bedding material.

The bedding material shall be compacted to 95% Standard Proctor Density except when under existing or proposed asphalt which shall be compacted to a minimum 98% Standard Proctor Density in accordance with Section 209 prior to the placement of the concrete box culvert. The surface of the bedding material shall have a uniform compacted surface. In confined areas of the excavation the bedding shall be compacted using suitable vibratory hand or plate tampers.

The box culvert shall be placed to the lines and grades shown on the Plan and shall have all joints oriented downstream.

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CONCRETE BOX CULVERT

310

Backfilling of the structure using select borrow shall be done in symmetrical lifts with each lift no greater than 200 mm. Each lift placed shall be uniformly compacted to a minimum 98% Standard Proctor Density prior to the placement of any successive lift.

310.04 Method of Measurement

Measurement for payment under this Section shall be the number of concrete box culverts installed.

Excavation shall be measured by the average end area method in accordance with Section 203.

Bedding material shall be measured by the tonne placed in accordance with Section 220.

310.05 Basis of Payment

Payment under this Section shall be at the unit bid price per concrete box culvert and this price shall be full compensation for supply and placement of the box culvert, bedding preparation, removal of existing culvert, dewatering, placing and compacting select borrow and incidentals necessary to complete the work.

Bedding material shall be paid for in accordance with Section 220. Excavation shall be paid for in accordance with Section 203.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

MULTI-PLATED CORRUGATED STEEL ARCH

311

311.01 Description

This work consists of the construction of a multi-plated corrugated steel arch.

Refer to Section 7.2 Culverts of the Department's Environmental Protection Plan.

311.02 Material

The plates shall be corrugated steel to CSA CAN 3-G A01-M15. All bolts and nuts shall be special heated steel to ASTM F-568 and ASTM A-563. The galvanizing on these bolts and nuts must meet CSA G-164 Class 5. Hardware including pins, bolts, washers, spikes and other necessary items for construction shall be as shown on Figure 311-1.

The arch rails shall be pressure treated eastern hemlock wood graded to NLGG Rule 1. At least 25% must be structural grade lumber treated in accordance with CAN/CSA 080.1 M and with a minimum preservative retention in accordance with 080.14 M.

Where non-treated lumber is specified it shall be approved by the Engineer.

Select borrow, bedding material, rip rap and other materials required for backfilling and bedding shall meet the respective specification.

311.03 Construction Method

The Contractor shall place and keep in good repair signs and other warning devices. Such warning devices shall meet the requirement of the respective specification. All work carried out under this Section shall be done in accordance with the EMS Approval to Proceed and the Environmental Requirements of Appendix 2.

All structures that carry watercourses must be installed in compliance with the PEI Watercourse and Wetland Alteration Guidelines (PEIWWAG), see Appendix 2, section 9. Unless otherwise specified watercourse structure installations may only occur between June 1 and September 30 of any given year. The watercourse must be isolated during installation or extension of the arch culvert (unless specified otherwise in the EMS Approval to Proceed). A pre-construction survey in accordance with the PEIWWAG must be completed prior to any work taking place. A surveyor must be onsite during the installation or extension of the arch culvert to ensure proper slope is achieved.

All asphalt pavement shall be cut and removed by the Contractor before excavation commences. Existing culverts shall be removed and disposed of as part of this work.

The excavation shall be to hard bottom suitable to support the arch to an elevation as established by the Engineer.

Excavation to a depth of 1 m below the bottom of the sills shall be included in the unit bid price for this Section. Excavation beyond 1 m below the sills shall be paid for as foundation excavation. In calculating this excavation use the depth of the excavation below the 1 m, times the length of the arch plus 2 m, times the width of the arch plus 1 m on each side of the arch.

Both during and after the excavation all exposed soil on the slopes of the excavation shall be covered with a suitable material to prevent soil erosion and deposition into the stream.

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MULTI-PLATED CORRUGATED STEEL ARCH

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The Contractor shall dismantle the existing structure and pile the used material to facilitate its removal from the site. This material will be picked up by the Department and returned to the bridge stock yard or disposed of as directed by the Engineer.

The excavated hole shall be kept free of water during the placement of bedding material, sills and rails. This cost shall be included in the unit bid price.

The Contractor shall supply all labour and material necessary for the proper execution of the work; as well as, all necessary falsework that may be required for the safety of the workmen.

Bedding material shall be compacted to a minimum 98% Standard Proctor Density in accordance with Section 209. The surface of the bedding material shall have a uniform compacted surface. In confined areas of the excavation the bedding shall be compacted using suitable vibratory hand or plate tampers.

The arch rails on which the bottom plates rest must be located accurately to line, grade and span in accordance with the construction Drawings.

Plate by plate assembly shall be performed directly on the arch rails. Holes for drift pins shall be 3 mm less than the diameter of the pin and drilled to a depth of 50 mm less than the length of the pin. The pin heads shall be driven so that the overlaying timber will have proper bearing on the timber beneath. The bolts should be torqued to a minimum of 250 N-m and a maximum of 500 N-m. The curved surface of the nut shall be placed against the plate.

Backfill to the top of the arch structure with select borrow in accordance with Sub-Provision 206.02.02. From the top of the structure, to the existing subgrade elevation, the original excavated material shall be placed. If the excavated material is deemed to be an unsuitable backfill material (i.e. moisture content too high) then additional material as approved by the Engineer will be used. The unsuitable material will be disposed of as per the Engineer's approval.

Backfill material shall be placed in layers no more than 200 mm and compacted to a minimum 98% of Standard Proctor Density in accordance with Section 209. Backfill material shall be placed on both sides of the structure simultaneously to approximately the same elevation.

R-25 random rip rap in accordance with Section 213, shall be supplied and placed by the Contractor as directed by the Engineer. This work shall include preparation of the area to be rip rapped.

Two-way traffic must be maintained at all times, unless the Engineer approves a detour.

311.04 Method of Measurement

Measurement for payment under this Section shall be by the FBM (Foot Board Measure) for all wood work and by the linear meter for the multi-plated steel arch.

Measurement for borrow shall be in accordance with Section 206.

Measurement for bedding material shall be in accordance with Section 220.

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MULTI-PLATED CORRUGATED STEEL ARCH

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311.05 Basis of Payment

Payment under this Section shall be at the unit bid price per FBM for wood work and per linear metre for steel work and this price shall be full compensation for all work, tools, equipment, labour and incidentals necessary to perform the work.

Payment for excavation except for the 1 m below the bottom of the sills shall be made in accordance with Section 203. Payment for the 1 m of excavation below the bottom of the sills shall be based on cubic meters as measured in accordance with Provision 311.03.

Payment for borrow under this Section shall be made in accordance with Section 206.

Payment for bedding material shall be made in accordance with Section 220.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CULVERT END TREATMENT

312

312.01 Description

The work to be carried out under this Section shall include the stabilization and protection of ditch slopes adjacent drainage culverts as a result of work carried out in Sections 215 - Ditching, 216 - Culvert End Cleanout, 305 - Roadway Culvert Installation, 306 - Driveway Culvert Placement, and 307 - Culvert Extension and shall include the necessary excavation and installation of geotechnical fabric, mulching and random rip rap as required to complete the work of this section.

*Refer to Sections 7.1.6 Mulching and 7.1.10 Rip Rap of TIE's Environmental Protection Plan.

312.02 Material

R-5 Rip Rap as specified in Section 213 Random Rip Rap.

Type N2 geotechnical fabric as specified in Section 218 - Geotechnical Fabric.

Mulching as specified in Section 805 - Mulching.

Erosion control mats as specified in Section 807 - Erosion Control Mats.

312.03 Construction Method - Roadway Culverts/High Erosion Potential Driveway Culverts

Immediately upon completion of roadway culvert installation or, as a minimum, at the end of the work day, disturbed slope areas within 10 m of the culvert shall be stabilized with mulch from top of foreslope to top of backslope.

At the inlet, the contractor shall place random R5 riprap to a 300mm depth over geotechnical fabric from the toe of the foreslope of the ditch to a minimum of 1 metre above the top of the culvert as indicated in Figure 312-01, Culvert End Treatment (Inlet). The riprap apron shall extend 2 meters on either side of the centreline of the culvert. The elevation of the ditch at the inlet shall not be lower than the culvert inlet. Mulch stabilization is acceptable at the culvert on a temporary basis not to exceed two days unless otherwise directed by the Engineer.

At the outlet, the contractor shall place random R5 riprap to a 300mm depth over geotechnical fabric from a minimum of 1 meter beyond the end of the culvert (into the ditch) to a minimum of 1 meter above the top of the culvert as indicated in Figure 312-02, Culvert End Treatment (Outlet). The riprap apron shall extend 2 meters on either side of the centreline of the culvert. For culverts not carrying streamflow, the elevation of the ditch at the outlet shall not be higher than the culvert outlet. Mulch stabilization is acceptable at the culvert on a temporary basis not to exceed two days otherwise directed by the Engineer.

At the inlet and outlet of the culvert to a minimum distance of 10 m on either side of the culvert, the remaining disturbed fill slope areas (not riprapped) shall be mulched from top of foreslope to top of backslope. This includes the slope area above the riprap to the top of the slope.

All mulch shall be removed from slopes prior to final grading. After slopes have been graded to the satisfaction of the Engineer, and the disturbed areas have been hydro seeded, then all areas shall be re-mulched or erosion control mats shall be placed as directed by Engineer.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CULVERT END TREATMENT

312

312.04 Construction Method - Driveway Culverts - Low Erosion Potential

Immediately upon completion of driveway culvert installation or, as a minimum, at the end of the work day, disturbed slope areas within 10m of the culvert shall be stabilized from top of foreslope to top of backslope.

At locations with low erosion potential (i.e. locations with small ditch flow volumes, low velocities, etc.), erosion control mat (i.e. jute mat, erosion control blanket) shall be installed from a minimum of 1 m beyond the end of the culvert (into the ditch) to a minimum of 1 m above the top of the culvert. At inlets to culverts the elevation of the ditch shall not be lower than the culvert inlet. At culvert outlets the elevation of the ditch shall not be higher than the culvert outlet. The erosion control mat shall extend 2 m on either side of the centerline of the culvert along the foreslope of the driveway or to a combined distance of 2m along the foreslope of the driveway and the foreslope and/or backslope of the roadway ditch. Remaining disturbed fill slope areas at the driveway shall be mulched. All mulch shall be removed from slopes prior to final grading. After slopes have been graded to the satisfaction of the Engineer, and the disturbed areas have been hydro seeded, then all areas shall be re- mulched or erosion control mats shall be placed as directed by Engineer.

312.05 Construction Method - Ditching, Culvert End Cleanouts and Culvert Extension

The method of culvert end treatment stabilization and protection to be followed when carry out work relating to Sections 215 - Ditching, 216 - Culvert End Cleanout, and Section 307 - Culvert Extension shall be determined by the type of culvert being cleaned or extended. For example, if a roadway culvert is being extended then the Contractor shall follow the method described in provision 312.03 but if ditching is being carried out near a driveway culvert and the Engineer indicates that there is low erosion potential then the method to be followed shall be the method described in Provision 312.04.

312.06 Method of Measurement

Measurement for payment made under this section shall be the number of Roadway and High Erosion Potential Driveway culvert ends treated regardless of culvert diameter.

No measurement for payment will be made for excavation required to prepare the area for placement of the geotechnical fabric and rip rap as it will be considered incidental to the work of this Section.

Measurement for payment for rip rap shall be measured under Section 213 - Random Rip Rap.

Measurement for payment for geotechnical fabric shall be measured under Section 218 - Geotechnical Fabric.

No measurement for payment will be made for Low Erosion Potential Driveway Culvert ends treated.

Measurement for payment for mulching and/or re-mulching shall be measured under Section 805 - Mulching.

Measurement for payment for erosion control mats shall be measured under Section 807 - Erosion Control Mats.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CULVERT END TREATMENT

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312.07

Basis of Payment

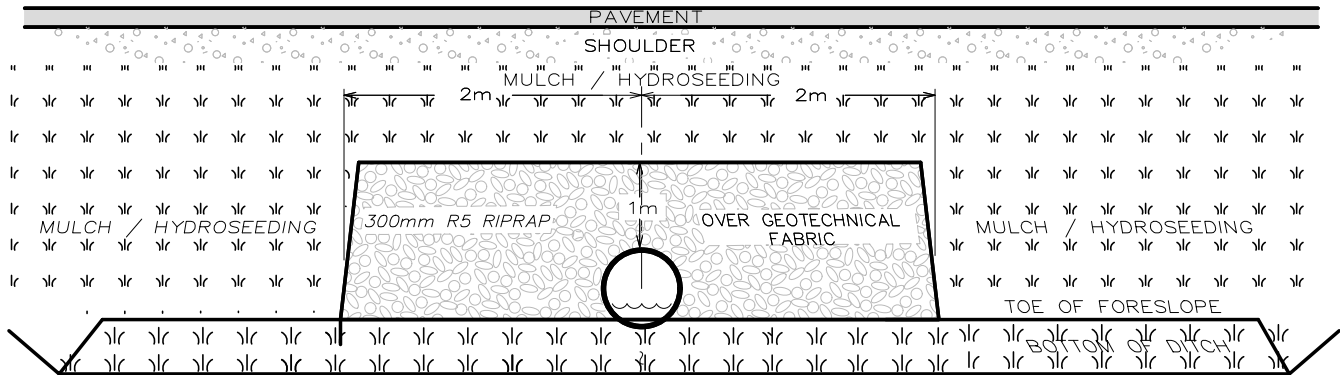
Payment under this section shall be at the unit bid price for the number of Roadway and High Erosion Potential Driveway culvert ends treated regardless of culvert diameter and this price shall be full compensation for all labour, excavation, equipment, tools, materials and incidentals necessary to complete the work of this section.

Payment for rip rap required under this section shall be in accordance with Section 213 - Random Rip Rap.

Payment for geotechnical fabric required under this section shall be in accordance with Section 218 - Geotechnical Fabric.

Payment for supply and placement of mulching and/or re-mulching required under this section shall be in accordance with Section 805 - Mulching.

Payment for supply and placement of erosion control mats required under this section shall be in accordance with Section 807 - Erosion Control Mats.



Note: An additional 7m to the left and right of the riprap, as well as above it to the shoulder, shall be mulched. Once fill slope areas are brought to final grade, and the areas are hydroseeded, the areas shall then be remulched.

END VIEW (N.T.S.)

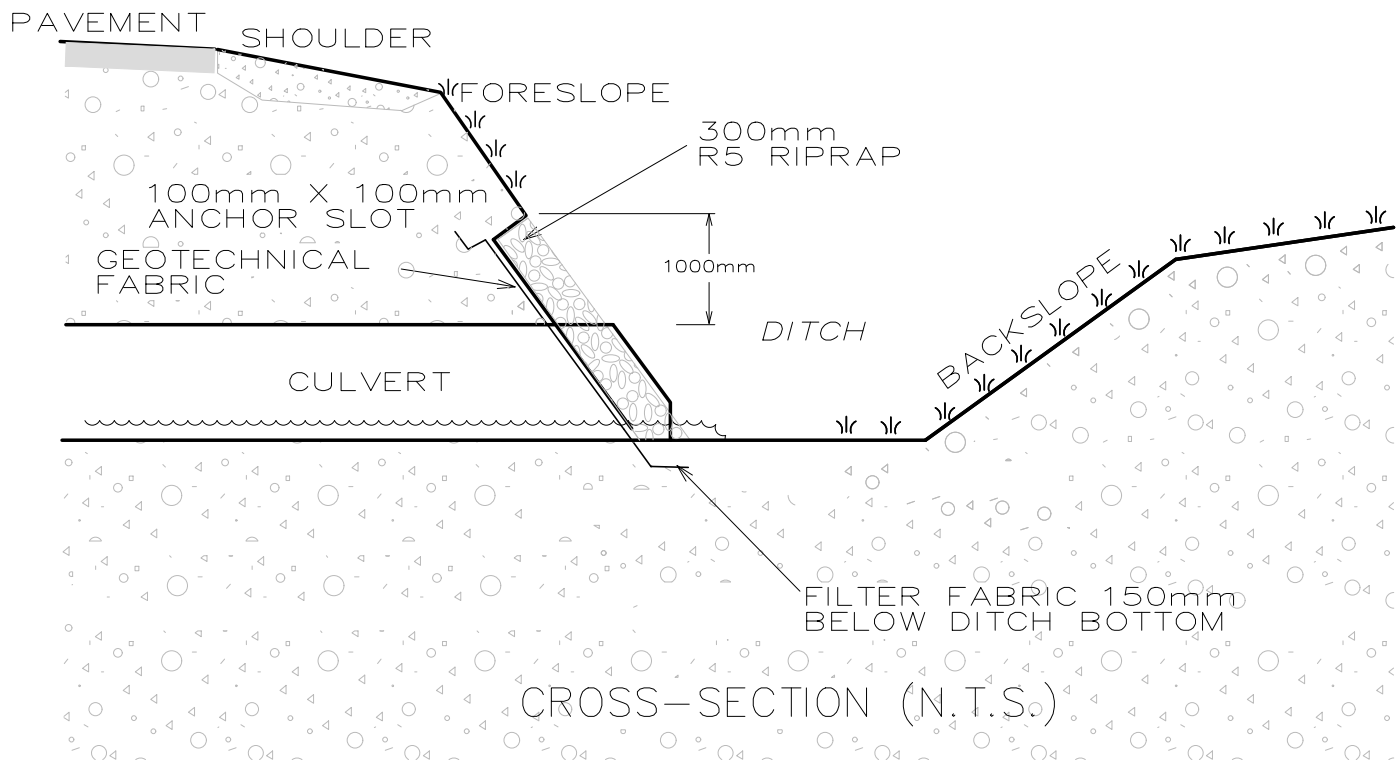
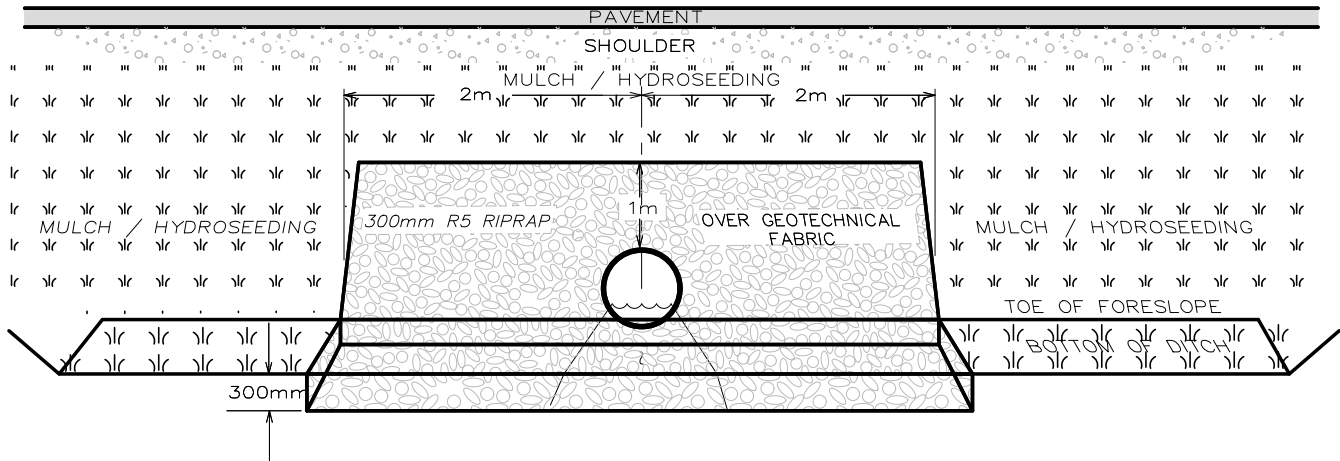
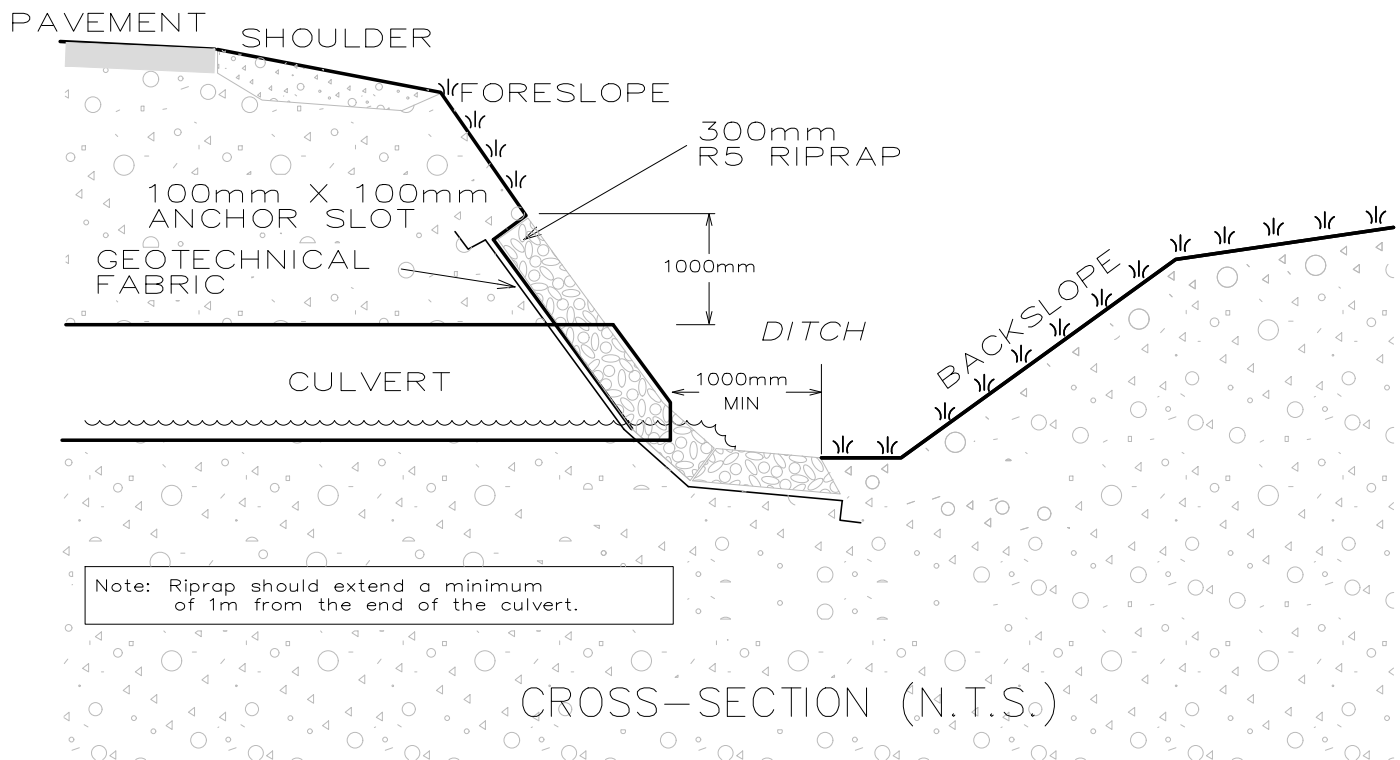


FIGURE 312-01 CULVERT END TREATMENT (INLET)
REVISED 2002



Note: An additional 7m to the left and right of the riprap, as well as above it to the shoulder, shall be mulched. Once fill slope areas are brought to final grade, and the areas are hydroseeded, the areas shall then be remulched.

END VIEW (N.T.S.)



CROSS-SECTION (N.T.S.)

FIGURE 312-02 CULVERT END TREATMENT (OUTLET)
REVISED 2002

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY& BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GRANULAR MATERIAL	400

401	Aggregate

402	Bedding Material

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

AGGREGATE

401**401.01** Scope

This Section outlines the source, processing, sampling, testing and quality requirements for aggregates to be incorporated in Department work or stockpiled for Department use.

401.02 Quality of Material

Aggregate shall satisfy all requirements of the specification for the type of material furnished, and unless otherwise specified, shall be one or a blend of the following:

Crushed rock composed of hard, sound, durable, uncoated, cubical fragments of consistent quality produced from non-sedimentary bedrock or non-sedimentary boulders.

Boulders shall be defined in accordance with ASTM D-653 as rock fragments, usually rounded, with an average dimension of 305 mm or greater.

Crushed or uncrushed of naturally formed, hard, sound, durable, uncoated particles of consistent quality, produced from gravel formations.

Aggregate specified in the Tender shall conform to Tables 401-1 and 401-2, and shall be approved by the Engineer. Aggregate shall be free from flat elongated or other objectionable particles and shall be well graded from coarse to fine. The gradings shall not show marked fluctuations from opposite extremes of the limiting sizes and the plotted curve shall flow in a manner free from acute changes in direction.

Blending of acceptable aggregate will be permitted in order to satisfy the gradation requirements for the class of material specified. The blending shall be performed in an approved manner which consistently produces a well graded product. Blending to improve quality will not be permitted except to increase the percentage of crushed particles or decrease the percentage of flat and elongated particles.

Class A material shall be processed by crushing quarried rock. The fine aggregate passing the 4.75 mm Sieve shall consist of resulting particles from the crushing of the coarse aggregate.

Class B material shall be processed by crushing and screening. The fine aggregate passing the 4.75 mm sieve shall consist of particles from the crushing of the coarse aggregate and/or natural sand.

Crushing of Class C material shall not be required.

Class D materials shall be processed by crushing quarried rock.

Aggregates may be rejected based on past field performance regardless of compliance with gradation or physical requirements.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

AGGREGATE

401

**Table 401-1
Gradation Requirement for Aggregate**

Sieve Size	Passing by Mass (%)			
	Granular Class A	Granular Class B	Granular Class C	Drainage Class D
50.0 mm	-	-	-	100
45.0 mm	-	-	100	-
38.0 mm	-	-	-	60-100
31.5 mm	-	100	87-100	40-100
25.0 mm	95-100	95-100	80-96	20-65
19.0 mm	-	-	-	0-30
12.5 mm	50-83	50-83	45-83	0-20
4.75 mm	30-60	30-60	25-65	0-5
1.18 mm	15-40	15-43	-	-
600 µm	10-32	10-35	-	-
300 µm	5-22	5-26	5-22	-
75 µm	3-9	3-9	3-10	-

Note: The granular Class A and B material shall have a minimum of 13% retained between the 4.75 mm and 600 µm Sieves.
As tested in compliance with ASTM C-136 and ASTM C-117.

401.03 Sampling and Testing

The Engineer shall be notified by the Contractor sufficiently in advance of his intent to deliver aggregate to the Contract indicating his source of supply.

Aggregate shall be randomly sampled as delivered to the Contract and tested to meet the requirements of Table 401-1 and Table 401-2.

Acceptance shall conform to the properties and specified gradation requirements for the class of material specified, as defined in Table 401-1 and Table 401-2, incorporated into the work, and up to the completion of the Contract.

1) If the material incorporated into the work does not conform with the specified properties and/or gradation as defined in Table 401-1 and Table 401-2, the Contractor shall cease hauling from the source of supply and shall immediately rectify the problem to the satisfaction of the Engineer.

2) Any material found to be non-conforming to the specified material shall be removed from the work.

If the Contractor's methods results in segregation of the materials as defined by ASTM C-125 and tested in accordance with ASTM C-136 the Contractor shall cease work immediately and correct deficiency.

If segregation of material occurs the Contractor shall scarify and make good the work in place or shall remove the segregated material from the work.

The acceptance of material shall not preclude its future rejection if it is subsequently found to lack consistency or if its field performance is unsatisfactory.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

AGGREGATE

401

**Table 401-2
Physical Requirements for Aggregate**

Test	Class A	Class B	Class C	Class D	ASTM
Los Angeles Abrasion, Max. % Loss	35	50	60	50	C-131
Magnesium Sulfate Soundness, Max. %Loss	15	-	-	15	C-88
Crushed, Min. %	75 ⁽¹⁾	50 ⁽²⁾	-	75 ⁽¹⁾	-
Flat and Elongated, Max. % ⁽³⁾	20	20	-	20	-
Plasticity Index, (Max)	3	3	3	-	D-4318
Petrographic Number, Max. ⁽⁴⁾	150	-	-	150	-

- (1) The percent of crushed material will be determined on the fraction of particles by mass retained on the 4.75 mm Sieve having 2 or more mechanically fractured faces.
- (2) The percent of crushed material will be determined on the fraction of particles by mass retained on the 4.75 mm Sieve having 1 mechanically fractured face.
- (3) Flat and elongated particles are those whose greatest mean dimension in the longitudinal axis compared to the least mean dimension in the plane perpendicular to the longitudinal axis exceeds a ratio of 4:1.
- (4) Petrographic number to be determined using current Department test procedures

401.04 Excavation, Processing, Handling and Stockpiling

The Contractor, before commencing excavation of aggregate from any pit, shall comply with Provision 104.15.

The Contractor shall clear and grub pit areas and shall remove and stockpile topsoil and overburden pursuant to Provision 204.02 to prevent infiltration of deleterious matter.

The Contractor shall ensure that the pit is excavated and the aggregate stockpile is constructed in such a manner as to prevent flooding of the materials.

Where necessary, to satisfy the requirements of the type of materials specified, aggregates shall be screened, crushed, washed and otherwise processed with equipment which is of adequate capacity and capable of consistently yielding an acceptable product.

Aggregates shall be washed only in properly designed and constructed washing plants. Truck, mixer or similar washing methods will not be permitted. The water to be used for washing aggregate shall be clean and free from injurious amounts of oil, alkali, acid, organic matter or other deleterious substances. Washed materials or materials excavated from underwater shall be stored for at least 24 hours or longer as determined by the Engineer to allow all free water to drain and to attain a uniform water content.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

AGGREGATE**401**

Aggregates shall be handled, transported and stockpiled in such a manner and with such equipment that segregation and/or contamination is avoided.

Storage areas shall be level, well drained, free of all foreign materials, and of adequate bearing capacity to support the stockpiles. The storage area shall be situated on solid ground with a suitable haul road. Storage areas and haul roads, must withstand heavy equipment and trucks. The Contractor will provide and ensure access for the Department or its agents at any time.

Stockpiles shall be either far enough apart or separated by substantial dividers to prevent intermingling. Stockpiles shall be built up in layers not exceeding 1 m in depth. Each layer shall be completed over the entire area of the stockpile before beginning the next layer. Special attention should be given, that each layer interlocks with the underneath layer. Coning of the piles or spilling of material over the edges will not be permitted. The use of bulldozers is not permitted to construct stockpiles, other than to level spot dumped truck loads or to maintain haul roads.

It is the express responsibility of the Contractor to ensure that stockpiles contain material of acceptable quality and of uniform distribution. Aggregates which are contaminated with foreign matter, segregated or mixed with other aggregates shall not be used and shall be removed from the stockpiles immediately.

The Contractor will provide for weighing of the aggregate in conformity with Provision 107.03.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

BEDDING MATERIAL

402**402.01 Scope**

This Section outlines the gradation requirements for bedding material to be incorporated in Department work or stockpiled for Department use.

402.02 Quality of Material

Bedding material shall meet the gradation requirements outlined in Tables 402-1 and 402-2. Samples will be taken on a regular basis during the work to ensure that the requirements of Table 402-1 and 402-2 are met.

**Table 402-1
Gradation Requirement for Bedding Material**

Sieve Size	Passing (%)
9.5 mm	100
4.75 mm	87-98
2.36 mm	55-95
1.18 mm	30-90
600 µm	10-70
300 µm	0-35
150 µm	0-15
75 µm	0-12

Note: There shall be a maximum of 35% difference between the percents passing consecutive sieves.

**Table 402-2
Gradation Requirement for Crushed Glass**

Sieve Size	Passing (%)
12.5 mm	100
9.5 mm	90-100
4.75 mm	45-85
2.38 mm	25-70
1.18 mm	10-30
0.75 mm	0-10

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

BITUMEN	500

501	Asphalt Cement
502	Asphalt Prime (RESCINDED 2018)
503	Asphalt Emulsions

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ASPHALT CEMENT

501

501.01 Scope

This Section is the material specification for Performance Graded (PG) Asphalt Cement. PG asphalt binders shall be homogeneous, free of water and any contamination, and shall not foam when heated to the temperatures specified by the Supplier for the safe handling and use of the product. It shall be shipped, used and handled at all times in accordance with the Suppliers's requirements.

501.02 Quality of Material

PG asphalt binders shall conform to the requirements of AASHTO M332, Table 1 - Performance Graded Asphalt Binder Specification, for Performance Grades specified with an "S" traffic designation. Additionally, any Performance Grades specified with a "H, V or E" traffic designation shall conform to the requirements of both Table 1 and Appendix X1 of AASHTO M332.

501.03 Method of Measurement

The quantity to be measured for payment under this section shall be the number of tonnes of asphalt cement utilized by the Contractor in producing hot mix asphaltic concrete as determined by calibrated asphalt cement pump metered settings logged by the Department as metered into the mix and calculated for the tonnage of hot mix asphaltic concrete produced.

501.04 Basis of Payment

The supply and transportation of performance grade asphalt cement will be paid for at the Contractor's unit bid price per tonne of asphalt cement. This price shall be full compensation for any and all expenses that may be incurred for the supply, transport and delivery of the performance grade asphalt cement to the Contractor's plant, including the cost of any anti-stripping additive required to meet design mix requirements as well as any storage, heating and handling requirements.

The unit bid price per tonne of PG Grade asphalt cement specified shall be adjusted using the PG Grade 58S-28 price index as posted 48 hours prior to closing of tender and the time when the asphalt cement is incorporated into the work. The price index to be used for comparison shall be the price as determined in the Maritime Suppliers Rack Price or as artificially established by the Department in the Special Provisions.

A link to the index can be found at:

<https://www.princeedwardisland.ca/en/information/transportation-infrastructure-and-energy/monthly-average-asphalt-binder-rack-price-2008>

The payment adjustment will be in dollars per tonne of asphalt binder. A payment adjustment will be established for each month of paving in which the price index for the month differs by more than \$10/tonne from the posted price index at the time in which tenders for the Contract were opened. When the price index differential is less than \$10/tonne there will be no adjustment established for that month.

The payment adjustment for the month will be calculated as follows, where:

PA = Payment Adjustment for asphalt binder in dollars
T = Posted PG asphalt binder price index at the time of Tender Opening
P = PG asphalt binder price index for month of paving

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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ASPHALT CEMENT

501

Q = Quantity of asphalt binder in tonnes

When $P > (T + \$10/\text{tonne})$, the Contractor receives an additional payment from the Owner as follows:

$$PA = (P - (T + \$10/\text{tonne})) \times Q$$

When $P < (T - \$10/\text{tonne})$, the Owner deducts from payments due to the Contractor as follows:

$$PA = (T - \$10/\text{tonne} - P) \times Q$$

Examples:

1. A Contractor's unit bid price for asphalt cement was \$325 for a tender that closed in February. The posted price index 48 hours prior to tender closing was \$283.75 and the work was undertaken in May when the price index was \$293.25.

$$\$283.75 - \$10 = \$273.75$$

$$\$283.75 + \$10 = \$293.75$$

Since the price index at time of paving (\$293.25) falls within the $\pm \$10/\text{tonne}$ range of the price index 48 hours prior to tender closing there would be no adjustment to the unit price of the asphalt cement.

2. A Contractor's unit bid price for asphalt cement was \$325 for a tender that closed in February. The posted price index 48 hours prior to tender closing was \$283.75 and the work was undertaken in June when the price index was \$260.00 and 250t of cement was used.

$$\$283.75 - \$10 = \$273.75$$

$$\$283.75 + \$10 = \$293.75$$

Since the price index at time of paving (\$260.00) falls outside the $\pm \$10/\text{tonne}$ range of the price index 48 hours prior to tender closing an adjustment to the amount paid to the Contractor would be required.

The price would be adjusted using the $P < (T - \$10/\text{tonne})$ formula. Thus the Owner will deduct the following amount from payment to the Contractor:

$$PA = ((283.75 - 10) - 260) \times 250 = \$3437.50$$

3. A Contractor's unit bid price for asphalt cement was \$325 for a tender that closed in February. The posted price index 48 hours prior to tender closing was \$283.75 and the work was undertaken in August when the price index was \$310 and 250t of cement was used.

$$\$283.75 - \$10 = \$273.75$$

$$\$283.75 + \$10 = \$293.75$$

Since the price index at time of paving (\$310.00) falls outside the $\pm \$10/\text{tonne}$ range of the price index 48 hours prior to tender closing an adjustment to the amount paid to the Contractor would be required.

The price would be adjusted using the $P > (T + \$10/\text{tonne})$ formula. Thus the Owner will add the following amount to the payment to the Contractor:

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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ASPHALT CEMENT

501

$$PA = (310 - (283.75 + 10)) \times 250 = \$4062.50$$

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ASPHALT PRIME

502

502.01 Scope

This Section is the material specification for asphalt prime.

502.02 Quality of Material

Asphalt prime emulsion shall conform in all respects to Table 502-1.

Table 502-1 Requirements for Asphalt Prime Emulsion

Test	Min.	Max.	ASTM
Tests on Emulsion			
Flash Point Tag Open Cup(°C)	45	-	D-1310
Saybolt Furol Viscosity at 50°C (mm²/s)	80	175	D-244
Residue by Distillation (%)	40	-	D-244(¹)
Oil Distillate by Volume(%)	-	25	D-244(¹)
Storage Stability, 24 hr (%)	-	1.5	D-244
Tests on Residue			
Penetration at 25 °C, 100g, 5s (0.1mm)	100	200	D-5
Ductility at 25 °C 5cm/min (cm)	100	-	D-113 (²)
Solubility in Trichloroethylene by Mass (%)	97.5	-	D-2042

1) Follow ASTM D-244 except use high temperature distillation thermometer. Bring the final temperature to 360°C and terminate heating immediately.

(2) If the Ductility at 25°C is less than 100, the material will be acceptable if its Ductility at 15°C is more than 100.

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ASPHALT PRIME

502

Table 502-2 Requirements for Asphalt Prime Cutback

Test	Min.	Max.	ASTM
Kinematic Viscosity at 60°C (mm ² /s)	20	35	D-2170
Distillation Tests % of Total to 360°C			
to 190 °C%	20	80	D-402
to 225 °C (%)	-	60	D-402
to 260 °C (%)	70	-	D-402
to 315 °C (%)	85	-	D-402
Distillation Residue to 360 °C Difference by Volume (%)	50	-	D402
Tests on Residue			
Penetration at 25°C, 100 g, 5s (0.1mm)	80	200	D-5
Ductility at 25 °C 5 cm/min (cm)	100	-	D-113(1)
Solubility in Trichloroethylene by Mass (%)	99.5	-	D-2042

(1) If the Ductility at 25°C is less than 100, the material will be acceptable if its Ductility at 15°C is more than 100

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ASPHALT EMULSION

503

503.01 Scope

This Section is the material specification for asphalt emulsions.

503.02 Quality of Material

Asphalt emulsion used for tack coats shall be SS-1, SS-1h, RS-1, RS-1h or Non-tracking Grade and shall conform in all respects to the requirements of Tables 503-1, 503-2 or 503-3.

The Non-tracking emulsion shall be Clean Bond Coat diluted with 40% water or equivalent, and shall meet the requirements of Table 503-3. Dilution of the emulsion shall be permitted at the terminal only.

**Table 503-1
Requirements for Tack Coat Material**

Type	SS-1		SS-1h		
Test	Min.	Max.	Min.	Max.	ASTM
Tests on Emulsion					
Saybolt Furol Viscosity At 25°C (mm ² /s)	20	100	20	100	D-244
Residue by Distillation (%)	57	-	57	-	D-244
Settlement in 5 days (%)	-	5	-	5	D-244
Retention by Mass on an 850 µm Sieve (%)	-	0.1	-	0.1	D-244
Cement Mixing Test (%)	-	2	-	2	D-244
Storage Stability in 24 hrs(%)	-	1	-	1	D-244
Tests on Residue					
Penetration at 25°C, 100g, 5 s (0.1 mm)	100	200	40	90	D-5
Ductility at 25°C, 5cm/min (cm)	40	-	40	-	D-113
Solubility in Trichloroethylene by Mass (%)	97.5	-	97.5	-	D-2042

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ASPHALT EMULSION

503

**Table 503-2
Requirements for Tack Coat Material**

Type	RS-1		RS-1h		
Test	Min	Max.	Min.	Max.	ASTM
Tests on Emulsion					
Saybolt Furol Viscosity at 25°C (mm ² /s)	20	100	20	100	D-244
Residue by Distillation (%)	55	-	55	-	D-244
Settlement in 5 days (%)	-	3	-	-	D-244
Retention by Mass on an 850 µm Sieve (%)	-	0.1	-	0.1	D-244
Cement Mixing Test (%)	-	-	-	-	D-244
Storage Stability in 24 hr (%)	-	-	-	1	D-244
Tests on Residue					
Penetration at 25°C, 100 g 5s (0.1 mm)	100	200	40	90	D-5
Ductility at 25°C, 5cm/min (cm)	60	-	-	-	D-113
Solubility in Trichloroethylene by Mass (%)	97.5	-	97.5	-	D-2042

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ASPHALT EMULSION

503

**Table 503-3
Non-tracking Emulsion Requirements (Prior to Dilute)**

Test Type			
	Min.	Max.	ASTM
Test on Emulsion			
Saybolt Furol Viscosity, 25°C, (SFs)	20	-	D-244
Retention by Mass on 850µm sieve, (%)	55	-	D-244
Oil Portion of Distillate	-	Trace	D-244
Particle Charge	negative	or positive	D-244
Test on Residue			
Penetration at 25°C, 100 g, 5s (0.1mm)	20	55	D-5
Ash Content, %	-	1	D-2415

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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PAVEMENT		600
601	Tack Coat Application	
602	Prime Coat Application (RESCINDED 2018)	
603	Hot Mix Asphaltic Concrete	
603.01/02	Description/Material	
603.03	Mix Design and Job Mix Formula	
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TACK COAT APPLICATION

601**601.01** Description

This work shall consist of the supply and application of a bituminous emulsion as a tack coat on an existing asphaltic concrete surface or on a portland cement concrete surface.

601.02 Material

Tack coat material shall be asphaltic emulsion and shall be in accordance with Section 503.

601.03 Equipment

The distributor shall be so designed, equipped, maintained and operated that asphaltic material at even heat may be applied uniformly on variable widths at readily determined and controlled rates with uniform pressure.

The distributor shall be capable of applying asphaltic material within plus or minus 5% of the desired rate and in a continuous and uniform manner both longitudinally and across the width of the spray bar.

The distributor shall be equipped with a rear mounted spray bar parallel to the surface to be sprayed. The spray bar must be capable of being adjusted in width from 2.5 - 3.7 m.

The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlays the spray fan from the adjacent nozzle by 50% so that a uniformly sprayed surface results.

All spray nozzles shall be in good condition, of the same manufacture, size and type. Nozzles shall have valves capable of instant full opening and positive cut-off. All spray nozzles shall be set in the bar so that the nozzle slots make the same horizontal angle (i.e. 15 - 30°) with the longitudinal axis of the bar.

The distributor shall be equipped with a suitable thermometer with a minimum range of 10 - 150°C, placed to accurately show the temperature of the distributor contents. Tack coat material must be circulated during the entire heating process in the distributor.

The distributor shall be equipped with a tachometer registering m/min that is visibly located to enable the truck driver to maintain constant application speeds at specified rates.

The distributor pump shall be equipped with a tachometer registering L/min passing through the nozzles and shall be readily visible to the operator.

The distributor shall be equipped with an accurate distance measuring device. The distributor shall be equipped with a sampling valve.

601.04 Construction Method

Paved surfaces which are to be covered with hot mix asphaltic concrete shall be tack coated. Surfaces of asphaltic concrete courses which are to be covered by subsequent courses of asphaltic concrete shall also be tack coated.

No tack coat shall be applied in wet weather or when the air temperature is less than 5°C unless otherwise directed by the Engineer.

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TACK COAT APPLICATION

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The surface to be treated shall be cleaned with a power broom, air line, or other approved equipment that will leave a clean, dry surface free from dust, dirt or other objectionable material.

The emulsion shall be heated and maintained at a temperature between 40 - 65°C and shall be applied to the surface at a rate of 0.35 - 0.5 L/m² for SS-1 and SS-1h, 0.15-0.25 L/m² for RS-1 and RS-1h, and 0.25-0.4 L/m² for Non-tracking emulsions as specified by the Engineer. The SS-1 and SS-1h emulsion shall be mixed with water to form a 50-50 mixture and Non-tracking emulsions shall be diluted with 40% water.

The material shall be applied evenly and shall form a thin unbroken film on the surface. The application of tack coat shall not extend beyond the limit of asphaltic concrete to be spread and compacted in a day.

At the end of the day tack coat may be applied to accommodate paving operations on the following day.

After applying the tack coat, the Contractor shall, by means of barricades, signallers, traffic convoys or other means, prevent the passage of traffic upon the tack coat until it has dried to a proper condition of tackiness as determined by the Engineer. The Engineer may direct that the Contractor reapply tack coat material to any surface where the original tack coat placed by the Contractor has been worn off by the traffic.

No asphaltic concrete shall be placed upon the tack coat until it has dried to a proper condition of tackiness, as determined by the Engineer. The Contractor is advised that the period required for such drying will depend upon weather conditions; it will not be less than 30 minutes and could be as long as 3 hours.

601.05 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of pavement to which tack coat is applied.

No measurement shall be made for the re-Application of a tack coat which has been worn off by traffic.

601.06 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for material, heating, handling, transportation, tools, labour, equipment and incidentals necessary to carry out the work.

No payment shall be made under this Section for the reapplication of a tack coat, which may be directed by the Engineer, in the event of traffic wearing off the original application.

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PRIME COAT APPLICATION

602

602.01 Description

This work shall consist of the supply and application of bituminous prime and sand cover on a previously prepared surface.

602.02 Material

Prime coat material shall consist of an asphaltic emulsion or an asphaltic cutback in accordance with Section 502. Sand cover shall conform to the gradation specified in Table 602-1.

Table 602-1 Gradation Requirement for Sand

Sieve Size	Passing (%)
9.5 mm	100
4.75 mm	87-98
2.36 mm	55-95
1.18 mm	30-90
600 µm	10-70
300 µm	0-35
150 µm	0-15
75 µm	0-6

602.03 Equipment

The distributor shall be so designed, equipped, maintained and operated that asphaltic material at even heat may be applied uniformly on variable widths at readily determined and controlled rates with uniform pressure.

The distributor shall be capable of applying asphaltic material within plus or minus 5% of the desired rate and in a continuous and uniform manner both longitudinally and across the width of the spray bar.

The distributor shall be equipped with a rear mounted spray bar parallel to the surface to be sprayed. The spray bar must be capable of being adjusted in width from 2.5 - 3.7 m.

The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlays the spray fan from the adjacent nozzle by 50% so that a uniformly sprayed surface will result.

All spray nozzles shall be in good condition, of the same manufacture, size and type. Nozzles shall have valves capable of instant full opening and positive cut-off. All spray nozzles shall

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be set in the bar so that the nozzle slots make the same horizontal angle (i.e. 15 - 30E) with the longitudinal axis of the bar.

The distributor shall be equipped with a suitable thermometer with a range of 10 - 150EC, placed to accurately show the temperature of the distributor contents. Prime coat material must be circulated during the entire heating process in the distributor.

The distributor shall be equipped with a tachometer registering m/min that is visibly located to enable the truck driver to maintain constant application speeds at specified rates.

The distributor pump shall be equipped with a tachometer registering R/min passing through the nozzles and shall be readily visible to the operator.

The distributor shall be equipped with an accurate distance measuring device. The distributor shall be equipped with a sampling valve.

Cover sand shall be spread using an approved spreader.

602.04

Construction Method

Unless otherwise directed by the Engineer any roadway surface which is to be covered with hot mix asphaltic concrete shall be prime coated. The Engineer shall be notified at least 4 hours prior to the start of bituminous priming.

Prime shall not be applied in wet weather or when the air temperature is less than 10°C unless otherwise directed by the Engineer.

The prime shall be heated prior to its application to temperatures between 40 - 550 C for an emulsion and between 27 - 450 C for a cutback.

The prime shall be applied to the surface at the rate of 0.9 - 1.8 R/m² as specified by the Engineer. The prime shall be applied evenly and shall form a thin unbroken film at the surface. Following the application of prime, a minimum curing time of 20 minutes shall be provided before a sand cover is applied for the purpose of preventing tracking by vehicles. This sand cover should be applied evenly at a rate not exceeding 12 kg/m². The Engineer can waive the use of sand if conditions permit the Contractor to control traffic so that it can be kept off the primed road until the prime has set up.

After applying the prime coat, the Contractor shall, by means of barricades, flagmen, traffic cones or other means, prevent the passage of traffic upon the prime coat until it has dried to a proper condition of tackiness as determined by the Engineer. The Engineer may direct that the Contractor reapply prime coat material to any surface where the original prime coat placed by the Contractor has been worn off by traffic.

Asphaltic concrete shall not be laid on the primed surfaces within 6 hours of an emulsified prime application and 48 hours after a cutback prime application.

602.05

Method of Measurement

Measurement for payment under this Section shall be the number of square metres of roadway to which prime coat is applied.

No measurement shall be made for the re-application of a prime coat which has been worn off by traffic.

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PRIME COAT APPLICATION

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602.06

Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for material, heating, handling, transportation, application material, tools, labour, equipment and incidentals necessary to carry out the work.

No payment shall be made under this Section for the re-application of a prime coat, which may be directed by the Engineer, in the event of traffic wearing off the original prime coat.

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HOT MIX ASPHALTIC CONCRETE- Description/Material	603.01/02

603.01 Description

This Section defines the requirements for the materials, equipment and methods to be followed for production, transportation of hot mixed, hot laid asphaltic concrete for pavement construction and other purposes.

603.02 Material

All materials to be incorporated into the work will be subject to test by the Engineer to determine suitability. Such tests may consist of chemical or physical analysis to determine wearability, soundness, density, stability or any other property pertinent to the satisfactory completion of the work. Acceptance by the Engineer based on the suitability tests shall not relieve the Contractor of the responsibility of maintaining a uniform acceptable product throughout the contract period.

603.02.01 Asphalt Cement

The Contractor shall supply as a bid item Performance Graded (PG) Asphalt Cement to be incorporated into the Department's work. Unless otherwise specified, the asphalt cement shall be PG 58S-28 and shall conform in all respects to the performance grade requirements of AASHTO M332 Table 1- Performance Graded Asphalt Binder Specification.

When anti-stripping additives are required, the asphalt cement shall meet the specified requirements of AASHTO M332 Table 1, after the addition of the required additives.

When the selected WMA technology requires that additives be added to the asphalt cement, acceptance of the asphalt cement shall be based on the samples that contain the WMA additive.

The Contractor shall supply the applicable mixing and compaction temperatures for the performance graded asphalt cement specified in addition to the supplier documentation indicating current test results meeting the requirements of AASHTO M332 Table 1 after the addition of required anti-stripping additives if necessary.

Department Staff shall have access to all Asphalt Binder delivery slips at the asphalt plant as the material is delivered. If Department Staff are not present at the time of delivery then a copy of the delivery slip(s) shall be retained in the asphalt plant control room for Department Staff.

The Department will conduct quality assurance testing by testing random samples taken from the Contractor's asphalt cement storage tanks located at the hot mix plant for the purpose of ensuring that the material used in the work conforms to the requirements of AASHTO M332 Table 1.

603.02.02 Mineral Filler

Mineral Filler shall meet the requirements of ASTM D-242.

603.02.03 Asphaltic Concrete Stripping

The Contractor is hereby advised that if their aggregate for asphaltic concrete is moisture susceptible they shall have the option of either using a liquid anti-stripping additive from the Department's list of acceptable products, using hydrated lime, or changing their source of aggregate.

The Department may determine that an anti-stripping additive is required if one of the following conditions occurs:

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HOT MIX ASPHALTIC CONCRETE- Description/Material

603.01/02

- The long term tensile strength ratio (TSR) of the asphaltic concrete as per the latest edition of AASHTO T283 (average of Conditioned & Freeze/Thaw TSR values) is less than 0.80.
- The conditioned & freeze thaw tensile strength values shall not be less than 400 kPa.
- Material that has been conditioned per the latest edition of AASHTO T283 meets the 0.80 minimum requirement but a visual examination indicates there is evidence of stripping.
- If based on past performance the aggregate source is known to be prone to stripping.

603.02.04 Anti-Stripping Agents

Any anti-stripping agent intended for use shall be incorporated in the mix design in the proportion to be used during production and in accordance with the Manufacturer's Specifications.

The anti-stripping agents shall consist of one of the following:

- Hydrated Lime (Ca(OH) 2) meeting the requirements of ASTM C-141
- Liquid Anti-Stripping Additives (from the approved list)

Manufacturer	Product
Meadwestvaco Corp	Evotherm M1
Meadwestvaco Corp	Evotherm P25
ARR-MAZ Products	AD-here LOF 6500
Zydex	Zycosoil
Zydex	Zycotherm
Zydex	Zycotherm SP
Zydex	Zycotherm SP2

Inclusion on this list does not attest to efficacy of use with any specific aggregate or approval for use on any specific project. Testing for each product shall be required for this purpose. This list is subject to revision.

603.02.04.01 Approval of Anti-Stripping Agents

Approval to use an anti-stripping agent will only be given if it is determined from the latest edition of AASHTO T283 that the long-term TSR of the mix with an anti-stripping agent equals or exceeds 0.80 (conditioned & freeze thaw tensile strength values meet or exceeds 400 kPa) and the visual examination indicates there is no evidence of stripping. The Contractor shall also demonstrate the capability of properly adding hydrated lime to the mix at the hot-mix plant if hydrated lime is proposed for use as an anti-stripping agent. In all cases a minimum of 10 working days are required to perform the stripping test after the aggregates have been received by the Materials Lab. An additional 10 working days will be required for re-testing of aggregate with an anti- stripping agent.

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603.01/02

603.02.04.02 Addition of Liquid Anti-Stripping Additive

The liquid anti-stripping additive shall be added at a rate as determined by the mix design (minimum 0.5% or 0.4% ARR-MAZ AD-here LOF 6500) to the asphalt cement at the Supplier's depot, concurrently, with loading of the asphalt cement into the Carriers tanker.

603.02.04.03 Information Sessions

At a pre-construction meeting the Contractor and the Department will review the requirements for use of the liquid anti-stripping additive, including proper procedures, worker information, use of protective clothing and equipment, site supervision and contingency.

The Contractor shall advise workers of the proper procedures to be followed when working with asphalt cement or asphaltic concrete containing anti-stripping additives.

603.02.05 Aggregates

Coarse aggregate to be supplied for the manufacture of asphaltic concrete shall consist of crushed gravel or crushed stone, composed of clean, sound, hard and durable particles free from a coating of silt, and/or clay and shall not contain other deleterious materials. Coarse aggregate shall conform to the physical requirements for coarse aggregate shown in Table 603-1 and 603-2 or as otherwise approved by the Engineer.

Irrespective of compliance with the physical requirements of Table 603-1 and 603-2, a coarse aggregate may be rejected on the basis of past field performance.

Fine aggregate to be supplied for the manufacture of asphaltic concrete shall consist of manufactured material processed by crushing quarried rock or natural sand and gravel, the particles of which shall be clean, hard, durable and free from coatings of silt, clay or other deleterious material. Fine aggregate shall conform to the physical and gradation requirements shown in Table 603-3 or as otherwise approved by the Engineer in writing. The fraction between any 2 of the following consecutive sieves (4.75 mm, 2.36 mm, 1.18 mm, 600 µm, 300 µm, 150 µm) shall be a minimum of 7 %. A minimum of 25% fine aggregate, processed by crushing quarried rock, shall be incorporated into all asphaltic mixes.

**Table 603-1
Gradation Requirement for Coarse Aggregate - ASTM C-136**

Material Size	9.5 mm	12.5 mm	19.0 mm
SieveSize	Passing (%)	Passing (%)	Passing (%)
25.0 mm	-	-	100
19.0 mm	-	100	90 - 100
12.5 mm	100	90 - 100	50 - 75
9.5 mm	80 - 100	45 - 75	20 - 55
6.3 mm	15 - 50	-	-
4.75 mm	0 - 15	0 - 15	0 - 15

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**Table 603-2
Physical Requirements for Coarse Aggregate**

Test	A Base	B Seal	C Seal	ASTM
Los Angeles Abrasion, Max % Loss	35	35	35	C-131
Magnesium Sulfate Soundness, Max % Loss	15	15	15	C-88
Absorption, Max %	1.7	1.7	1.7	C-127
Crushed, Min. %	75	75	75	(1)
Flat and Elongated, Max. %	20	20	20	(2)
Petrographic Number, Max.	200	140	140	(3)
4.75 mm Sieve, Max. % Passing	15	15	15	C-136
75 µm Sieve with $PI \leq 3$, Max. % Passing	3	3	3	C-117

- (1) Crushed percentage is the fraction of particles by mass retained on the 4.75 mm Sieve having two or more freshly fractured faces for Classes A, B, C.
- (2) Flat and elongated particles to be determined using current Department test procedures.
- (3) Petrographic number to be determined using current Department test procedures.

**Table 603-3
Physical and Gradation Requirements for Fine Aggregate**

Test	A Base	B Seal	D Seal	ASTM
Magnesium, Sulfate Soundness, Max. % Loss	15	15	15	C-88
4.75 mm Sieve, Min. % Passing	85	85	85	C-136
75 µm Sieve, Max. % Passing	8	8	8	C-117

603.02.06 Blending Sand

Blending sand supplied for the manufacture of asphaltic concrete shall consist of clean, tough, durable particles, free of silt, clay or other deleterious material.

The gradation of the blending sand shall be such that when incorporated into the asphaltic concrete mix, the resultant mix shall meet the requirements of Tables 603-4, 603-5 and 603-6.

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The blending sand shall have 100 percent passing the 9.5 mm Sieve and a maximum of 50% passing the 300 µm Sieve. Blending sands with gradations outside these limited may be deemed acceptable at the Engineers discretion.

The maximum mass of blending sand to be used in the total mix shall not exceed 12% for all mixes except "D" mix.

603.02.07 Warm Mix Asphalt (WMA)

WMA technologies must be approved by the Engineer prior to its use. Technology approved for previous work is not guaranteed approval on all future work.

The Contractor shall supply all materials required for the production of WMA. Supporting documentation from the WMA supplier for the proper preparation, storage and handling of their product shall be obtained by the Contractor and submitted to the Engineer.

603.02.08 Reclaimed Asphalt Pavement (RAP)

RAP used in asphalt mixes shall be supplied by the Contractor. All RAP shall be free of contamination and all particles shall pass the 50 mm sieve when tested in accordance with ASTM C136. The gradation of the RAP shall be such that when incorporated into the asphalt mix, the resultant mix shall meet the requirements of Tables 603-4, 603-5 and 603-6. Minimal quantities of oversized particles may be deemed acceptable at the discretion of the Engineer.

RAP shall have a minimum asphalt content of 5.3%. In determination of the RAP asphalt content a 0.3% oven correction factor will be applied to samples tested in accordance with ASTM D6307.

The maximum amount of RAP permitted shall be 15% of the total weight of the combined materials. RAP shall not be permitted for use on bridge decks and/or contracts that specify a performance grade binder other than PG 58S-28.

The Contractor shall be responsible for the incorporation of RAP into the asphalt mix which shall be done in a manner as per Section 603.05 of the PEIDTI General Provisions and Contract Specifications for Highway Construction. RAP shall be incorporated into the asphalt mix as part of the cold feed system and shall enter the asphalt plant through a collar on the mixing drum. The collar shall be placed as per the plant manufactures recommendations.

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HOT MIX ASPHALTIC CONCRETE – Mix Design and Job Mix Formula

603.03

603.03 Mix Design and Job Mix Formula

603.03.01 Responsibility for Design Mix

Authority Mix Design

The Engineer shall be notified when stockpiles meeting minimum size requirements of coarse aggregate, fine aggregate, blending sand and performance grade asphalt cement representative of the material to be used in the work are available for sampling at the plant site.

The Engineer will arrange for samples of each material to be taken and submitted to the Department's laboratory for mix design purposes after stockpile requirements as specified in Subsection 603.04.01 have been met. The Contractor will be notified of the composition of the mix design no later than three (3) weeks after the day on which all of the representative samples were received by the Department's laboratory. The Contractor shall not commence mix production before such notification.

A new asphalt mix design shall be required if any change occurs in the nature or source of the aggregate and/or the supplier of the performance graded asphalt cement.

Contractor Mix Design

Preparation and submission of the asphalt mix design for the Department's approval is optional to the Contractor. In conformance with this specification, the Contractor shall use professional engineering services and a qualified testing laboratory to assess the performance grade asphalt cement and aggregate materials proposed for use and to carry out the design of the asphalt mix.

603.03.01.01 Requirement for Asphalt Mix Design

The asphalt mix design shall follow the Marshall method of mix design based on 75 Blows and be in accordance with the latest edition of the Asphalt Institute Publication, Mix Design Methods for Asphalt Concrete Manual Series No. 2 (MS-2).

The asphalt cement grade shall be PG 58S-28, unless otherwise specified. The design percent of asphalt cement shall be that percent which yields design air voids of $4\% \pm \frac{1}{2}\%$.

The job mix formula shall be the approved asphalt mix design specifying the aggregate blend proportions and the optimum percentage of asphalt cement that yields target air voids as determined by contract SADT (Summer Average Daily Traffic).

<u>SADT</u>	<u>Target Air Voids ($\pm 0.5\%$)</u>
< 3000	2.5
3000 - 10,000	3.0
> 10,000	3.5

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HOT MIX ASPHALTIC CONCRETE – Mix Design and Job Mix Formula

603.03

The percent passing the 4.75 mm sieve size $\pm 5\%$ for the blended aggregate gradations for given mix types shall be as follows:

<u>Mix Type</u>	<u>Percent Passing 4.75mm sieve size</u>
A	50%
B & C	62%

The asphalt mix design data and the proposed job mix formula determined by the Department's Laboratory or submitted by the Contractor for the Department's review and approval shall include for each blend the following:

- 1) The name of the testing firm responsible for the mix design.
- 2) The specific location(s) of the source(s) of mineral aggregate.
- 3) The source and type of mineral admixture and the percentage to be used.
- 4) The percentage of aggregate passing each of the specified sieves for each aggregate to be incorporated into the mixture.
- 5) The proportion of each material (in percent of aggregate), including hydrated lime, if required, as an anti-stripping additive.
- 6) The composite gradation based on (4) and (5) above.
- 7) The composite gradation plotted on a 0.45 power graph paper.
- 8) The results of all aggregate testing, determinations, etc., as defined in Tables 603.1, 603.2 and 603.3 of Section 603, of the General Provisions and Contract Specifications for Highway Construction manual, including bulk specific gravity and apparent specific gravity for both the coarse and fine aggregates. The 75 μ m material shall be removed prior to the determination of the specific gravities. In addition, aggregates shall be tested as per the latest edition of AASHTO T283 to determine if they are prone to stripping (tensile strength ratio <0.8 and conditioned freeze thaw tensile strength values less than 400 kPa) as well as no visual evidence of stripping. Provided an anti-stripping additive is required, hydrated lime or an effective liquid anti-stripping additive shall be used and tested for compliance as per the latest edition of AASHTO T283 (tensile strength ratio >0.8 and conditioned and freeze thaw tensile strength values meet or exceed 400 kPa) with no visual evidence of stripping.
- 9) The mix design with a minimum of four (4) different asphalt contents (minimum 0.5 % between each point) with at least one point above and one point below the optimum asphalt percentage that reports the following:
 - (i) The percentage (in units of one tenth of 1%) of asphalt cement to beaded, based on the total weight of the mixture.
 - (ii) The Marshall test results for the individual and average bulk specific gravity, stability and flow of at least three specimens at each asphalt content.
 - (iii) The maximum theoretical specific gravity at each asphalt content.
 - (iv) The percent of air voids in the mixture for each asphalt content.
 - (v) The percent voids in mineral aggregate (VMA) at each asphalt content.
 - (vi) The percent voids filled with asphalt (VFA) at each asphalt content.
 - (vii) The design asphalt content as a percent of total mix.
- 10) All Marshall mix design characteristics, including graphs used in arriving at the final mix design, the bulk relative density of the combined aggregates and the asphalt absorption of the combined aggregates.
- 11) The source and current test results of the performance graded asphalt cement to be incorporated into the Department's work meeting the requirements of AASHTO M-332 Table 1 for performance graded asphalt cement including applicable mixing and compaction temperatures.

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HOT MIX ASPHALTIC CONCRETE – Mix Design and Job Mix Formula

603.03

The Contractor shall submit the following with the asphalt mix design for verification purposes:

- (a) One - 20 kg sample of each representative virgin aggregate.
- (b) Thirty-two 1.2 kg samples of representative virgin aggregate blended to the design mix gradation of the asphalt mix aggregate.
- (c) Four Litres of the type of performance grade asphalt cement to be used.

603.03.01.02 Design Mix Approval

Design mix approval will be based on the design mix tests and the corresponding requirements detailed in Tables 603.4 and 603.5 of Section 603, of the General Provisions and Contract Specifications for Highway Construction.

A new asphalt mix design shall be required if any change occurs in the nature or source of the aggregate and/or the supplier of the performance graded asphalt cement.

The Engineer shall not accept any asphalt mix produced prior to the Contractor receiving written approval of the asphalt mix design.

The job mix formula shall be the approved asphalt mix design specifying the aggregate blend proportions and the optimum percentage of asphalt cement that yields target air voids as determined by contract SADT (Summer Average Daily Traffic).

<u>SADT</u>	<u>Target Air Voids ($\pm 0.5\%$)</u>
< 3000	2.5
3000 - 10,000	3.0
> 10,000	3.5

Once the job mix formula has been designated by the Engineer, the Contractor shall be required to produce an asphaltic concrete mixture conforming to the requirements specified in Table 603-4, Table 603-5 and Table 603-6.

The mix design and job mix formula shall remain in effect until changed in writing. Should the aggregate source change, or when unsatisfactory results or other conditions make it necessary, a new mix design will be required.

The Department's laboratory shall require fifteen (15) working days from the time of receipt of Contractor submitted asphalt mix design and samples to evaluate the asphalt mix design. As part of the asphalt mix design evaluation, the Department's laboratory shall determine the following properties:

- (i) Combined aggregate gradation;
- (ii) Bulk specific gravity for the asphalt mix aggregate;
- (iii) Marshal density;
- (iv) Theoretical maximum specific gravity of the asphalt mix at the design asphalt content and at each asphalt content considered by the Contractor above and below the design asphalt content.
- (v) The difference between the property values submitted by the Contractor and the property values as determined by the Department's laboratory shall not exceed the amounts shown as follows:

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HOT MIX ASPHALTIC CONCRETE – Mix Design and Job Mix Formula

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<u>Property</u>	<u>Maximum Permissible Variation</u>
Bulk Specific Gravity of Aggregate	± 0.015
Marshall Density	± 12 kg/m ³
Theoretical Maximum Specific Gravity	±0.010

The asphalt mix design shall be rejected if the maximum permissible variations are exceeded.

**Table 603-4
Blended Aggregate Gradation and Asphalt Content for Asphaltic Concrete Mixes**

Sieve Size	Passing (%)			
	A Base	B Seal	C Seal	D Sand Seal
25.0 mm	100	-	-	-
19.0 mm	90-100	-	100	-
12.5 mm	71-86	100	90-100	-
9.5 mm	60-78	90-100	76-91	100
4.75 mm	39-61	55-75	49-72	85-100
2.36 mm	23-49	32-60	28-58	65-85
1.18 mm	16-34	19-45	19-40	45-70
600 µm	11-24	13-35	13-27	30-55
300 µm	7-16	8-22	9-18	15-35
150 µm	5-10	5-12	6-11	7-20
75 µm	3.3-6	4.5-6.5	3.7-6	5.5-8
Asphalt Cement % by Mass of Total Mixture	4.7-6.0	5.5-7.0	5.3-6.5	6.5-8.5

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**Table 603-5
Physical Requirements for Dense Graded Asphaltic Concrete**

Test	A Base	B Seal	C Seal	D Sand Seal
Stability at 60°C (N)	5800	5800	5800	3400
Flow (0.25 mm)	8-16	8-16	8-16	8-16
Air Voids (%)	2.5-4.5	2.5-4.5	2.5-4.5	3-5
Min. VMA (%)	13	15	14	16
VFA (%)	68-78	70-80	70-80	70-85

**Table 603-6
Mix Control Tolerance Variation from Job Mix Formula**

Sieve Size	Allowable Variation of % Passing (±%)
25.0mm	5
19.0 mm	5
16.0 mm	5
12.5 mm	5
9.5 mm	5
4.75 mm	5
2.36 mm	4
1.18 mm	4
600 µm	3
300 µm	3
150 µm	2
75 µm	1
Asphalt Cement	0.3

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603.03.02 Physical Requirements of the Mixture

The mixture shall be uniform and shall consist of a mixture of coarse and/or fine aggregate together with any required blend sand, mineral filler or lime, and mixed with asphalt cement.

The mineral constituents shall be combined in such proportions as to produce a mixture conforming to the gradation requirements of Table 603-4. The grading shall not show marked fluctuations from opposite extremes of the limiting sizes.

Mixtures shall meet the physical requirements of the properties specified in Table 603-5. Current Department test procedures will be used to determine these properties.

603.03.03 Mix Control Tolerances

Once the job mix formula has been designated by the Engineer, the Contractor shall be required to produce an asphaltic concrete mixture conforming to the mix control tolerance as specified in Table 603-6.

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603.04 Handling of Materials

603.04.01 Stockpile Requirements

Stockpiling sites shall be level, well drained, free of all foreign materials and of adequate bearing capacity to support the mass of the stockpiled materials. Stockpiles shall be either far enough apart or separated by substantial dividers to prevent intermingling.

For all aggregates except where stockpiled on Portland cement concrete, asphaltic concrete or on otherwise acceptably stabilized areas, the bottom 150 mm of the stockpile is not to be incorporated into the Department's work.

Stockpiles shall be built up in layers not exceeding 1 m in depth. Each layer shall be completed over the entire area of the stockpile before beginning the next layer. Coning of the piles or spilling of material over the edges of the pile will not be permitted. Traffic over the stockpile surface shall be limited to that required for adequate levelling or removal.

The minimum size of each coarse and fine aggregate stockpile shall be 1000 tonnes. The minimum size of the stockpile(s) of blending sand shall be 150 tonnes.

Before any production of asphaltic concrete mixture has commenced, aggregate stockpiles of the required size and gradation shall be provided at the asphalt plant site. Minimum stockpile requirements shall be maintained throughout the project. Aggregates brought to the site after production has commenced shall be stored in separate stockpiles.

A minimum of 2 working days between the arrival of asphalt aggregate and its incorporation into the asphaltic concrete mixture will be required to facilitate complete analysis of the aggregate prior to its use.

603.04.02 Handling, Feeding and Drying of Aggregate

Aggregate shall be loaded into the cold feed bins so as to prevent the mixing of separated size of aggregate. Mixing of materials on site or loading of more than one material into a single bin shall not be permitted.

Where the Contractor chooses to use a batch or continuous mix operation, the aggregate shall be dried and heated in the drier and separated by screening into hot storage bins. When the aggregate is delivered to the mixer, it shall be at a temperature consistent with proper mixing and laying and shall in no case exceed 165°C. Surfaces of dried aggregate shall be free of carbon or unburnt fuel oil.

The aggregate shall be sufficiently dried as evidenced by the lack of noticeable steaming, bubbling, or foaming of the asphalt mixture and the absence of visible free water on the tailgate of the truck box.

If insufficient drying is evident, the Contractor shall take steps as deemed necessary to provide properly dried aggregates.

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603.05.01 Requirement of all Mixing Plants

603.05.01.01 Air Quality Permit Requirements

The Contractor must comply with all applicable sections of the Department's Environmental Protection Plan (EPP) which forms part of these Specifications.

The Contractor must supply all asphaltic concrete from an asphalt plant that has a valid Air Quality Permit issued by the PEI Department of Environment, Labour and Justice (ELJ).

The Contractor must supply the Engineer with a copy of a valid Air Quality Permit for each asphalt plant which will be used to supply asphaltic concrete to the Contractor or project before production begins.

If the Department receives a copy of a written notice from EJJ to the Owner of an asphalt plant that the asphalt plant does not possess a valid Air Quality Permit or that the Air Quality Permit for that plant has been revoked, then the Department will not accept asphaltic concrete from that plant.

603.05.01.02 Inspection Requirements

All equipment shall be on the site and available for inspection, testing and approval before operations commence.

Plants used for the manufacture of asphaltic concrete under this Section shall conform to the requirements of ASTM D-995.

The Engineer, or authorized representative, shall have access at all times to any or all parts of the plant and equipment pertaining to the work. In order to ensure that the manufacture of the mixture is in strict accordance with the specifications, the Department may use whatever recording devices are deemed necessary for permanent records including audio and video records.

Stairways to the mixer platform and to the asphalt cement storage tank manholes, and ladders to other plant units shall provide accessibility to all plant operations. Ample and unobstructed space shall be provided on the mixing platform. A platform shall be provided in the vicinity of the plant to permit inspection and sampling of the mixture before it is delivered to the work site.

603.05.01.03 Equipment for Preparation of Asphalt Cement

Asphalt Cement storage tanks shall be capable of heating the material under effective and positive control at all times and maintaining a range between 130 - 165° C. When the amount of asphalt cement added to the mixture is measured volumetrically, the actual working temperature shall not vary by more than plus or minus 5° C .

A circulating system of adequate size shall be provided for the asphalt cement to ensure proper and continuous circulation between the working tank and the mixer during the entire operating period. A sampling valve shall be between the working tank and the mixer. All pipe lines and fittings shall be insulated to prevent heat loss.

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There shall be a separate tank and circulation line for each grade of asphalt cement being used in the work.

603.05.01.04 Cold Feed System

Bin dimensions and geometry shall be such as to provide a free flow of material at all times. An individual cold feed bin shall be provided for each size, type or aggregate gradation. Each bin shall be equipped with individual gate controls to provide accurate and positive proportioning. Partitions of sufficient height to eliminate intermingling of the aggregate shall be provided between adjoining bins. If the cold feed bins are being fed with a front-end loader, the width of each bin must be at least 500 mm wider than the width of the loader bucket.

A variable speed control shall be permitted only if it is properly designed to give total and proportional control of the cold feed system.

603.05.01.05 Drier

This clause is not applicable to drum mixers.

A rotary drier, of sufficient capacity to heat and dry the aggregate to the required temperature, shall be provided.

603.05.01.06 Screens

This clause is not applicable to drum mixers.

Plant screens capable of screening all aggregates to the sizes required for proportioning each type of asphalt mixture, and capable of handling capacities in excess of the hourly mixer capacity, shall be provided.

All screens shall have square openings, unless otherwise specified by the Engineer. Screens shall be kept clean and in good repair.

603.05.01.07 Hot Aggregate Storage Bins

This clause is not applicable to drum mixers.

The plant shall contain a minimum of two (2) hot aggregate storage bins arranged to ensure separate and adequate storage of appropriate aggregate fractions. Each bin shall be of a size and at a location to prevent material from backing up into other bins. An oversize chute shall be provided to prevent oversize aggregate from becoming incorporated in the mix. Gates on hot storage bins shall be so constructed as to prevent leakage when they are closed.

Each bin shall be provided with a safe and suitable device for obtaining test samples.

603.05.01.08 Asphalt Cement Control Unit

Satisfactory means shall be provided to incorporate the required quantity of asphalt cement into the mixture. All measuring devices shall be sensitive to a one percent (1%) variation above or below the actual mass required. Suitable insulation shall be provided for maintaining the temperature of the asphalt cement in pipelines, meters, weigh buckets, spray bars, containers or flow lines.

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The remainder of this clause is not applicable to drum mixers.

The asphalt cement shall be delivered to the pugmill in a thin uniform sheet or in multiple streams over the full length or width of the mixer.

603.05.01.09 Thermometric Equipment

Suitable thermometric equipment shall be provided to register the temperature of the asphalt as delivered to the mixer. The indicator dial, graduated from 100 - 200°C in 2°C increments, shall be mounted where it is clearly visible to the operator at all times.

Each asphalt cement storage tank shall be equipped with a similarly graduated thermometer installed in the asphalt cement feed line near the mixer's discharge pipe. Plants shall have approved recording thermometers, pyrometers, or approved recording thermometric instruments at the discharge chute of the drier to register and automatically record the temperature of the heated aggregate. In drum mixers, where the temperature of the hot bituminous mixture is registered and recorded with a printed recorder that can be monitored by the plant operator, the printed record shall be available to the Department.

603.05.01.10 Dust Collectors

This clause is not applicable to drum mixers.

All plants shall be equipped with a primary dry dust collecting system and a wet or dry secondary dust collecting system.

Provisions shall be made to waste all of the collected materials or to uniformly return all or any portion of the dry material to the mixture, as required, to meet mix design.

603.05.01.11 Filler Attachments

Should filler be required in the mixture, the plant shall be equipped with all filler feeding equipment necessary to uniformly incorporate the prescribed proportion of filler into the mixture.

603.05.01.12 Hydrated Lime

Should hydrated lime be required in the mixture, the plant shall be equipped with all feeding equipment necessary to uniformly incorporate the prescribed proportion of lime. The feeding equipment shall be mounted so as to permit thorough dry mixing with the aggregate prior to contact with the asphalt cement.

603.05.01.13 Hot Mix Surge Bins

If the Contractor elects to use a hot mix surge bin, it shall be designed, constructed and operated so that there shall be no segregation of, or damage to, the mix due to the surge bin or its appurtenances. The hot mix surge bin shall be operated in such a manner during draw down to prevent free discharge of hot mix from the conveyor belt to the truck. The maximum allowable time which an asphalt mixture can be stored in a hot mix surge bin shall be 4 hours.

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603.05.01.14 Hot Mix Storage Silos

If the Contractor elects to use a hot mix storage silo, it shall be designed, constructed and operated so that there shall be no segregation of, or damage to, the mix. The storage silo shall be equipped with an appropriate holding and batching system at the top of the silo, coordinated with plant production, to prevent complete discharge so that mix is not permitted to fall directly into the silo.

Storage silos, equipped with a heating system, shall be capable of maintaining the temperature without localized overheating.

Storage silos shall be equipped with mix level indicators, and when the plant is in continuous operation, the minimum level of mix in the silo must be maintained above the one-third (a) capacity level.

Storage in the silo up to 20 hours shall be permitted provided:

- (I) that the penetration of the asphalt cement recovered from the stored asphalt concrete is equal to or greater than the penetration after the thin film oven test of the original asphalt cement before mixing, and
- (ii) which, when discharged from the storage silo, was free flowing and without lumps, and
- (iii) which, when delivered to the paver, was at or above 135°C

603.05.01.15 Mix Production Control

At all times during mix production, a Plant Operator, competent and familiar with the operation of the plant, shall be at the control console. The Contractor shall designate a qualified person solely for this operation during the production of asphaltic concrete. The Department reserves the right to reject any mix produced during the Plant Operator's absence.

603.05.01.16 Asphalt Plant Inspector's Quarters

At any asphalt plant the Contractor shall provide, at the Contractor's own expense, working quarters for the Asphalt Plant Inspector having the following dimensions and equipment.

- a) Outside dimension: Min. (3 x 2.4 x 2.4 m).
- b) Equipment
 - 1 door and padlock
 - 1 window that opens, Min. (700 x 600 mm)
 - 1 chair
 - 1 sturdy and well supported bench along the 3 m wall (700 mm wide x900 mm high)
 - Electricity: 1 overhead light and at least 1 wall plug
- c) The working quarters shall be located so that the Inspector is able to observe the operation from the building.
- d) This building is to be for the sole use of the Asphalt Inspector. The Contractor is not to store equipment or supplies in it.

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603.05.02 Special Requirements for Batch Mixing Plants

603.05.02.01 Material Level Indicators

A material level indicator shall be installed in each hot aggregate bin at the 2/3 full level and shall be connected to remote high-low indicator lights mounted at the operator's station.

603.05.02.02 Weigh Hopper

The equipment shall include a means to accurately weigh each bin size of aggregate in a weigh hopper suspended on scales and this weigh hopper shall be of ample size to hold a full batch without running over. The hopper shall be supported on fulcrums and knife edges and constructed so that the fulcrums and knife edges are not easily thrown out of alignment or adjustment. The hopper shall be dimensioned and constructed to prevent segregation of the dry aggregate prior to mixing. Gates on the hopper shall be constructed to prevent leakage when closed.

603.05.02.03 Plant Scales

Scales for weighing aggregates and asphalt cement shall be the dial type and of a standard make and design. Scales for weighing aggregates shall be accurate and sensitive to 0.5% of the maximum load required, and shall provide a positive means of balancing the tare mass of the hopper and asphalt bucket. At the beginning of each construction season, after each plant set-up and prior to batching any materials, and whenever it is deemed necessary by the Engineer, the Contractor shall verify the accuracy of the scales.

603.05.02.04 Mixer Unit

The plant shall include an approved twin shaft pugmill type batch mixer that can produce a uniform mixture within the tolerances required. The clearance of the blades from the inner surfaces of the pugmill liners shall not exceed 20 mm. The mixer shall be constructed to prevent leakage of the contents. The mixer shall be fitted with separate dry and wet mixing cycle timers and locking devices so that asphalt cement cannot be discharged and the pugmill gate cannot be opened until the desired mixing times have elapsed.

Mixing time shall be determined as the minimum time required to fully coat all aggregate particles with a uniform coating of bitumen.

603.05.03 Special Requirements for Drum Mixers

603.05.03.01 Aggregate Feed System

A positive interlocked automatic shut-off shall be provided so that the plant shuts down automatically after a 15 second disruption in the flow of aggregate from any cold feed bin.

The Contractor shall be responsible for obtaining aggregate moisture contents and adjusting the system accordingly to ensure the correct proportion of asphalt cement and aggregate are maintained.

A vibrating screen of adequate size and capacity shall be provided for oversize material and other debris from the combined cold feed.

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The conveyor belt, with the load cell, shall be equipped with a positive means to prevent build-up of material.

603.05.03.02 Asphalt Cement Control Unit

A flow switch shall be installed in the delivery system which will automatically stop the plant if an interruption occurs in the asphalt cement flow.

The asphalt cement metering system shall have provision to compensate for fluctuations in specific gravity and temperature. The Contractor shall be responsible for calculating and adjusting specific gravity values for temperature fluctuations of 5°C or a temperature compensating system shall be installed in the asphalt cement line from the storage tank.

A positive means of controlling the delay time between initial aggregate flow and initial asphalt cement delivered shall be employed.

603.05.03.03 Calibration

The asphalt feed system shall be equipped with a calibration system to allow asphalt cement to be bypassed into a container and weighed. The asphalt cement metering system shall be calibrated to an accuracy of plus or minus 1% through the actual working range of the system, at the start of the paving season, whenever the weighing conveyor is moved and whenever deemed necessary by the Engineer.

The aggregate belt scale on the cold feed conveyor shall be calibrated within an accuracy of plus or minus 0.5% through the actual working range of the system at the start of the Contract, whenever the weighing conveyor is moved, and whenever deemed necessary by the Engineer.

603.05.04 Placement Equipment

Pavers shall be self-propelled and capable of laying a consistent, satisfactory mat which is true to the specified geometrics, cross-section and alignment as directed by the Engineer.

The term "screed" shall mean the unit of the paver which strikes off and imparts an initial compaction to the mix.

Pavers shall be equipped with hoppers and distributing screws to place the mixture evenly in front of the screed.

Pavers shall be equipped with screeds and shall be capable of spreading the mixtures, without segregation in thickness from 12 - 200 mm, and in widths to at least 4 m in increments of 250 mm. The screed shall be adjustable to level and crown and shall be heated in an approved manner.

Pavers shall be equipped with automatic longitudinal and transverse grade and slope controls which are capable of being operated from either side of the paver.

The longitudinal grade control shall be adjustable for small mat thickness increments without stopping the paver and shall be equipped to operate from either a 12 m ski or floating beam, a 3 m ski, or a joint matching shoe as required. Where the ski is a flexible unit, it shall be equipped with a spring-tensioned wire extending between brackets fitted

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on and slightly above each end of the ski. The sensing grid shall ride on the wire and not on the ski.

The term "screed extension" shall mean the section of screed plate, mould board, tamperbar/vibrator and spreading screw which are used to extend the basic screed to the desired paving width.

The term "hydraulic strike-off" shall mean an extension to the mould board and strike-off which can be extended beyond the screed while the paver is operating, to place any strike-off mixtures in narrow transitions or tapers.

Vibrating hydraulic extendable screeds and vibrating bolt-on screed extensions shall be used in placing mat widths greater than three (3) m. Only hydraulic extendable screeds shall be used for paving varying width such as transitions or tapers. Hot overlays using fixed screed extensions shall only be permitted with the approval of the Engineer. All extensions shall provide the same degree of heat and vibration as the main screed. Hydraulic strike-off extensions will not be allowed in the laying of regular or specified mat widths or when placing surface mixture. A three (3) m straight edge shall be provided on each paver. This straight edge shall be of metal or wood.

603.05.05 Compaction Equipment

All rollers shall be of types specifically designed for asphalt compaction.

Rollers shall be in good condition and capable of reversing without backlash.

Steel wheeled rollers shall be equipped with a means of supplying a controlled flow of water to the wheels to prevent adhesion of the asphalt mix.

Pneumatic-tired rollers shall be self-propelled with a mechanical means of adjusting the tire inflation pressure. Wheels shall be mounted with smooth tread rubber tires. Approved skirts or windbreaks shall be provided on rollers to protect tires from the cooling air.

All rollers with rubber tires shall be equipped with a means to prevent the asphalt mix from adhering to the rubber tires.

Vibratory rollers shall be equipped with a device that accurately indicates the speed of the roller and the vibrating frequency. All vibratory rollers shall be equipped with an accurate speedometer that indicates speed in increments of one (1) km/hr through the normal operating range. All vibratory rollers shall be equipped with a gauge showing the frequency of vibration per minute when operating in vibratory mode. The frequency of vibration shall not be less than 2200 vibrations per minute. All vibratory rollers shall be capable of automatically stopping the vibrations prior to stopping.

Compaction equipment shall consist of at least one of each of the following:

- a) Vibratory roller
- b) Pneumatic tire roller
- c) Steel-drum tandem finish roller.

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603.05.06 Material Transfer Vehicle

Provided a Material Transfer Vehicle (MTV) has been permitted for use by the Engineer the Contractor shall be paid a cost per tonne premium, for all non-segregated, uniformly textured, smooth asphaltic concrete applied using an approved Material Transfer Vehicle (MTV).

Material Transfer Vehicles (MTVs) proposed for use by the Contractor must be evaluated and approved by the Department. Material Transfer Vehicles (MTVs) shall be self-propelled equipment capable of transferring asphaltic concrete from the hauling equipment into the paver.

The MTV is not to come in direct contact with the paver, and shall meet the following criteria for a Type 1 or Type 2 MTV:

Type 1 MTV :

- (i) Minimum storage capacity of 20 tonne.
- (ii) A conveyor system to transfer asphaltic concrete from the hauling equipment to the paver hopper insert; and
- (iii) An auger system in the MTV or paddle mixers in the storage hopper to re-mix the asphaltic concrete prior to discharge from the Material Transfer Vehicle into the paver hopper insert.

Type 2 MTV :

- (i) Minimum loaded capacity of 15 tonne
- (ii) An auger re-mix system within the MTV receiving hopper
- (iii) A conveyor system to transfer asphaltic concrete from the hauling equipment to the paver hopper insert

Provided a Material Transfer Vehicle (MTV) has been permitted for use by the Engineer, the Contractor shall be paid a cost of \$5.00 per tonne (Type 1 MTV) or \$4.00 per tonne (Type 2 MTV) premium for all non-segregated, uniformly textured, smooth asphaltic concrete.

Areas subject to repairs, as a result of segregation and non-uniform texture (as determined by a Department Engineer) will not be eligible for the cost per tonne premium. Repairs, if required, shall be at the Contractor's expense and shall extend the full width and full depth of the mat in which the repair work is performed.

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Plant Calibrations

All asphalt plants must be calibrated to meet accuracy requirements in accordance with the Department's plant calibration procedures at the commencement of each paving season and at each set-up for portable plants using the truck scale (certified by a scale company) at the asphalt plant site.

The Engineer shall be notified a minimum of 24 hours in advance by the Contractor when the plant is ready for verification of the calibrated system.

Calibration verification of the asphalt plant will occur during the daylight hours only.

The Department, at the discretion of the Engineer, shall randomly check the asphalt plant to ensure the mixture can be produced within the required plant calibration tolerances and if the plant does not meet the required tolerance a re-calibration of the plant may be required.

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603.07 Manufacture of the Mixture

603.07.01 Batch and Continuous Mix

For batch and continuous mixing, the mix proportions of the hot aggregate including any blending sand from each individual hot bin, filler and lime when required, and the asphalt cement, shall be measured separately and accurately. In batch mixing, the asphalt cement shall be added after the hot aggregate, and filler and lime when required, had been charged into the mixer and thoroughly dry mixed for at least 15 seconds. Mixing shall be continued for a period of not less than 25 seconds or longer if necessary, to produce a uniform homogenous mixture in which all particles of the mineral aggregate are thoroughly and uniformly coated. In continuous mixing, the mixing period shall be as determined by the formula given in Sub-Provision 603.05.03.04 but not less than 40 seconds and longer if necessary, to produce a uniform homogenous mixture.

The temperature of the mixture as it is discharged from the mixer shall be controlled within plus or minus 5°C of the temperature designated by the Engineer to be consistent with proper mixing and laying and in no case in excess of 160°C.

603.07.02 Drier Drum Mixer

The plant shall not be operated outside the production range established during plant weight cell calibration.

The heating, coating, and mixing of the asphalt mix shall be accomplished in an approved parallel flow drier-mixer. The aggregate shall enter the drum at the burner end and travel parallel to the flame and exhaust gas stream. Heating shall be controlled to prevent fracture of the aggregate or excessive oxidation of the asphalt. The system shall be equipped with automatic burner controls and shall provide for continuous printing of a temperature recording of the bituminous mixture at discharge to be monitored by the plant operator. The printed record of mix temperatures shall also be available to the Department for inspection.

The mixing period and temperature shall produce a uniform mixture in which all the particles are thoroughly coated. Facilities for sampling and observing the mix at this point shall be provided.

The temperature of the mix immediately after mixing shall not exceed 165°C. The method used to transfer the mixture from the drum mixer to the haulage units shall be designed, constructed and operated so that no segregation of, or damage to, the mix occurs.

603.07.03 Moisture Content

The maximum moisture content allowed in the asphaltic concrete mix as it is discharged to the surge bin, storage silo, or plug mill shall not exceed 0.15%.

The aggregate shall be dried sufficiently so that visual evidence of moisture, such as but not limited to the presence of foaming, slumping or stripping of the mix, does not occur.

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603.08 Transportation of the Mixture

The mixture shall be transported from the asphalt plant to the work site in vehicles with smooth metal boxes in good and leak-proof condition and previously cleaned of all foreign materials. Each vehicle shall be equipped with a tarpaulin of canvas or other suitable material. Such tarpaulins shall be on the truck at all times and shall be of sufficient size to overhang the fully loaded truck box and to be tied down on three sides. Tarpaulins shall prevent air flow from contacting the mixture as well as preventing water from entering the truck box. Tarpaulins shall be rolled off the hot mix before the load is dumped into the spreader.

Truck boxes shall be lightly coated with a uniform application of a release agent just before each loading. If liquid agent is used, the truck boxes must be drained after each application and before each loading. All release agents shall comply with occupational health and safety requirements and must not be detrimental to the mix.

Delivery of hot mix to the work site shall be scheduled such that spreading and compacting of the hot mix complies with the time restraints imposed by Provision 106.12. In no case shall temperature be increased at the plant to offset long distance hauling unless authorized by the Engineer in writing.

603.09 Communication Between Road and Plant

Direct communications between the paving operation and the plant shall be the responsibility of the Contractor. Inability to control the delivery of the mixture shall not be cause for the acceptance of work which does not meet the requirements of the Contract, nor shall it relieve the Contractor's responsibility for rejected loads.

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HOT MIX ASPHALTIC CONCRETE – Seal Course Trial Area

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603.10 Seal Course Trial Area

On projects which require asphaltic concrete type B & C, the Contractor shall be required to produce seal course mix for sampling and testing before placement commences. At the discretion of the Engineer, the Contractor shall place a minimum of 60 tonnes of seal course mix on a trial area.

The placement of seal course shall be typical of the entire Contract and shall allow the evaluation of the equipment performance under normal operation. Locations such as interchange ramps or intersections are not suitable. The trial area shall be a section which requires a covering seal course mix. Where the base course is 70 mm or greater in thickness the asphalt shall be laid in 2 lifts in the trial area so that the upper lift of 35 mm thickness may be constructed using seal course mix.

The placement of seal course shall not be permitted until the Contractor has demonstrated in the trial area that the materials, equipment, personnel and methods of operation are capable of producing a satisfactory pavement meeting design and specification requirements.

The construction of the trial area may involve moving road equipment back and forth or changing methods of operation or changing plant facilities and operation until the Engineer is assured that the trial area is satisfactory. If deficiencies in the mixture, equipment, operations or end results are indicated, during the construction of the trial area, work on the trial area shall be suspended until the deficiencies are corrected.

No additional payment shall be made to the Contractor for carrying out the operational work necessary for construction of the trial area, as all associated costs are to be included in the Contract unit bid price for seal course.

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603.11 Requirements for Completed Pavement Courses

After final compaction, the surface of each course, and across longitudinal joints other than at a crown, shall be free from deviations exceeding 4 mm as measured with a 3 m straight edge.

Each course after final compaction shall be smooth and true to the required cross-slope and grade. The Contractor shall be responsible for the determination of mix course thicknesses, unless otherwise specified by the Engineer.

The minimum thickness for A mix shall not be less than 50 mm.

The minimum thickness for B & C mix shall not be less than 35 mm.

The thickness of combined courses shall be within 5 mm of the specified design thickness.

Each course shall be within 0.5% of the specified cross-slope.

Levelling courses shall not be subject to the 5 mm thickness tolerance.

The finished surface of any pavement course shall have a uniform texture and be free of visible signs of poor workmanship.

If the Engineer determines that any load of asphalt concrete is visually unacceptable for reasons of being segregated or the aggregate being improperly coated, it will be rejected for used in the work.

Any obvious defects, as determined by the Engineer, will be cause for rejection of the pavement. Such defects shall include, but not necessarily be limited to, the following:

- (i) Segregated areas;
- (ii) Areas of excess or insufficient asphalt cement;
- (iii) Roller marks;
- (iv) Cracking or tearing;
- (v) Improper matching of longitudinal and transverse joints;
- (vi) Tire marks;
- (vii) Sampling locations not properly reinstated;
- (viii) Improperly constructed patches;
- (ix) Improper cross slope and;
- (x) Fuel spills on the mat.

The Department reserves the right to reject pavement not meeting the requirements of this specification and reserves the right to require that the Contractor replace the pavement at no cost to the Department.

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603.12 Placing of Asphaltic Concrete

Prior to placing any course of asphalt on a granular grade the Contractor shall ensure that fine grading has been achieved and that the necessary planning with respect to mat widths or transitions has been conducted.

The mixture shall be laid only upon a base which is firm and free from standing water. Not less than 300 m of prepared grade shall be maintained ahead of the paver. This requirement shall be waived at the end of the lane, or at the end of the paving operation for that day. Prior to the delivery of the mix, the prepared base shall be cleaned of all loose or foreign material by the use of a power broom or other suitable means.

A course shall not be placed upon a previously laid course until at least 12 hours following the final compaction of the previously laid course.

Immediately after each course is laid and before roller compaction commences, the surface shall be checked and any deficiencies in surface geometrics or texture shall be corrected. Irregularities in alignment and grade along the outside edges shall be corrected before rolling.

The Contractor shall provide competent workmen who are capable of correcting all pavement irregularities.

The mixture shall be dumped in the centre of the spreader hopper and care shall be exercised to avoid over-loading and spillage of the mixture.

The automatic screed controls and all compaction aids on the paver shall be in operation during placing of the mixture unless otherwise directed.

To ensure continuous operation, pavers shall operate at uniform speeds to match the output of the plant provided that a consistent and satisfactory mat is being laid. However, in no case shall the speed of the paver exceed 10 m/min.

The longitudinal alignment of the paver shall be controlled by a string line set from the alignment stakes. The string-line shall be set on the outer edges of the pavement so that the paver is directed at all times by the alignment stakes and not by the edge of the preceding courses.

The longitudinal grade of single pavers, or the lead paver shall be controlled by an approved 12 m ski or a 12 m floating beam. Where such a ski is a flexible unit, it shall be equipped with a spring tensioned wire extending between brackets fitted on and slightly above each end of the ski. The sensing grid shall ride on the wire and not on the ski.

When placing a second or subsequent mat using a single paver, joints shall be matched using an approved ski not less than 3 m in length or an approved joint matching shoe, which would ride on the previously placed compacted mat.

Automatic longitudinal grade controls shall be required to be used in combination with transverse slope controls or as otherwise approved by the Engineer.

In narrow base widening, deep or irregular sections, intersections, turnouts or driveways, where it is impractical to spread and finish the base, levelling or seal mixtures by machine methods the Contractor shall spread the mixture by hand. During hand spreading, loads shall not be dumped any faster than they can be properly handled. When it is necessary

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to hand spread the mixture in areas adjacent to machine laid areas, such hand spreading shall be carried out concurrent with machine laying in order to obtain a good joint.

In an effort to eliminate seams, there shall be no visible longitudinal joints on the asphalt seal, with the exception of the centerline of the roadway. In wider areas where this cannot be achieved with one paver, multiple pavers will be required. Layout and construction method must be approved by the Engineer.

A mixture which does not comply with the requirements or a mixture which cannot be incorporated in the work shall be rejected. The Department shall charge the Contractor the cost of those materials which are supplied by the Department and that are contained in the rejected work or mixture.

When the Contractor chooses to supply asphaltic concrete to the contract from more than one asphalt plant, the asphaltic concrete mix supplied shall be required to be comprised of aggregates from the same aggregate sources unless otherwise approved by the Engineer.

Temperature Requirements for Placement

- 1) Asphalt concrete mix shall not be placed unless the air temperature at the surface of the road is 5°C or greater. Under no circumstances will asphalt concrete be placed on frozen base or subgrade.
- 2) For hot mix the temperature prior to initial rolling shall be minimum 125°C.
- 3) For warm mix the temperature directly behind the screed shall be maximum 130°C and minimum 100°C prior to initial rolling. Placement temperatures may be altered depending on additive supplier recommendations and at the discretion of the Engineer.

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603.13 Construction of Joints

All joints shall be so constructed to ensure a thorough and continuous bond and to provide a smooth riding surface.

All dirt, foreign material and loose material shall be removed from all faces against which joints are to be made.

All faces at which joints are to be made shall be painted with a thin uniform coating of joint painting material, with the exception of joints between adjacent lanes of Mix D. Joints not meeting requirements shall be repaired to the satisfaction of the Engineer.

603.13.01 Requirements for Longitudinal Joints

Joints shall be properly "set up" with the back of a rake or lute at proper height and grade prior to rolling to form a correct, clean and neat joint.

The width of subsequent courses shall be adjusted to an off set of 150-300 mm to ensure that longitudinal joints do not coincide vertically.

When matching a compacted joint, the thickness of the uncompacted mat shall be set to allow for compaction, and the paver shall overlap the adjoining mat by at least 50 mm. After compaction the measured deviation across longitudinal joints other than at the crown shall not exceed 4 mm as measured with a 3 meter straight edge.

603.13.02 Requirements for Transverse Joints with New Asphaltic Concrete

Transverse joints between asphaltic concrete laid under this Contract (i.e. new asphaltic concrete) shall be constructed by cutting a straight vertical face to the full thickness of the proposed lift. Adjacent mats shall be staggered a minimum of 6 m or to a greater length by the discretion of the Project Manager or Engineer.

The paver shall not move more than 20 m from any transverse joint until that joint has been compacted and measured with a straight edge by the Contractor.

Measurements of Transverse Joints shall be taken at right angles to the joint. Joint measurements shall be recorded at the centre and quarter points of the mat width. The 3 m straight edge shall be positioned to record the greatest measured deviation in any of the following positions:

- Extending back 3 m from the joint on the previously placed mat
- Projecting forward 3 m from the joint on the mat being placed.
- Centering the straight edge on the joint.

After compaction, the measured deviation across the transverse joints for A mixes shall not exceed 6 mm as measured with a 3 m straight edge. Transverse joints exceeding this measured deviation shall be repaired immediately.

After compaction, the measured deviation across the transverse joints for B and D mixes shall not exceed 4 mm as measured with a 3 m straight edge.

Transverse joints not meeting the measured deviation requirement shall be repaired to the satisfaction of the Engineer at the Contractor's own expense; the Contractor may be required to meet the measured deviation requirement by cold planing and replacing.

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Any joints considered for cold planing and replacing shall be planed the full travel or passing lane width and a minimum of 20 m in length. The depth of cold planing shall be the thickness originally specified for the mix being planed. The entire cold planing and replacing operation shall be done at the Contractor's own expense.

Replacement asphaltic concrete shall be with an approved asphaltic concrete mixture and shall be of the type originally specified.

Materials removed by cold planing shall become the property of the Contractor. The materials shall be hauled and stockpiled in accordance with environmental regulations. All costs associated with the hauling and stockpiling of this material shall be at the Contractor's own expense.

The repaired section shall be in accordance with Section 603.

603.13.03 Requirements for Transverse Construction Joints with Existing Asphaltic Concrete

Joints between asphaltic concrete laid under this Contract and existing asphaltic concrete shall be constructed as follows.

When matching into an existing asphaltic concrete pavement the transverse joint for the first lift shall be prepared by cutting the existing pavement to a straight vertical face and removing such area and depth of the existing pavement as may be necessary to ensure the full depth of asphaltic concrete thickness to be placed.

Successive lifts shall be offset from the previous joint by a minimum of 5 m and shall be prepared by cutting the existing pavement to a straight vertical face and removing such area and depth of the existing pavement as may be necessary to ensure the successive lift thickness.

Adjacent mats on the final lift of asphalt base and on the asphalt seal shall be offset a minimum of 3 m.

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603.14 General Requirements For Compaction

Compaction equipment requirements shall be as per section 603.05.06, Compaction Equipment Requirements.

In all cases, the production and placement of mixture shall be controlled so that all rolling shall be completed a ½ hour before sunset.

603.14.01 Definitions

Lot: A discrete quantity of material or work to which an acceptance procedure is applied.

Mean (X): The arithmetic average of a group of test measurements.

Random Sample: A sample selected in such a way that every element of the population has an equally likely opportunity to be included in the sample.

Sample: A subset of the lot, measurements on which are used to assess the quality of the lot.

Standard Deviation: The square root of the value found by adding the squares of the individual deviations of each test result from the mean of the test results, and dividing by one less than the number of tests.

603.14.02 Sampling

Pavement sampling will be conducted using the Stratified Random Sampling Procedure. The sampling frequency will be based on lots. A lot will normally be one day's production of each hot mix type. A lot will be terminated when the operation changes from one pavement course to another or moves to a different contract. Each lot will be divided into four approximately equal sublots.

The Engineer, using random numbers, will determine the sample location for each subplot.

Random pavement core samples obtained from each subplot will not be taken within 300 mm of a longitudinal or transverse joint or pavement edge.

Random pavement core samples shall be obtained not later than the next working day after the compaction of the lot.

Each core shall have a minimum nominal diameter of at least 150 mm and a maximum nominal diameter of 200 mm and shall consist of the full layer being sampled.

The Contractor, with approval of the Engineer, may elect to arrange for independent core sampling, in conformance with this specification. Care shall be taken to ensure that cores are not damaged during coring operations or in transit. Core samples shall be delivered within two hours of sampling to the TIR Laboratory for analysis. Holes resulting from the removal of pavement samples shall be repaired to the satisfaction of the Engineer in conformance to the specification.

Core samples shall be placed in a suitable container which will protect the sample integrity during transport and until testing. Each sample shall be labelled with the contractor, contract number, highway number, date sampled, mix type, lot number, subplot number, lift number, design lift thickness, station location and offset of the highway.

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603.14.03 Determination of Percent Compaction

The percent compaction will be determined by the Department on the random samples using the following procedure:

$$\% \text{ Compaction} = \frac{\text{BRD} \times 100}{\text{MMRD}}$$

Where MMRD = The mean maximum theoretical relative density of the subplot random cores determined by ASTM D2041.

BRD = The bulk relative density of a random core obtained from the lot, determined by ASTM D2726 for specimens that contain moisture.

The mean percent compaction for the lot will be determined by calculating the mean of the four subplot random core percent compaction results.

603.14.04.01 Acceptance Procedure

Acceptance for the lot will be based on the lot average compaction.

The lot mean and individual percent compaction value will be reported to one decimal place.

The price adjustment for a given lot based on the lot average method will be determined by reference to the appropriate price adjustment in Table 603.8 provided:

1. Each subplot core shall meet or exceed 89.5% of the mean maximum theoretical relative density for the lot.
2. Each subplot core shall not exceed 97.5% of the mean maximum theoretical relative density for the lot.
3. Subject to the discretion of the Engineer, rejectable lots/sublots shall be repaired/re-decisioned as per 603.14.04.03 or price adjusted. The Engineer will indicate what areas in the lot, as determined by coring are to be repaired or subject to price adjustment for the value of re-instating the mix.
4. Provided the area subject to rejection is permitted to remain in the work as per the Engineer's discretion, the area shall be subject to price adjustment. This value will be determined by the Engineer and shall be the value of the tendered asphalt mix plus the value of the tendered liquid asphalt to replace the asphalt in the rejected area. The asphalt volume would be determined by using a depth equal to the mat thickness, a width equal to lane width (plus the paved shoulder width if applicable) and a length defined by acceptable cores. For the purpose of this exercise the density of the asphalt shall be 2.5 tonnes per cubic meter. Any subplot subject to rejection that has been covered with asphaltic concrete prior to the compaction results being determined shall be subject to \$10.00/tonne price adjustment. In addition the lower rejection limit of 89.5% or the upper rejection of 97.5 %, depending on the limit failed shall be used for the covered failed subplot to calculate the mean lot average for price adjustment for the lot. Either the price adjustment calculated for the failed subplot for asphaltic concrete remaining in the work as per the Engineer's discretion, or the price adjustment calculated for the covered asphaltic concrete prior to the compaction results being determined for the subplot shall apply.

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Table 603-8 Price Adjustment Per Tonne Based on Lot Average
Percent of Maximum Theoretical Relative Density

Lot Average	Price Adjustment Per Tonne
>97.5	Reject
97.5-95.5	0
95.4	\$0.25
95.3	\$0.50
95.2	\$0.75
95.1	\$1.00
95.0-93.5	\$1.25
93.4	\$1.00
93.3	\$0.75
93.2	\$0.50
93.1	\$0.25
93.0-92.5	0
92.4	(\$0.10)
92.3	(\$0.20)
92.2	(\$0.30)
92.1	(\$0.40)
92.0	(\$0.50)
91.9	(\$0.60)
91.8	(\$0.70)
91.7	(\$0.80)
91.6	(\$0.90)
91.5	(\$1.00)
91.4	(\$1.10)
91.3	(\$1.20)
91.2	(\$1.30)
91.1	(\$1.40)
91.0	(\$1.50)
90.9	(\$1.75)
90.8	(\$2.00)
90.7	(\$2.25)
90.6	(\$2.50)
90.5	(\$2.75)
90.4	(\$3.00)
90.3	(\$3.25)
90.2	(\$3.50)
90.1	(\$3.75)
90.0	(\$4.00)
89.9	(\$5.00)
89.8	(\$6.00)
89.7	(\$7.00)
89.6	(\$8.00)
89.5	(\$9.00)

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<89.5	Reject

603.14.04.02 Retesting

Each sample will be checked for validity in accordance with ASTM E 178-80, Standard Practice for Dealing with Outlying Observations using a "T" test at a 5 percent significance level (two-sided).

- 1) If the outlier test procedure shows that the test result is valid then the test result will be used in the calculations.
- 2) If the outlier test procedure shows that the test result is not valid, the test result will be discarded unless there is an obvious error in the calculations or in transposing of the numbers. If there is no obvious error, a replacement sample shall be obtained for retesting within 300 mm of the original randomly determined core location.
 - i. If a test result is deemed not valid and the test result has a zero or positive price adjustment, then no replacement sample will be obtained.
- 3) The test results from the replacement sample will be binding on both the Contractor and the Engineer and will be used in the determination of the mean lot average.

Provided the subplot has not been covered with asphaltic concrete:

- 1) Any subplot subject to rejection will automatically be re-sampled within 300 mm of the original randomly determined core location.
- 3) If this verification sample confirms that the subplot sample is subject to rejection, subsequent samples will be obtained at 20 metre increments. These subsequent samples will be obtained in both directions, within the subplot, in order to establish the extent of the area subject to rejection, a mean of the final subplot samples defining the rejection areas shall be utilized to calculate the mean lot average for price adjustment for the lot.
- 4) If the verification sample does not confirm that the subplot sample is subject to rejection, the verification sample will be substituted for the original subplot sample.

Any subplot which has been covered with asphaltic concrete shall not be retested to:

- 1) Check for validity in accordance with ASTM E 178-80, Standard Practice for Dealing with Outlying Observations using a "T" test at a 5 percent significance level (two-sided).
- 2) Verify rejection or to determine the extent of the rejection area.

Covered rejectable sublots shall be subject to a \$10.00/tonne price adjustment. In addition the lower rejection limit of 89.5% or the upper rejection of 97.5%, depending on the limit failed shall be used for the rejected subplot to calculate the mean lot average for price adjustment for the lot.

603.14.04.03 Repairing And Re-Decisioning

When the Engineer requires a rejectable lot/sublot to be repaired, the Engineer will indicate what areas in the lot are to be repaired.

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These areas shall be repaired by removal and replacement or as approved by the Engineer prior to re-decisioning. The minimum width of repair shall be the width of the lane and/or shoulder being repaired. The minimum length shall be sufficient for a paver to be used for carrying out the repair and shall not be less than 40 metres in length.

When repairs are made to all or parts of a lot the lot shall be re-decisioned. Replacement core samples shall be obtained for all sublots which were subject to rejection. The test results from the replacement samples will be binding on both the Contractor and the Engineer and will be used in the determination of the mean lot average.

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603.15 Smoothness

603.15.01 Definitions

International Roughness Index (IRI). IRI is a statistical measurement used to determine the amount of roughness in a measured longitudinal profile. IRI will be measured in mm/m and reported to two (2) decimal places for all procedures relating to this specification.

Reporting Interval. The reporting interval for this specification shall be 100 metres for overall IRI, and 10 metres for localized roughness.

Localized Roughness. Localized roughness is reported in 10 metre intervals where the IRI exceeds an established value as set out in Table 603.15-2 of this specification, for a particular roadway category.

Segment. A segment of Roadway shall be defined by the full lane width (including paved shoulders) over a defined length. The segment length shall be 10 metres for localized roughness. The segment length shall be 100 metres for overall IRI, however, shorter segment lengths may exist as outlined in Item 603.15.04.02.

Project Chainage. The distance as measured by the High Speed Profiler will be referenced to the contract stake chainage, but will be the only chainage deemed accurate and acceptable for the smoothness specification.

603.15.02 References

All reference standards shall be current issue or latest revision at the first date of Tender advertisements. This specification refers to the following standards, specifications or publications:

- ASTM E 950 Standard Test Method for Measuring the Longitudinal Profile of Travelled Surfaces with an Accelerometer Established Inertial Profiling Reference
- PEITIR General Provisions and Contract Specifications for Highway Construction.

603.15.03 Equipment

A Class 1 inertial laser profiler, with moving average filter (high pass 300 ft and low pass 1 ft), will be used for all smoothness measurements under this specification. The equipment will be installed and operated in accordance with the manufacturer's recommendations and ASTM E 950.

603.15.04 Smoothness Testing Procedures

The Department or its designated representative will conduct smoothness testing in accordance with ASTM E 950. The Department's smoothness testing results will be used in determining payment adjustments and areas requiring Corrective Work.

603.15.04.01 Profile Measurements

The profiler will conduct three (3) complete passes in each lane, recording the right and left wheel path IRI values simultaneously at 10 metre intervals. The final IRI will be the average of the three passes reported at 10 metre intervals. The 100 metre interval averages will then be computed from the 10 metre interval average IRI values.

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The profile measurements shall be collected in the direction of traffic. The start and end location of measurement for each lane shall be 30 metres from the transverse construction joints or in the case of a tapered lane at the locations defined by which the full lane width occurs.

603.15.04.02 Exclusions:

The 30 metre segments at both ends of the section under contract defined by the transverse construction joints shall be excluded from smoothness calculations. Bridge structures (excluding culverts and arches), underpass structures and overpass structures located within any 10 metre segment, including the 10 metre segments immediately before and after a structure will be excluded from payment adjustments under this specification.

603.15.05 Payment Adjustments

The Engineer will provide the Contractor with a copy of the smoothness test results, including detailed payment adjustment summaries and Compulsory Corrective Work requirements.

603.15.05.01 100 Metre Segments

Payment adjustments for 100 metre segments will be calculated based on the overall average IRI in mm/m for each 100 metre segment in each lane in accordance with Table 603.15-1.

Table 603.15-1 Price Adjustment for each 100 metre Segment in each Lane

IRI(mm/m)	Pay Adjustment
0.00 - 0.10	\$950.00
0.11 - 0.20	\$860.00
0.21 - 0.30	\$770.00
0.31 - 0.40	\$670.00
0.41 - 0.50	\$570.00
0.51 - 0.60	\$470.00
0.61 - 0.70	\$370.00
0.71 - 0.80	\$270.00
0.81 - 0.90	\$160.00
0.91 - 1.00	\$50.00
1.01 - 1.10	(\$70.00)
1.11 - 1.20	(\$190.00)
1.21 - 1.30	(\$320.00)
1.31 - 1.40	(\$450.00)
1.41 - 1.50	(\$590.00)
1.51 - 1.60	(\$740.00)
1.61 - 1.70	(\$900.00)

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1.71 - 1.80	(\$1070.00)
1.81 - 1.90	(\$1260.00)
1.91 - 2.00	(\$1480.00)
2.01 - 2.10	(\$1720.00)
2.11 - 2.20	(\$2040.00)
2.21 - 2.30	(\$2750.00)
2.31 - 2.40	(\$3290.00)
2.41 - 2.50	(\$3300.00)
2.51 - 3.00	(\$3300.00)

603.15.05.02 Localized Roughness

With the exception of areas described in Item 603.15.04.02, each 10 metre segment with an IRI value greater than those shown in Table 603.15-2 shall be defined as localized roughness; resulting in negative payment adjustments. The total localized roughness payment adjustment shall be the numerical summation of all the individual localized roughness payment adjustments for the defined section of Roadway.

**Table 603.15-2
Localized Roughness**

Localized Roughness IRI (mm/m) for 10 metre Segments	Payment Adjustment(for each occurrence)
>1.40 and ≤ 3	(\$250.00)
>3	(\$2000.00) or Compulsory Corrective Work

603.15.05.03 Total Payment Adjustments

The total payment adjustment shall be the summation of all the individual payment adjustments for each 100 metre segment in each lane, including localized roughness payment adjustments. If the total 100 metre segment payment adjustment is a positive value (bonus), the Contractor will be assessed the total 100 metre segment payment adjustment, and the total localized roughness payment adjustment for the defined section of Roadway.

If the total 100 metre segment payment adjustment is a negative value (penalty), the Contractor will be assessed either the total 100 metre segment payment adjustment or the total localized roughness payment adjustment, whichever is numerically less (i.e., whichever results in a greater penalty to the Contractor). The two penalties shall not be applied in summation.

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603.15.05.04 Segments Less Than 100 Metres

For segments less than 100 metres in length, price adjustments will be determined from 10 metre segments that are not subject to exclusions as described in Item 603.15.04.02. Payment adjustments under Item 603.15.05.01 and Item 603.15.05.02 shall apply to these areas based on the actual number of 10 metre segments that are not excluded. Price adjustments shall be prorated based on the number of non-excluded 10 metre segments in the 100 metre segment, as detailed in Table 603.15-1.

Example 1: 100 metre Segment (Station 7+700 - 7+800)
Exclusions apply in four (4) of the individual 10 m segments (20 m bridge + 10 m at each end)

10 Metre Segment	IRI (mm/m)	Exclusion Applies? (yes/no)	Localized Roughness Payment Adjustment	Average IRI over 60 metre Segment	IRI Payment Adjustment (See Table 603.15-1)	Total Payment Adjustment (for this 60 metre Segment)
7+700-7+710	0.53	No	\$0	$(0.53+0.39+0.34+0.23+0.28+1.42)/6 = 0.53$	$+\$470 \times 6/10 = +\$282$	$+\$282 - \$250 = +\$32$
7+710-7+720	0.39	No	\$0			
7+720-7+730	0.34	No	\$0			
7+730-7+740	0.23	No	\$0			
7+740-7+750	0.28	No	\$0			
7+750-7+760	1.15	Yes (Bridge Approach)	\$0			
7+760-7+770	1.86	Yes (Bridge)	\$0			
7+770-7+780	2.43	Yes (Bridge)	\$0			
7+780-7+790	0.91	Yes (Bridge Approach)	\$0			
7+790-7+800	1.42	No	-\$250			

Example 2: 30 metre Segment (Station 6+420 - 6+450) at end of paving section
Exclusions Apply in one (1) of the individual 10 m segments

10 Metre Segment	IRI (mm/m)	Exclusion Applies? (yes/no)	Localized Roughness Payment Adjustment	Average IRI over 30 metre Segment	IRI Payment Adjustment (See Table 603.15-1)	Total Payment Adjustment (for this 30 metre Segment)
6+420-6+430	0.88	No	\$0	$(0.88+1.45)/2 = 1.16$	$-\$190 \times 2/10 = \$38$	$-\$38 - \$250 = -\$250$
6+430-6+440	1.45	No	-\$250			
6+440-6+450	1.65	Yes (Manhole)	\$0			

603.15.06 Mandatory Penalty

The Contractor shall be subjected to a mandatory penalty of -\$2000.00 for each 10 metre segment with an IRI > 3.00 mm/m, with exception of areas defined in Section 603.15.04.02.

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HOT MIX ASPHALTIC CONCRETE – Smoothness

603.15

- 603.15.06.01 The Engineer reserves the right to require Compulsory Corrective Work on any 10 metre segments with an IRI > 3.00 mm/m. In any 10 metre segments where Compulsory Corrective Work is required, the Department will waive the -\$2000.00 penalty.

The Engineer shall notify the Contractor if Compulsory Corrective Work is required.

603.15.06.02 Compulsory Corrective Work Procedures

Corrective work shall consist of Removal and Replacement of the surface course of asphaltic concrete pavement. The minimum length of any repair area shall be 10 metres.

Removal and Replacement: On each of the 10 metre segments affected, the Contractor shall remove (by cold planing) and replace the full width of the lane and the full depth of the surface course of asphaltic concrete pavement affected, including paved shoulders.

Compulsory Corrective Work Requirements: The asphaltic concrete repair shall conform with either Section 603 or 609 of the Department's Specification, as stated in the Contract.

Incidental Corrective Work: Corrective Work may result in additional incidental costs, including but not limited to: tack coat, additional shoulder gravelling, guardrail adjustments, re-application of pavement markings, etc. Such work shall be carried out in accordance with the Department's specifications and at the Contractor's expense.

Disposal of Asphaltic Concrete: Asphaltic concrete that has been removed as a result of Corrective Work undertaken by the Contractor shall become the property of the Contractor to haul, stockpile or otherwise dispose of in an environmentally acceptable manner, at the Contractor's expense.

603.15.06.03 Retesting Following Corrective Work

After Corrective Work has been completed, each of the 100 metre segments containing corrective work will be retested, using the same profiler used in the original testing. The new IRI values will be used and the recalculated results will be binding.

Should the new IRI results indicate further Mandatory Penalty 10 metre segments as stated in Item 603.15.06, the Contractor shall be subject to the Mandatory Penalty as stated in Item 603.15.06.

603.15.06.04 Costs for Corrective Work

All costs associated with Corrective Work shall be the responsibility of the Contractor.

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HOT MIX ASPHALTIC CONCRETE – Cleanup

603.16

603.16

Cleanup

In addition to complying with the terms of Provision 103.04, the Contractor shall thoroughly remove from all bridges, culverts, catch basins, curbs, gutters and other structures asphalt or other work materials.

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HOT MIX ASPHALTIC CONCRETE – Method of Measurement/Basis of Payment 603.17/18

603.17 Method of Measurement

The quantity to be measured under this Section shall be the number of tonnes of each class of asphaltic concrete acceptably placed.

Cold planing of transverse construction joints shall be measured in accordance with Section 705.

Tack coat applications shall be measured in accordance with Section 601.

No measurement shall be made for the remedial work outlined in Sub-Provisions 603.13.02 and 603.15.02.

603.18 Basis of Payment

Payment under this Section shall be at the unit bid price per tonne for each type of hot mix asphaltic concrete and this price shall be full compensation for materials, other than those supplied by the Department; handling, hauling, storing, stockpiling, cutting of existing pavement, painting of joints, mixing, hauling, placing and compacting hot mix asphaltic concrete, tools, labour, equipment, materials and incidentals necessary to complete the work.

Payment for Asphalt Cement when RAP is incorporated into the asphalt mix shall be at the unit bid price per tonne. The unit bid price per tonne shall be based on the total metered asphalt cement content. This includes both the virgin asphalt cement and the asphalt cement contribution from the RAP.

Payment for cold planing of transverse construction joints shall be in accordance with Section 705.

No extra payment shall be made for paving intersections, aprons, driveway entrances, extra widths, deep or irregular sections other than the number of tonnes of asphaltic concrete of each class acceptably placed.

Tack coat applications shall be paid in accordance with Section 601.

No payment shall be made for the remedial work outlined in Sub-Provisions 603.13.02 and 603.15.02.

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CHIP SEAL

604

604.01 Description

This Section covers the requirements for the design, surface preparation, application of Bituminous Binder and the supply and application of aggregate for either single or double chip seal surface treatments.

604.01.01 Single Surface Treatment

A single chip seal surface treatment shall consist of a single application of binder followed by a single application of Class E aggregate.

604.01.02 Double Surface Treatment

A double chip seal surface treatment shall consist of a single application of binder followed by a single application of Class E aggregate, and a second application of binder followed by a single application of Class E aggregate.

604.02 Material

604.02.01 Chip Seal Aggregate

The chip seal aggregate must be crushed quarried rock and shall be of high quality and free of soft disintegrated stone, clay or other deleterious materials. The screening and crushing of natural gravel deposits to produce chip seal aggregate shall not be permitted.

The crushed aggregate shall be screened and washed over a 6.35 mm screen. Aggregate shall be washed only in properly designed and constructed washing plants. Truck or mixer washing of aggregates and washing methods of like intent will not be permitted.

Water used for washing aggregates shall be clean and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances. Where it is specified that the chip seal aggregate is to be stockpiled, it shall be washed first.

The aggregates shall meet the requirements of Tables 604-1 and 604-2.

Aggregate in stockpiles shall be free of all chlorides.

604.02.02 Asphalt Emulsion

Asphalt emulsion shall be RS-2K or HP-200 and shall meet the requirements of Table 604-3 when delivered to the job site.

Table 604-1 Gradation Requirement for Aggregate

Sieve Size	Passing (%)	ASTM
12.5 mm	100	C-136
9.5 mm	80-100	C-136
6.7 mm	0-43	C-136
4.75 mm	0-10	C-136
75 µm	0-15	C-117

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A minimum of 50% of the material in the total gradation must pass the 9.5 mm Sieve and be retained on the 6.7 mm Sieve.

Table 604-2 Physical Requirements for Aggregate

Test	Class E	ASTM
Los Angeles Abrasion, Max % Loss	25	C-131
Magnesium Sulfate Soundness, Max % Loss	12	C-88
Crushed, Min.%(¹)	100	-
Flat and Elongated, Max. % (¹)	20	-
Flakiness Index, Max. (%)	35	-
Petrographic Number, Max. (³)	135	-

- (1) The percent of crushed material will be determined on the fraction of particles by mass retained on the 4.75 mm Sieve having two or more mechanically fractured faces.
- (2) Flat and elongated particles are those whose greatest mean dimension in the longitudinal axis compared to the least mean dimension in the plane perpendicular to the longitudinal axis exceeds a ratio of 4:1.
- (3) Petrographic number to be determined using current Department test procedures.

604.03 Equipment

The Contractor shall supply all tools, machinery and equipment required in the execution of all phases of the work. Such equipment shall at all times be maintained in first class working condition and shall at all time be operated by skilled and experienced operators.

604.03.01 Pressure Distributor

The pressure distributor used for applying asphalt emulsion shall consist of a fully insulated tank permanently and rigidly mounted on a truck or trailer; that is capable of accurately maintaining any speed required for spraying and capable of applying the binder with plus or minus 5% of the desired application rate.

The distributor shall be provided with the following minimum equipment:

- Hand spray attachments to uniformly apply emulsion to any areas missed by the distributor.
- An efficient and positive means of uniformly heating emulsion and maintaining the contents at a constant selected temperature without local overheating, and a satisfactory method of circulating the contents during the entire heating process.

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- An approved thermometer with a minimum range of 10° - 150° C graduated in intervals of not more than 10° C with subdivisions at every 1° C, placed to accurately show the temperature of the distributor contents.
- An approved tachometer, driven from a fifth wheel, mounted so that it is readily visible to the driver. The tachometer must clearly and accurately register distances travelled when spraying emulsion and must allow the driver to maintain the constant speed required to ensure the specified rate of application.
- A bitumen pump tachometer with plus or minus 5% accuracy which registers pump speed.
- A pressure gauge with plus or minus 15 kPa accuracy indicating the pressure in the spray bar.
- A rear mounted adjustable spray bar set parallel to the surface to be sprayed to provide required spraying widths from 2.5 to 3.5 m. The distributor shall be equipped with a spray bar heating device. The distributor shall circulate a uniform viscosity and pressure of the emulsion at each nozzle, both before and during spraying operations. The circulating system shall also have a strainer to prevent clogging of the bar and nozzles. The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlaps the spray fan from the adjacent nozzle by 50% to ensure a uniformly sprayed surface. Spray bar height adjustment shall be made by the height set when the distributor is ½ full.
- Spray bar nozzles shall be designed and set to ensure uniform fan shaped sprays. The nozzles shall not produce such a fine mist that the emulsion will blow away resulting in a non-uniform emulsion coating. All spray nozzles shall be of the same manufacture, size, type and in good condition and shall be provided with valves capable of instant full opening and positive cut-off. All spray nozzles shall be set in the bar so that the nozzles slots make the same horizontal 30° angle with the longitudinal axis of the bar. Before work commences and periodically as required during spraying operations, the nozzles on the spray bar shall be removed and immersed in a solvent for a period of time sufficient to remove all congealed asphalt.
- A strainer shall be provided in the filling line to prevent entry of foreign material into the tank.
- A sampling cock fitted on the spray bar or circulating line is required to allow samples of the emulsion to be obtained directly from the distributor.

Table 604-3 Requirements for Emulsified Asphalt

Type	RS-2K		HP-200		
Test	Min	Max.	Min.	Max.	ASTM
Tests on Emulsion Saybolt Furol Viscosity at 50°C (mm³/s)	150	400	50	350	D-244

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Residue by Distillation (%)	65	-	65	-	D-244
Settlement in 5 days	-	5	-	3	D-244
Oil Portion of Distillate by Mass (%)	-	3	-	-	D-244
Retention by Mass on an 850 µm Sieve (%)	-	0.1	-	0.1	D-244
Coating (1)	-	-	-	-	-
Particle Charge	Positive		Negative		
Tests on Residue					
Penetration at 25°C, 100g, 5s (0.1 mm)	100	250	100	200	D-5
Ductility at 25°C, 5cm/min (cm)	60	-	46	-	D-113
Solubility in Trichloroethylene by Mass(%)	97.5	-	97.5	-	D-2042

- (1) Follow ASTM D-244 procedures for wet aggregate except that limestone aggregate and dust is replaced by the test aggregate. The stone should not be less than 75% coated, both before and after washing.

604.03.02 Mechanical Aggregate Spreader

The self-propelled aggregate spreader shall be capable of continuously and uniformly spreading closely regulated quantities of aggregate within plus or minus 10% of the application rate selected.

The spreader shall be equipped with a rear-mounted aggregate hopper. The spreader shall be equipped with a front hopper and an approved means of transferring the aggregate to this hopper from the rear. The front hopper shall be equipped with an oversize reject screen and metering gauges. The gates shall adjust the spreading width and shall be adjustable to obtain a uniform flow of aggregate across the spreading width. These gates shall also be designed to provide simultaneous movement or closure from the operator's position. The flow of aggregate from the metering gates shall be further controlled by a spread roller, the rotation of which shall automatically commence when the metering gates are opened.

604.03.03 Rollers

Steel-tired rollers shall have tandem wheels and weigh at least 7 tonnes and shall exert a pressure on the compression roll of at least 3.5 kg/mm per roll width. Pneumatic-tired rollers shall be self-propelled and have a minimum ballasted weight of 8 tonnes. A minimum of 2 pneumatic-tired rollers shall be used on each section of work.

604.03.03 Mechanical Broom

Shall be of an approved type suitable for pavement use.

604.04 Construction

604.04.01 Qualifications of Contractor

To be eligible as a bidder, the Contractor must have had previous experience of the application of chip seal of a similar nature in similar climatic conditions.

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CHIP SEAL**604**

The Contractor's foreman on this project shall have a minimum of 3 years experience.

604.04.02 Design

The Contractor shall assess the roadway surface condition and design the required application rates for binder and aggregate for either single or double chip seal treatments. A copy of which shall be forwarded to the Engineer.

604.04.03 Guarantee

The Contractor will be required to guarantee the work and associated items for a period of 1 year after completion against all defects, due either to defective workmanship and/or material. Any repairs required will be carried out expeditiously at the Contractor's own expense.

604.04.04 Inspection

The Engineer will have the right to inspect all or any of the materials at source, manufacture or storage. The Contractor will arrange for the Engineer to have the right of access to the supplier's premises for purposes of inspection.

604.04.05 Surface Preparation

Before chip seal operations commence the contractor shall completely clean the pavement of all dirt and other debris. Cleaning shall be by the use of a power broom. Should there be any depressions not completely cleaned with the power broom, then the Contractor shall clean such spots with a hand broom.

604.04.06 Pavement Restoration and Crack Filling

Pavement restoration and crack filling shall be carried out to repair pavement pot-holes and cracks prior to the carrying out of the chip seal surface treatment operations. The pavement restoration shall be in accordance with Section 709. Crack filling shall be in accordance with Section 607.

604.04.06.01 Trail Areas

When required by the Engineer, trial areas shall be used to establish the correct rates of application of binder and aggregate. A trial area shall be at least 100 m long and 1 lane wide. The rates of application of the binder and aggregate shall be determined by carefully measuring the contents of the distribution before and after spraying the trial area and by carefully measuring the quantity of aggregate applied.

604.04.07 Application of Emulsion

All required patching and crack filling shall be carried out to the satisfaction of the Engineer, at least 24 hours prior to chip seal emulsion application.

The emulsion shall be applied at a temperature in the range 60 - 80° C.

The emulsion shall be applied at the design rate as designed for either single or double chip seal treatments. For any given area the emulsion shall be applied at the rate designed by the Contractor.

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During the application of the emulsion, the distributor shall be operated by a minimum of 2 men, one of whom shall be stationed on the rear platform, to control the application. The forward speed of the distributor shall not exceed 1.6 m/s.

604.04.08 Application of Aggregate

The crushing and stockpiling of chip seal aggregates must be 100% complete prior to application to the road surface.

The aggregate shall be uniformly distributed at the application rate designed by the Contractor for both single and double chip seal treatments.

The aggregate application operation shall be coordinated with the emulsion application so that no more than 30 m separates the emulsion application and the aggregate spreading.

Application of aggregate operations for the day shall be completed at least 2 hours before sunset.

604.04.09 Rolling

Immediately after the application of the aggregate, pneumatic-tired rolling shall be carried out in such a manner that the entire treated area received at least 2 passes. Final rolling shall consist of 1 pass of a steel wheel roller.

The rollers shall be operated at such a speed that there is no aggregate pick up but in no case shall the speed of the rollers exceed 10 km/hr.

All rolling shall be completed within 30 m of the aggregate spreader. Initial rolling shall occur within 1 minute of the application of the aggregate.

The minimum number of rollers required is 2 pneumatic-tired rollers and 1 steel roller. If this combination of rollers is not sufficient to maintain the completed rate of progress additional rollers shall be provided.

604.04.10 Mechanical Brooming

The chip seal treated surface shall be swept with a power broom. All excess aggregate shall be removed and disposed of by the Contractor, at the Contractor's own expense. Sweeping shall not be carried out until the treatment has set to a sufficient degree so that the chip seal is not damaged.

On chip seal treated surfaces open to traffic, power brooming shall be carried out within 48 hours of the application of aggregate.

604.04.11 Temperature and Weather

Chip seal operations shall not be carried out when, in the opinion of the Engineer, road conditions, high humidity, imminence of rain, wetness or dampness are present.

Asphalt emulsion application operations shall not be carried out when the air temperature is less than 15° C

Chip seal treatment shall not be carried out before June 1 or after September 1, unless otherwise directed by the Engineer.

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604.04.12 Protection of Work and Traffic Control

When possible, the traffic shall be kept off the treated surface until the chip seal is resistant to damage. When traffic must go over the surface before it is fully cured, the Contractor shall control traffic speed by means of directing the traffic in convoys. The Contractor shall provide a lead vehicle to ensure that convoys proceed at low speed. Traffic control is to be maintained until power brooming has been completed.

604.05 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of acceptable chip seal applied.

Measurement for pavement restoration shall be in accordance with Section 709.

Measurement for crack filling shall be in accordance with Section 607.

604.06 Basis of Payment

Payment for chip seal shall be at the unit bid price per square metre and this price shall be full compensation for labour, materials, equipment, roadway surface preparation, supply and application of asphalt binder, supply and application of aggregate, rolling, power brooming, traffic control, royalties and incidentals necessary to perform the work.

No compensation other than the Contract price shall be made for variations in the rate of application or for the treatment of any areas, as required by the Engineer.

Payment for pavement restoration shall be in accordance with Section 709.

Payment for crack filling shall be in accordance with Section 607.

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DOUBLE EMULSIFIED ASPHALT SLURRY SEAL

605

605.01 General

605.01.01 Scope

This Section covers the requirements for the design, testing, surface preparation, traffic control and quality control required for the proper application of a double emulsified asphalt slurry seal.

605.01.02 Description

The slurry seal shall consist of a mixture of an approved emulsified asphalt, mineral aggregate, water and specified additive. The slurry seal mix shall be proportioned, mixed and uniformly spread over a properly prepared surface. The completed slurry seal shall be a homogeneous mat, adhered firmly to the prepared surface and with a skid resistant surface texture.

605.01.03 Applicable Specifications

The following specifications and all test methods therein dealing with mineral aggregates, mineral filler and slurry seal form a part of this specification:

American Society for Testing Materials and International Slurry Seal Association.

All material, equipment and construction procedures shall conform, unless otherwise directed, to the "Recommended Slurry Seal Surface" published by the International Slurry Seal Association except as modified by the requirements of this project specification.

605.01.04 Qualifications of Contractor

The Contractor must have had previous experience on the application of slurry seal of a similar nature in similar climatic conditions. The Contractor must list at least 5 similar jobs which on investigation will prove to have been completed in a satisfactory manner.

The Contractor's foreman on this project shall have a minimum of 3 year's experience on similar projects.

605.01.05 Guarantee

The Contractor will be required to guarantee the work and all associated items for a period of 1 year after contract completion date against all defects, due either to defective workmanship and/or materials. Any repairs required will be carried out expeditiously at the Contractor's own expense.

605.01.06 Inspection

The Engineer will have the right to inspect all or any of the work materials at the source, manufacture or storage. The Contractor will arrange for the Engineer to have the right of access to the supplier's premises as may be necessary for the purpose of inspection.

605.01.07 Mix Design

The Contractor shall assess the contract roadway surface condition.

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All materials shall be pretested by a qualified materials testing firm as to their suitability for use in slurry seal. A complete laboratory analysis and mix design, including the Wet Track Abrasion Test shall be submitted to the Engineer prior to commencement of the work.

605.02 Material

The emulsified asphalt shall conform to the requirements of ASTM D-2397 for CSS-1H emulsion type.

The mineral aggregate shall consist of manufactured crushed quarried rock such as granite, or other high quality aggregate. The aggregate shall be clean and free from vegetable matter and other deleterious substances.

When tested according to ASTM C-131, the aggregate shall show an abrasion loss of not more than 25%. When tested according to ASTM C-88, the aggregate shall show a loss of not more than 15% by use of magnesium sulphate.

Mineral filler in the form of normal Portland cement shall be considered part of the blended aggregate and shall be used in the proportion determined by the mix design.

When tested by ASTM C-136 and ASTM C-117, the aggregate and mineral filler shall meet the gradation of Table 605-1 as specified by the International Slurry Seal Association.

All water shall be potable and compatible with the slurry mix. Compatibility must be insured by the Contractor.

Additives may be used to accelerate or retard the break-set of the slurry seal or improve the finished surface. The use of additives in the slurry mix or in individual materials shall be made initially in quantities predetermined by the mix design with field adjustments, if required, after approval by the Engineer.

605.03 Equipment

All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working order at all times.

The slurry seal mixing equipment shall be a continuous flow mixing unit. The unit must have suitable means of accurately metering each individual material being fed into the mixer. All feeding mechanisms must be continuous feed and proportioning must remain constant at all times. The unit shall be equipped with approved devices so that the machine can be accurately calibrated and the material quantities of materials used during any period can be estimated.

The spreader box shall be equipped to prevent loss of slurry seal from all sides and shall be equipped with a flexible rear strike-off. It shall be capable of producing a uniform surface its full width and shall be equipped with hydraulically-powered augers to keep the slurry in motion and to help keep the mixture uniformly spread across the spreader box width.

Suitable crack and surface cleaning equipment, barricading equipment, hand tools and any support equipment shall be provided as necessary to perform the work.

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Table 605-1 Gradation Requirement for Aggregate and Mineral Filler

Sieve Size	Type II – Passing (%)
9.5 mm	100
4.75 mm	90-100
2.36 mm	65-90
1.18 mm	45-70
600 µm	30-50
300 µm	18-30
150 µm	10-21
75 µm	5-15

605.04 Construction

605.04.01 Traffic Control

The Contractor will be responsible for all traffic control.

Suitable methods, including directing the traffic in convoys shall be used by the Contractor to protect the slurry seal from traffic until the new surface will support the traffic without damage. Opening to traffic does not constitute acceptance of the work. The Engineer shall be notified of the methods to be used.

Any damage to the new surface during the curing period done by traffic or the Contractor's equipment will be repaired at the Contractor's own expense.

605.04.02 Weather Limitation

The slurry seal shall not be applied if either the pavement or air temperature is below 150 C and falling, but may be applied when both pavement and air temperatures are above 100 C and rising. No slurry seal 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 traffic opening to beyond a reasonable time.

605.04.03 Surface Preparation

Immediately prior to applying the slurry seal, the surface shall be cleared of all loose material, silt spots, vegetation, oil spots and other objectionable material. Any standard cleaning method will be acceptable. If water is used, cracks will be allowed to dry thoroughly before slurry sealing. The Engineer shall approve the surface preparation prior to sealing.

605.04.04 Application of the Slurry Surface

The surface shall be pre-wetted by fogging ahead of the slurry box when in the opinion of the Engineer, it is required by local conditions. Water used in pre-wetting the surface shall be applied such that the entire surface is damp with no apparent flowing water in front of the slurry box. The rate of application of the fog spray shall be adjusted during the day to suit temperatures, surface texture, humidity and pavement surface dryness.

The slurry mixture shall be of the desired consistency when deposited on the surface and no additional elements shall be added. A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that complete coverage is obtained. No lumping,

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balling or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted. If the coarse aggregate settles to the bottom of the mix, the slurry will be removed from the pavement. No excessive breaking of the emulsion will be allowed in the spreader box. No streaks caused by oversized aggregate will be left in the finished pavement.

605.04.05 Joints

No excessive build-up or unsightly appearance shall be permitted on longitudinal or transverse joints.

605.04.06 Handwork

Areas which cannot be reached with the slurry seal machine shall be surfaced using hand squeegees to provide complete and uniform slurry seal coverage. The area to be hand worked shall be lightly dampened prior to mix placement and the slurry shall be worked immediately. Care shall be exercised to leave no unsightly appearance from hand work. The same finish as applied by the spreader box shall be required. Hand work shall be completed during the machine applying process.

605.05 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of acceptable slurry seal.

605.06 Basis of Payment

Payment for slurry seal surface treatment shall be at the unit bid price per square metre of application and this price shall be full compensation for materials, preparation, mixing, application, labour, equipment, tools, test mix design, traffic control and incidentals to complete the work.

No compensation other than the Contract price shall be made for variations in the rate of application or for the re-treatment of any areas, as required by the Engineer.

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ASPHALTIC CONCRETE CURB

606

606.01 Description

This work shall consist of the manufacture and placement of asphaltic concrete curb in accordance with the Plans or as directed by the Engineer.

606.02 Material

The hot mix, hot placed asphaltic concrete shall meet the requirements for asphalt curb and shall be approved by the Engineer prior to placing. The liquid asphalt cement shall be supplied by the Contractor.

606.03 Construction

The hot mix, hot placed asphalt curb shall be placed on a clean area that has previously been coated with an approved bituminous tack coat at a rate as directed by the Engineer. Asphaltic curb shall be placed using an approved asphalt curb spreader which will produce a standard 15 cm curb.

606.04 Method of Measurement

Measurement for payment under this Section shall be the number of linear metres of asphaltic curb acceptably constructed.

606.05 Basis of Payment

Asphaltic concrete curb shall be paid for at the unit bid price per linear metre and this price shall be full compensation for the supply and placement of the curb, all labour, equipment, materials, tools and incidentals necessary to complete the work.

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ASPHALT CRACK FILLING

607**607.01** Description

This work shall consist of the routing and sealing of random and straight cracks in asphaltic concrete and Portland cement concrete pavement.

607.02 Material

Material used for sealing shall be specifically designed to form resilient adhesive and effective seals for cracks and joints. The material shall fully conform to the requirements of ASTM D-1190 or D-3405 and shall be subject to the Engineer's approval.

Current recommended materials are Hydrotech 6165 or 6160.

607.03 Equipment

Routing equipment shall have self-cleaning vertical routing bits which are capable of producing joints 40 mm in width and 15 mm deep.

The melting kettle shall be a double boiler with indirect heating; using a high flash point oil (Min. 315°C) as a heat transfer medium. The kettle shall have an effective mechanically operated agitator and shall be equipped with a positive thermostatic temperature control. The kettle shall be portable, mounted on rubber tires and equipped with a metal shield beneath the fire box to protect the pavement.

607.04 Construction Method

The bags shall be stripped from the compound and the material shall be cut into blocks of approximately 4.5 kg before being placed in the melting kettle. The kettle should be charged by adding a few sections of compound at a time.

The sealing compound shall be melted to the temperature specified by the manufacturer, but any material heated in excess of 230°C at any stage of the melting or pouring operation shall not be used in the work. The joint sealing compound shall be poured as soon as possible after the correct pouring temperature is reached. Only as much compound as can be poured in a day in accordance with Provision 106.12 shall be melted.

Cracks shall be routed to a depth of 10 mm and to the width of the crack or 40 mm whichever is less.

Following the routing operation and immediately prior to placing new joint sealing compound, all residual dust and debris created by the routing operation shall be thoroughly cleaned from the cut by a compressed air/hot lance. The Contractor is to sweep the debris to the gutter and dispose of it in accordance with Provision 104.14.

The joints shall be sealed in a neat manner so that upon completion of the work the surface of the sealing material shall be flush with, or not more than 3 mm below the adjacent pavement surface.

The pouring of joints shall only be undertaken when the joint surfaces are dry and the air temperature in the shade is 10°C.

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ASPHALT CRACK FILLING

607

607.05 Method of Measurement

The quantity to be measured for payment under this Section shall be the number of linear metres of cracks filled to the satisfaction of the Engineer.

607.06 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre and this price shall be full compensation for routing of cracks or joints, supply of crack filling compound, disposal of routed material, placement of crack filling material, all tools, equipment, labour, materials, and incidentals required to perform the work.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD MIX BITUMINOUS PATCHING MATERIAL

608

608.01 Description

This Section consists of supplying aggregates and engineered bituminous material to be blended together in a conventional asphalt plant, or approved pugmill, to produce a cold mix bituminous patching material.

608.02 Material

608.02.01 Aggregates

Aggregate to be supplied for the manufacture of cold mix bituminous patching material shall consist of manufactured material derived from crushed stone or gravel, the particles of which shall be clean, hard, durable and free from coatings of silt, clay or other deleterious material.

Aggregate shall meet the physical and gradation requirements of Tables 608-1 and 608-2.

**Table 608-1
Physical Requirements for Aggregate**

Test	Value	ASTM
Magnesium Sulphate Soundness, Max. Loss (%)	12	C-88
Relative Density	2.55 - 2.75	C-128
Absorption, Max. (%)	2	C-128
Moisture, Max. (%)	3	C-566

**Table 608-2
Gradation Requirement for Aggregate**

Sieve Size	Passing, (%)	ASTM
12.5 mm	100	C-136
9.5 mm	90-100	C-136
4.75 mm	40-70	C-136
2.36 mm	10-40	C-136
1.18 mm	0-15	C-136
0.300 mm	0-5	C-136
75 µm	0-2	C-117

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COLD MIX BITUMINOUS PATCHING MATERIAL

608

608.02.02 Bituminous Materials for Cold Mix

The bituminous material shall be a modified cut-back asphalt containing anti-stripping agents and additives designed to meet the following requirements:

- Stripping resistance
- Flexible and cohesive properties at cold temperatures
- Adhesive quality in wet application
- Long stockpile life of the cold mix bituminous patching material.

The bituminous material shall be in accordance with the requirements of Table 608-3.

Engineered bituminous products not complying with the physical properties specified in Table 608-3 may be approved for use upon review of documentation indicating the material's physical test properties.

**Table 608-3
Requirements for Bituminous Material**

Test	Min.	Max.	ASTM
Kinematic Viscosity at 60°C (mm²/s)	250	500	D-2170
Distillation Tests % of Total to 360°C			
to 225°C	0	10	D-402
to 260°C	15	55	D-402
to 315°C	60	87	D-402
Distillation Residue to 360°C, Difference by Volume (%)	67	-	D-402
Water Content (%)	-	0.2	D-95
Tests on Residue			
Penetration at 25°C, 100g, 5s (0.1mm)	120	250	D-5
Ductility at 25°C, 5cm/min (cm)	100	-	D-113
Solubility in Trichloroethylene by Mass(%)	99	-	D-2042

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COLD MIX BITUMINOUS PATCHING MATERIAL

608

608.03 Cold Mix Production

Aggregates shall be pre-dried and allowed to cool to a temperature between 60 - 85°C prior to being utilized in the mix, unless otherwise approved by the Engineer.

The aggregate and bitumen shall be mixed to ensure a homogenous mixture with all particles of the mineral aggregate thoroughly coated with bitumen.

The temperature of the final mixture at discharge shall not exceed 70°C. Cold Mix Production shall occur during daylight hours only.

608.04 Quality Control

Quality control shall be the responsibility of the Contractor. The manufactured cold mix bituminous patching material must meet the following specification requirements.

The extracted bitumen content from the cold mix shall be in accordance with Table 608-4.

**Table 608-4
Minimum Requirements for Extracted Bitumen Content**

Aggregate Absorption (%)		Extracted Bitumen (%)
Min.	Max.	Min.
0.0	1.0	4.5
1.1	1.5	5.0
1.6	2.0	5.5

Extracted bitumen content by ASTM D-2172

The retained coating of bitumen on aggregate must be in excess of 75% when tested in accordance with the following test for stripping resistance:

50 g of the cold mix will be placed in 400 ml of boiling distilled water in a 600 ml glass beaker. It will be stirred with a glass rod at one revolution per second for 3 min.

The percentage coating retained will then be visually evaluated. Retained coatings of less than 75 % shall constitute failure.

The estimated coated area shall be above 95%, as specified in ASTM D-1664.

The cold mix must remain flexible and cohesive to -10°C and must be capable of retaining adhesive qualities in place during wet application.

The cold mix must be capable of remaining pliable and usable in uncovered stockpiles for a minimum of 2 years.

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COLD MIX BITUMINOUS PATCHING MATERIAL

608

608.05 Quality Assurance

At least 1 week prior to proposed production of the cold mix bituminous patching material the Contractor shall:

Notify the Department to:

- Allow scheduling of moisture testing of the aggregate.
- Schedule a Department representative to be at the site at the time of mixing.

Deliver to the Department:

- A sample of the proposed engineered bituminous material.
- Test documentation of the proposed engineered bituminous material indicating compliance with specification requirements.
- Aggregate test documentation indicating compliance with physical and gradation requirements.

The Contractors shall provide to the Department records of testing of the cold mixed bituminous patching material showing compliance.

The cold mixed bituminous patching material shall be randomly sampled by Department representatives at the time of mixing.

608.06 Method of Measurement

Measurement for payment under this Section shall be the number of tonnes of cold mix bituminous patching material acceptably produced.

608.07 Basis of Payment

Cold mix bituminous patching material shall be paid for at the unit bid price per tonne delivered to the stockpile(s) and this price shall be full compensation for all work, material, trucking to the stockpiles, tools, equipment, labour and incidentals necessary to perform the work.

Drying aggregates prior to mixing shall be considered incidental to the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

HOT MIX ASPHALTIC CONCRETE – END RESULT SPECIFICATION (ERS)	609.01/02

609.01 Description

609.01.01 General

This Item defines the requirements for the supply and placement of hot mixed conventional asphaltic concrete for pavement construction and other purposes.

The asphaltic concrete shall be identified by the following mix designations:

- Hot mixed conventional asphaltic concrete base mix - A.
- Hot mixed recycled asphaltic concrete base mix - HRA.
- Hot mixed conventional asphaltic concrete surface mix - B.

It shall be the Contractor's responsibility to provide an acceptable product as specified.

- The Contractor shall implement and maintain a quality control system that will provide assurance that all components, as well as end result products, submitted to the Owner for acceptance, conform to the Contract requirements.
- This responsibility is without regard to whether the products are manufactured by the Contractor or purchased from suppliers or subcontractors.

Quality assurance tests shall be performed, by the Engineer, on random samples taken either at the job site or at the supplier's plant.

609.01.02 Definitions

End Result Specification (ERS):

A specification under which the Engineer monitors the Contractor's control of the process that produces the items of construction and accepts or rejects the end product according to a specified quality assurance plan; the Contractor is entirely responsible for quality control; end product acceptance is the responsibility of the Owner and includes a statistically oriented program of quality assurance testing.

Design Mix Formula (DMF):

The Laboratory determination of the precise proportions of asphalt binder and aggregates to be blended together to meet the specified properties for the asphaltic concrete mix.

Job Mix Formula (JMF):

The establishment of the single definite percentage passing the 4.75 mm and 75 µm sieve fraction of aggregate, the percentage of blending sand and the asphalt binder content that will produce the desired mix properties under field conditions.

- Percentage of materials constituting the JMF to be stated on the JMF sheet.

Asphalt Binder Content:

- Design Asphalt Binder Content - the asphalt binder content established by the DMF.
- Approved Asphalt Binder Content - the asphalt binder content determined by the JMF.
- Actual Asphalt Binder Content - the amount of asphalt binder in the mix as determined by ASTM D2172 or as per current TIR Test Procedures Manual, Series 400 Bituminous Materials LTP-418 (Asphalt Content of Bituminous Paving Mixtures by the Ignition Method).

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HOT MIX ASPHALTIC CONCRETE – END RESULT SPECIFICATION (ERS)

609.01/02

Lot:

A portion of the Work being considered for acceptance and is further defined as the following:

- A plant production of 1800 t $\pm$ 50 t where approved changes to the Job Mix Formula have not occurred.
- If it is the last time the mix is produced with this criterion the following shall apply;
 - If the plant production is 600 t or less, the production will be added to the previous Lot.
 - If the plant production is more than 600 t but less than 1800 t, the production will be designated as a Lot.
 - A separate Lot will be established if, in the Engineer's opinion, conditions of construction indicate that it is likely that a portion of a lot will be significantly different for the remainder of that Lot.

Stratified Random Sample:

The division of the Lot into 3 or more areas or segments' a random sample is taken from each area or segment in an un-biased way.

Sample Mean:

The arithmetic mean of a set of 3 or more test results constituting the sample.

Mean of the Deviations:

The sum of the absolute values of the deviations from the JMF or the air voids (4.00%) divided by the number of tests in the Lot.

Thickness:

The specified thickness as measured from the core samples.

609.02

Materials

609.02.01

Asphalt Binder

The Contractor shall supply as a bid item Performance Graded Asphalt Cement (PGAC) or Performance Graded Asphalt Cement with elastic recovery (PGAC-E) to be incorporated into the Department's work. Unless otherwise specified, the asphalt cement shall be PG 58-28 and shall conform in all respects to the performance grade requirements of AASHTO M320 Table 1- Performance Graded Asphalt Binder Specification.

Provided Asphalt Concrete HRA is used as per section 609.03.01.01, the Contractor shall supply as a bid item performance graded asphalt cement to be incorporated into the Department's work; the total asphalt cement, being comprised of both reclaimed asphalt cement and virgin asphalt cement, shall meet the requirements of PG 58-28 unless otherwise specified and shall conform in all respects to the performance grade requirements of AASHTO M320 Table 1- Performance Graded Asphalt Binder Specification.

When anti-stripping additives are required, the asphalt cement shall meet the specified requirements of AASHTO M320 Table 1, after the addition of the required additives.

The Contractor shall supply the applicable mixing and compaction temperatures for the performance graded asphalt cement specified in addition to the supplier documentation indicating current test results meeting the requirements of AASHTO M320 Table 1 after the addition of required anti-stripping additives if necessary.

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HOT MIX ASPHALTIC CONCRETE – END RESULT SPECIFICATION (ERS)

609.01/02

609.02.02 Mineral Filler

Mineral Filler shall meet the requirements of ASTM D-242.

609.02.03 Asphaltic Concrete Stripping

Any anti-stripping agent intended for use shall be incorporated in the mix design in the proportion to be used during production and in accordance with the Manufacturer's Specifications.

Anti-stripping admixtures shall be supplied by the Contractor.

The requirement for an anti-stripping admixture is determined at the asphaltic concrete mix design stage.

The anti-stripping agents shall consist of one of the following:

- Hydrated Lime (Ca(OH)₂) meeting the requirements of ASTM C-141
- Liquid Anti-Stripping Additives (from the approved list)

Table 609-2 Approved Anti-stripping Admixtures

Manufacturer	Product
Akzo Nobel Chemicals	Redicote C 3082
Akzo Nobel Chemicals	Redicote 95-S
Meadwestvaco Corp	Evotherm M1
Morton International	Pave Bond "T" Lite
Morton International	Pave Bond Lite
Travis Chemicals	Travcor 4501
ARR-MAZ Products	AD-here LOF 6500
Ultrapave	Ultracote (UP-5000)
Zydex	Zycosil
Zydex	Zycotherm

Inclusion on this list does not attest to efficacy of use with any specific aggregate or approval for use on any specific project. Testing for each product shall be required for this purpose. This list is subject to revision.

The type and dosage of all asphalt binder anti-stripping admixtures shall be noted on the delivery slip.

The Department may determine that an anti-stripping additive is required if one of the following conditions occurs:

- The long term tensile strength ratio (TSR) of the asphaltic concrete as per latest edition of AASHTO T283 (average of Conditioned & Freeze/Thaw TSR values) is less than 0.80.
- The conditioned and freeze thaw tensile strength values shall not be less than 400 kPa.
- Material that has been conditioned as per the latest edition of AASHTO T283 meets the 0.80 minimum requirement but a visual examination indicates there is evidence of stripping.
- If based on past performance the aggregate source is known to be prone to stripping.

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609.01/02

609.02.04 Addition of Liquid Anti-Stripping Additive

The liquid anti-stripping additive shall be added at a rate as determined by the mix design to the asphalt cement at the Supplier's depot, concurrently, with loading of the asphalt cement into the Carriers tanker.

609.02.05 Information Sessions

At a pre-construction meeting the Contractor and the Department will review the requirements for use of the liquid anti-stripping additive, including proper procedures, worker information, use of protective clothing and equipment, site supervision and contingency.

The Contractor shall advise workers of the proper procedures to be followed when working with asphalt cement or asphaltic concrete containing anti-stripping additives.

609.02.06 Aggregates

609.02.06.01 Coarse Aggregate

Coarse aggregate shall be supplied by the Contractor.

The coarse aggregate shall be prepared by crushing rock or gravel and shall consist of hard, sound, durable particles, free from adherent coatings, shale, clay, loam, schist and other soft or disintegrated pieces, or other deleterious substances.

Coarse aggregate is the portion retained on the 4.75 mm sieve, tested in accordance with ASTM C136, and shall meet the physical requirements of Table 609-1.

Coarse aggregate may be produced from pit run gravel by crushing the fraction retained on the 31.5 mm sieve, provided that no more than 10% of the retained material passes the 31.5 mm sieve, as determined by ASTM C136 and C117.

Coarse aggregate may be rejected on the basis of past performance.

609.02.06.02 Fine Aggregate

Fine aggregate shall be supplied by the Contractor.

Fine aggregate shall be prepared by crushing rock or gravel or screening a manufactured sand and shall consist of hard, sound, durable particles free from adherent coatings, shale, clay, loam, schist and other soft or disintegrated pieces, or other deleterious substances.

Washed materials shall be stockpiled for at least 24 hours prior to use to allow free water to drain from the aggregate and to allow the material to attain a uniform moisture content.

Fine aggregate shall be that portion passing the 4.75 mm sieve, when tested in accordance with ASTM C117 and C136, and shall meet the physical requirements of Table 609-1.

Fine aggregate may be produced from pit run gravel by crushing the fraction retained on the 6.3 mm sieve, provided that no more than 5% of the retained material passes the 31.5 mm sieve, as determined by ASTM C136 and C117.

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Fine aggregate may be rejected on the basis of past performance.

609.02.06.03 Blending Sand

Blending sand shall be supplied by the Contractor.

Blending sand supplied for the manufacture of asphaltic concrete shall consist of clean, tough, durable particles, free of silt, clay or other deleterious material.

Blending sand shall be used to obtain acceptable physical asphaltic concrete mix properties as outlined in Table 609-1.

The maximum mass of blending sand to be used in the total asphaltic concrete mix shall not exceed 10% of the total mass.

Blending sand shall have 100.0% passing the 9.5 mm sieve prior to the introduction into the cold feed at the plant.

The gradation of the blending sand shall be such that when incorporated into the asphaltic concrete mix, the resultant mix shall meet the requirements of Table 609-1.

609.02.06.04 RAP

If applicable to the Contract:

RAP shall be supplied by the Owner in designated stockpiles or obtained by the Contractor as per section 715 of PEITIR specifications.

The Contractor shall be responsible for the incorporation of RAP into the asphalt concrete base mix.

RAP shall be free of contamination and shall be stockpiled and reintroduced back into the asphalt base mix within 14 Days of the introduction into the cold feed at the plant, in such a manner that all particles pass the 50 mm sieve for HRA, when tested in accordance with ASTM C136.

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609.01/02

**Table 609-1
Marshall Asphaltic Concrete Mix Requirements**

Sieve Size ASTM Designation		Type A/HRA	Type B
		% (by mass) Passing Each Sieve	
Coarse Aggregate	25.0 mm	100.0	-
	19.0 mm	84.0 - 98.0	-
	16.0 mm	72.0 - 94.0	-
	12.5 mm	60.0 - 87.0	100.0
	9.5 mm	51.0 - 75.0	76.0 - 98.0
	6.3 mm	41.0 - 66.0	60.0 - 84.0
Fine Aggregate	4.75 mm	34.0 - 60.0	52.0 - 70.0
	2.36 mm	22.0 - 50.0	36.0 - 65.0
	1.18 mm	12.0 - 42.0	25.0 - 55.0
	600 µm	6.0 - 32.0	16.0 - 44.0
	300 µm	3.0 - 20.0	8.0 - 26.0
	150 µm	2.0 - 8.0	4.0 - 12.0
	75 µm	2.0 - 6.0 (A) 2.0 - 6.5 (HRA)	2.0 - 6.0
Physical Requirements for Asphaltic Concrete			
Stability at 60°C (N) (Minimum)		5800	5800
Flow (0.25 mm)		8 - 16	8 - 16
Air Voids		2.5 - 4.5	2.5 - 4.5
VMA % (min)		13.5	15.5
Voids Filled with Asphalt %		68.0 - 78.0	70.0 - 80.0
TSR (Average of Conditioned & Freeze/Thaw TSR values) %(min) AASHTO T283 (latest edition)		80	80
Dust to Binder Ratio		0.6 - 1.2	0.6 - 1.2
Physical Requirements for Coarse Aggregate			
Los Angeles Abrasion, Max % Loss ASTM C 131		35	35
Magnesium Sulfate Soundness, Max % Loss ASTM C88		15	15
*Petrographic No. (max) TIR Method LTP-210		200	140
Flat & Elongated Particle & (max@4:1) TIR Method LTP-209		20	20
Crushed Particles (min% by wt, two face) TIR Method LTP-208		75	75
Absorption % (max)		1.7	1.7
Plasticity Index (max) TIR Method LTP-304		3	3
*Note: Not Mandatory, the Owner reserves the right to obtain a Petrographic No.			
Physical Requirements for Fine Aggregate			
Magnesium Sulfate Soundness, Max % Loss ASTM C 88		15	15
Uncompacted Void Content % (min) ASTM C1252		45.0	45.0

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609.03 Mix Design and Job Mix Formula

609.03.01 Responsibility for Design Mix Formula

Preparation and submission of the asphalt DMF for the Owner's approval is the responsibility of the Contractor.

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.

609.03.01.01 Requirement for Asphalt Mix Design

The asphalt mix design shall follow the Marshall method of mix design based on 75 Blows and be in accordance with the latest edition of the Asphalt Institute Publication, Mix Design Methods for Asphalt Concrete Manual Series No. 2 (MS-2).

The asphalt concrete mix design, at the Design Asphalt Content, shall meet the requirements in Table 609-1 for the Asphalt Concrete Mix Type specified.

The amount of RAP in the hot mixed recycled asphalt concrete base mix shall be as specified in the Contract documents.

609.03.01.02 Approval of Design Mix Formula

Design mix approval will be based on the design mix tests and the corresponding requirements detailed in Table 609.1.

A new asphalt mix design shall be required if any change occurs in the nature or source of the aggregate and/or the supplier of the performance graded asphalt cement.

The Engineer shall not accept any asphalt mix produced prior to the Contractor receiving written approval of the asphalt mix design.

The mix design and job mix formula shall remain in effect until changed in writing. Should the aggregate source or the asphalt binder source change, or when unsatisfactory results or other conditions make it necessary, a new mix design will be required.

All submissions shall include the Contract number.

The material samples shall be tagged and indicate the Contract number, the location of the source, pit/quarry ID number as indicated by the Engineer, the date sampled, the sample location and the type/size of the material.

Sampling of the current year's production of aggregates for the DMF shall not be undertaken until:

- At least 30% of each aggregate type is in stockpile, when the tendered Quantity for the mix designation is less than 10,000 tonnes; or
- At least 2000 tonnes of each aggregate type is in stockpile, when the tendered Quantity for the mix designation exceeds 10,000 tonnes.

The Contractor shall submit the DMF including the following information/materials to the Engineer for approval at a location(s) designated by the Engineer.

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- A list of all constituent materials, including aggregate sources(s), blending sand sources(s), asphalt binder source(s) and anti-stripping admixture source(s).
- The average gradation of each aggregate to be used in the asphalt concrete mix.
- The percentage by mass of each aggregate (including blending sand) to be used in the asphalt concrete mix.
- Provided Asphalt Concrete HRA is used, the Abson recovery analysis and results per 1000 tonnes of RAP to be used.
- Extraction and gradation analysis and results per 500 tonnes of RAP to be used.
- The asphalt concrete mix design gradation of the combined aggregate (including blending sand) plotted on 0.45 power graph paper.
- Other characteristics of the combined aggregate specified in Table 609-1.
- Including the results of all aggregate testing, determinations, etc., as defined in Table 609.1, including the bulk specific gravity and the apparent specific gravity for both the coarse and fine aggregate. The 75µm material shall be removed prior to the determination of the specific gravities. In addition, aggregates shall be tested as per latest edition of AASHTO T283 to determine if they are prone to stripping (tensile strength ratio <0.8 and conditioned and freeze thaw tensile strength values less than 400 kPa) as well as no visual evidence of stripping. Provided an anti-stripping additive is required, hydrated lime or an effective liquid anti-stripping additive shall be used and tested for compliance as per latest edition of AASHTO T283 (tensile strength ratio >0.8 and conditioned and freeze thaw tensile strength values meet or exceed 400 kPa) with no visual evidence of stripping.
- The mix design with a minimum of four (4) different asphalt contents (minimum 0.5 % between each point) with at least one point above and one point below the optimum asphalt percentage that reports the following:
 - (i) The percentage (in units of one tenth of 1%) of asphalt cement to be added, based on the total weight of the mixture.
 - (ii) The Marshall test results for the individual and average bulk specific gravity, stability and flow of at least three specimens at each asphalt content.
 - (iii) The maximum theoretical specific gravity at each asphalt content.
 - (iv) The percent of air voids in the mixture for each asphalt content.
 - (v) The percent voids in mineral aggregate (VMA) at each asphalt content.
 - (vi) The percent voids filled with asphalt (VFA) at each asphalt content.
 - (vii) The design asphalt content as a percent of total mix.
- All Marshall mix design characteristics, including bulk relative density specimen mass, graphs used in arriving at the final asphalt concrete mix design, the bulk relative density of each individual material and the combined aggregates, and the asphalt absorption of the combined aggregates.
- The source and current test results of the performance graded asphalt cement to be incorporated into the Department's work meeting the requirements of Table 501-1 for performance graded asphalt cement including applicable mixing and compaction temperatures.

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The Contractor shall submit the following with the asphalt mix design for verification purposes:

- (i) Eight-18 kg samples of coarse aggregate, (ten)-18 kg samples of fine aggregate, (two)-18 kg samples of blending sand.
- (ii) Thirty-three 1150g samples of representative virgin aggregate blended to the design mix gradation of the asphalt mix aggregate.
- (iii) Eight 2500g samples of representative virgin aggregate blended to the design mix gradation of the asphalt mix aggregate.
- (iv) Four Litres of the type of performance grade asphalt cement to be used including the anti-stripping agent if required.
- (v) One-18 kg sample of representative RAP per 500 ton of RAP to be used.

In order to calibrate the ignition oven, additional samples are required: (3)-18 kg samples of coarse aggregate, (3)-18 kg samples of fine aggregate, (3)-18kg samples of RAP, (1)-18 kg samples of blending sand, and 3L/mix of asphalt binder, will be required to be delivered to a lab designated by the Engineer.

The Engineer will require up to fifteen (15) days from the time of receipt of the DMF, for evaluation by the Owner's Laboratory.

The evaluation period will include verification of the asphalt concrete mix design, moisture sensitivity testing, and verification of the bulk relative densities of the coarse and fine aggregates and blending sand(s).

In case of discrepancy in the bulk relative density values of the aggregates or blending sand(s), the Engineer's results shall prevail.

If the DMF does not meet the requirements of Table 609-1 it shall be rejected.

- The Engineer shall provide a written explanation to the Contractor that details why the DMF failed.
- The Contractor shall then provide another complete DMF and re-submit it to the Engineer for approval.
- The Engineer will not accept any asphalt concrete mix produced prior to the Contractor receiving written approval of the DMF from the Engineer.
- Once the DMF has been approved, the Engineer shall prepare samples of the combined aggregates and a sample of the asphalt binder for calibration of the ignition furnace to be used for the quality assurance.
- The Engineer shall deliver the calibration samples to the quality assurance laboratory
- The Engineer shall complete calibration of the ignition furnace within 3 days of approval of the DMF.
- Production of asphalt concrete mix shall not start until the ignition furnace has been calibrated for the DMF.

The Contractor shall be responsible to pay the Owner's associated costs if the Contract submits for evaluation more than one asphalt concrete mix design per Contract conventional mix designation.

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- Testing costs incurred by the Owner shall be charged as per TIR Standard Laboratory Rate Schedule.

609.03.01.03 Approval of Job Mix Formula

The contractor shall submit the JMF to the Engineer for approval. The Contractor's submission shall include the following information:

- The percentage by mass of each aggregate (including blending sand) to be used in the asphalt concrete mix.
- The percentage by mass passing the 4.75 mm and 75 µm sieves of the combined aggregates and blending sand.
- The asphalt binder content as a percentage of the mass of the total mix.

The JMF, when compared to the DMF, shall be within the following limits:

- ±3.0% for material passing the 4.75 mm sieve.
- ±0.8% for material passing the 75 µm sieve.
- ±0.3% for asphalt binder.

The Engineer's written approval of the JMF will allow the Contractor to begin production.

Rejection of the JMF shall require the appropriate action based on the Engineer's assessment.

609.03.01.04 JMF Adjustments During Production

Adjustments to the JMF shall only be made upon approval of the Engineer. In no case will changes to the JMF be accepted during production of the Lot.

The Contractor shall submit a revised DMF in accordance with 609.03 for a change in the aggregate source or the asphalt binder source used in the asphaltic concrete mix.

609.03.02 Submittals

The Contractor shall submit, in writing, the proposed source(s) of supply of coarse aggregate and fine aggregate for approval by the Engineer.

The Contractor shall notify the Engineer three (3) days in advance of the commencement of the production of asphaltic concrete mix.

The Contractor shall submit in writing, the proposed supplier of the asphalt binder.

The Contractor shall supply, upon request, a sample of the asphalt binder (2L/mix) including any proposed admixture(s), in a volume proportional to the asphalt binder sample.

The Contractor shall supply, upon request, the optimum mixing and compaction temperature, for PG asphalt binders.

The Contractor shall submit at the time of delivery to the plant the refinery certification and delivery slip for each tanker load of asphalt binder.

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If the source or supply of the asphalt binder changes during the Work, the Contractor shall submit in writing, this proposed change prior to using the new asphalt binder supply in the Work.

Other submittals are required for this Item and are contained within the sections applicable to the specific phase of the work being undertaken.

Submittals are required in accordance with any cross-referenced Item forming part of this item.

609.03.03 Composition of Asphaltic Concrete Mix

609.03.03.01 Asphalt Binder Content

For the purpose of establishing the Unit Price for asphaltic concrete, the Bidder shall assume an asphalt binder content for the asphaltic concrete mix as follows:

- Asphaltic Concrete "A" 5.0 % of the total specified tonnage.
- Asphaltic Concrete "B" 6.0 % of the total specified tonnage.
- Asphaltic Concrete "HRA" 3.5% of the total specified tonnage.

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609.04 Construction

609.04.01 General

The Contractor shall carry out the Work as indicated in the Contract documents and/or as specifically directed by the Engineer

609.04.01.01 Air Quality Permit Requirements

The Contractor must comply with all applicable sections of the Department's Environmental Protection Plan (EPP) which forms part of these Specifications.

The Contractor must supply all asphaltic concrete from an asphalt plant that has a valid Air Quality Permit issued by the PEI Department of Environment, Labour and Justice (ELJ).

The Contractor must supply the Engineer with a copy of a valid Air Quality Permit for each asphalt plant which will be used to supply asphaltic concrete to the Contractor or project before production begins.

If the Department receives a copy of a written notice from ELJ to the Owner of an asphalt plant that the asphalt plant does not possess a valid Air Quality Permit or that the Air Quality Permit for that plant has been revoked, then the Department will not accept asphaltic concrete from that plant.

609.04.02 Equipment

Equipment shall be designated and operated to produce an end product complying with the requirements of this Specification.

Equipment used shall be of adequate rated capacity and shall be in good working order.

609.04.02.01 Mixing Plant

The asphalt mixing plant and its' components shall meet the requirements of ASTM D 995 and the Contract Documents.

609.04.02.02 Hot Mix Surge Bins

If the Contractor elects to use a hot mix surge bin, it shall be designed, constructed and operated so that there shall be no segregation of, or damage to, the mix due to the surge bin or its appurtenances. The hot mix surge bin shall be operated in such a manner during draw down to prevent free discharge of hot mix from the conveyor belt to the truck. The maximum allowable time which an asphalt mixture can be stored in a hot mix surge bin shall be 4 hours.

609.04.02.03 Hot Mix Storage Silos

If the Contractor elects to use a hot mix storage silo, it shall be designed, constructed and operated so that there shall be no segregation of, or damage to, the mix. The storage silo shall be equipped with an appropriate holding and batching system at the top of the silo, coordinated with plant production, to prevent complete discharge so that mix is not permitted to fall directly into the silo.

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Storage silos, equipped with a heating system, shall be capable of maintaining the temperature without localized overheating.

Storage silos shall be equipped with mix level indicators, and when the plant is in continuous operation, the minimum level of mix in the silo must be maintained above the one-third (a) capacity level.

Storage in the silo up to 20 hours shall be permitted provided:

- (i) that the penetration of the asphalt cement recovered from the stored asphaltic concrete is equal to or greater than the penetration after the thin film oven test of the original asphalt cement before mixing, and
- (ii) which, when discharged from the storage silo, was free flowing and without lumps, and
- (iii) which, when delivered to the paver, was at or above 135°C.

609.04.02.04 Asphalt Plant Inspector's Quarters

At any asphalt plant the Contractor shall provide, at the Contractor's own expense, working quarters for the Asphalt Plant Inspector having the following dimensions and equipment:

- a) Outside dimension: Min. (3 x 2.4 x 2.4 m).
- b) Equipment:
 - 1 door and padlock
 - 1 window that opens, Min. (700 x 600 mm)
 - 1 chair
 - 1 sturdy and well supported bench along the 3 m wall (700 mm wide x 900 mm high)
 - Electricity: 1 overhead light and at least 1 wall plug.
- c) The working quarters shall be located so that the Inspector is able to observe the operation from the building.
- d) This building is to be for the sole use of the Asphalt Inspector. The Contractor is not to store equipment or supplies in it.

609.04.02.05 Plant Scales

Scales for weighing aggregates and asphalt cement shall be the dial type and of a standard make and design. Scales for weighing aggregates shall be accurate and sensitive to 0.5% of the maximum load required, and shall provide a positive means of balancing the tare mass of the hopper and asphalt bucket. At the beginning of each construction season, after each plant set-up and prior to batching any materials, and whenever it is deemed necessary by the Engineer, the Contractor shall verify the accuracy of the scales.

609.04.02.06 Calibration

The asphalt feed system shall be equipped with a calibration system to allow asphalt cement to be bypassed into a container and weighed. The asphalt cement metering system shall be calibrated to an accuracy of plus or minus 1% through the actual working range of the system, at the start of the paving season, whenever the weighing conveyor is moved and whenever deemed necessary by the Engineer.

The aggregate belt scale on the cold feed conveyor shall be calibrated within an accuracy of plus or minus 0.5% through the actual working range of the system at the start of the

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Contract, whenever the weighing conveyor is moved, and whenever deemed necessary by the Engineer.

609.04.03 Placing Equipment

Pavers shall be self-propelled and capable of laying a consistent, satisfactory mat which is true to the specified geometrics, cross-section and alignment as directed by the Engineer.

The term "screed" shall mean the unit of the paver which strikes off and imparts an initial compaction to the mix.

The term "hydraulic strike-off" shall mean an extension to the mould board and strike-off which can be extended beyond the screed while the paver is operating, to place any strike-off mixtures in narrow transitions or tapers.

Vibrating hydraulic extendable screeds and vibrating bolt-on screed extensions shall be used in placing mat widths greater than three (3) m. Only hydraulic extendable screeds shall be used for paving varying width such as transitions or tapers. Hot overlays using fixed screed extensions shall only be permitted with the approval of the Engineer. All extensions shall provide the same degree of heat and vibration as the main screed. Hydraulic strike-off extensions will not be allowed in the laying of regular or specified mat widths or when placing surface mixture

Pavers shall be equipped with hoppers and distributing screws to place mixture evenly in front of the screeds.

Pavers shall be equipped with vibrating screeds and shall be capable of spreading mixtures, without segregation and with a smooth and uniform textured surface, to the required thickness and in widths from 3 m to 5 m.

Screeds shall be equipped with heaters which are capable of preheating the entire screed and screed extensions.

The Contractor shall provide a 3 m straight edge with each paver.

Pavers shall be equipped with automatic screed controls for the control of longitudinal grade and transverse Slope.

- The longitudinal grade control shall be equipped to operate from either side of the paver and be capable of providing longitudinal grade control as well as matching longitudinal joints.
- The transverse Slope control shall also be capable of operating from either side of the paver.
- The Contractor shall use a minimum 12 m ski/floating beam or an approved equivalent for longitudinal grade control.
- A joint matching shoe may be used to control longitudinal grade of subsequent mats placed adjacent to the original mat.
- A calibrated Slope indicator shall be installed in a readily visible location on each paver.

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Longitudinal grade control shall be used on all lifts and transverse slope controls shall be used on all lifts except surface course unless otherwise directed by the Engineer.

Vibrating hydraulic screed extensions and vibrating bolt-on screed extensions shall be used in placing mat widths greater than 3 m.

Hydraulic strike-off extensions are only acceptable when laying mats or irregular widths outside of the driving lanes.

Provided a Remix Paver has been permitted for use by the Engineer, the Contractor shall be paid a cost of \$1.15 per tonne premium, for all non-segregated, uniformly textured, smooth asphaltic concrete applied using an approved Remix Paver.

Areas subject to repairs, as a result of segregation and non-uniform texture or areas subject to negative smoothness price adjustments, will not be eligible for the cost per tonne premium. Repairs, if required, shall be at the Contractor's expense and shall extend the full width and full depth of the mat in which the repair work is performed.

609.04.04 Compaction Equipment

All rollers shall be of types specifically designed for asphaltic concrete compaction. Compaction Equipment shall consist of at least one of each of the following:

- (i) Vibratory roller
- (ii) Pneumatic-tired roller
- (iii) A combination steel-drum vibratory/pneumatic tire roller may be used in place of the vibratory and pneumatic rollers.
- (iv) Steel-drum tandem finish roller

All rollers with rubber tires shall be equipped with a means to prevent the asphalt mix from adhering to the rubber tires.

Hydrocarbon fuels or solvents shall not be used.

609.04.05 Material Transfer Vehicle

Provided a Material Transfer Vehicle (MTV) has been permitted for use by the Engineer the Contractor shall be paid a cost per tonne premium, for all non-segregated, uniformly textured, smooth asphaltic concrete applied using an approved Material Transfer Vehicle (MTV).

Material Transfer Vehicles (MTVs) proposed for use by the Contractor must be evaluated and approved by the Department. Material Transfer Vehicles (MTVs) shall be self-propelled equipment capable of transferring asphaltic concrete from the hauling equipment into the paver. The MTV is not to come in direct contact with the paver, and shall meet the following criteria:

- (i) Minimum storage capacity of 20 tonne.
- (ii) A conveyor system to transfer asphaltic concrete from the hauling equipment to the paver hopper insert; and

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- (iii) An auger system in the MTV or paddle mixers in the storage hopper to re-mix the asphaltic concrete prior to discharge from the Material Transfer Vehicle into the paver hopper insert.

Provided a Material Transfer Vehicle (MTV) has been permitted for use by the Engineer, the Contractor shall be paid a cost of \$3.00 per tonne premium for use on the surface course, and paid a cost of \$1.15 per tonne premium for use on the base course for all non-segregated, uniformly textured, smooth asphaltic concrete.

Areas subject to repairs, as a result of segregation and non-uniform texture or areas subject to negative smoothness price adjustments, will not be eligible for the cost per tonne premium. Repairs, if required, shall be at the Contractor's expense and shall extend the full width and full depth of the mat in which the repair work is performed.

609.04.06 Production and Placing of Asphaltic Concrete Mix

609.04.06.01 Production of Mix

Asphaltic concrete shall be produced to meet the requirements of Table 609-4.

609.04.06.02 Trial Mix

Trial mixes are the property of the Contractor and shall be placed outside the Work Site, unless otherwise authorized by the Engineer for the purpose of padding or patching.

609.04.06.03 Mixing and Temperatures

Mixing temperature for all types of plants shall be such that the temperature of the asphaltic concrete mix when discharged from the mixer unit shall be controlled within $\pm 5^{\circ}\text{C}$ of the temperature requirement of the DMF, unless otherwise authorized by the Engineer.

The minimum mixing temperature shall be 125°C .

The maximum mixing temperature shall be 165°C or the temperature recommended by the asphalt binder supplier.

The heating of the asphalt mix shall be controlled to prevent the fracture of the aggregate and damage to the asphalt binder.

The system shall be equipped with automatic burner controls and shall provide a printed record of the mix temperature at discharge.

The asphalt binder recovered by extraction from the asphalt mix shall meet the requirements of the Pressure Aging Vessel (PAV) as specified in AASHTO M320. Table 1 - Performance Graded Asphalt Binder Specification.

Overnight storage in silos will not be permitted.

609.04.06.04 Moisture Content:

The Maximum moisture content allowed in the asphaltic concrete mix as it is discharged to the surge bin, storage silo or pug mill shall be 0.15%.

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The aggregate shall be dried sufficiently so that visual evidence of moisture, such as but not limited to the presence of foaming, slumping or stripping of the mix, does not occur.

609.04.06.05 Transportation of Asphaltic Concrete

609.04.06.05.01 Transportation of the Mixture

The mixture shall be transported from the asphalt plant to the work site in vehicles with smooth metal boxes in good and leak-proof condition and previously cleaned of all foreign materials. Each vehicle shall be equipped with a tarpaulin of canvas or other suitable material. Such tarpaulins shall be on the truck at all times and shall be of sufficient size to overhang the fully loaded truck box and to be tied down on three sides. Tarpaulins shall prevent air flow from contacting the mixture as well as preventing water from entering the truck box. Tarpaulins shall be rolled off the hot mix before the load is dumped into the spreader.

Truck boxes shall be lightly coated with a uniform application of a release agent just before each loading. If liquid agent is used, the truck boxes must be drained after each application and before each loading. All release agents shall comply with occupational health and safety requirements and must not be detrimental to the mix.

Delivery of hot mix to the work site shall be scheduled such that spreading and compacting of the hot mix complies with the time restraints imposed by Provision 106.12. In no case shall temperature be increased at the plant to offset long distance hauling unless authorized by the Engineer in writing.

Hydrocarbon fuels or solvents shall not be used.

Tarpaulins shall be rolled back and the hot asphaltic concrete shall be uncovered immediately prior to dumping the load into the paver.

609.04.06.05.02 Timing of Paving Operations

Paving operations shall only be conducted during the daylight hours unless specifically altered by written approval of the Engineer.

If Asphalt Concrete HRA is used per section 609.03.01.01, placement of new asphalt concrete shall commence within 21 days of the commencement of the cold milling operation.

609.04.06.06 Placing Asphaltic Concrete

A course shall not be placed upon a previously laid course until at least 12 hours following the final compaction of the previously laid course.

Immediately after each course is laid and before roller compaction commences, the surface shall be checked and any deficiencies in surface geometrics or texture shall be corrected. Irregularities in alignment and grade along the outside edges shall be corrected before rolling.

The longitudinal grade of single pavers, or the lead paver shall be controlled by an approved 12 m ski or a 12 m floating beam. Where such a ski is a flexible unit, it shall be equipped with a spring tensioned wire extending between brackets fitted on and slightly above each end of the ski. The sensing grid shall ride on the wire and not on the ski.

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When placing a second or subsequent mat using a single paver, joints shall be matched using an approved ski not less than 3 m in length or an approved joint matching shoe, which would ride on the previously placed compacted mat.

Automatic longitudinal grade controls shall be required to be used in combination with transverse slope controls or as otherwise approved by the Engineer.

When the Contractor chooses to supply asphaltic concrete to the contract from more than one asphalt plant, the asphaltic concrete mix supplied shall be required to be comprised of aggregates from the same aggregate sources unless otherwise approved by the Engineer.

Prior to placing any course of asphalt on a granular grade the Contractor shall ensure that fine grading has been achieved and that the necessary planning with respect to mat widths or transitions has been conducted.

The Contractor shall place asphaltic concrete on a dry surface.

Asphaltic concrete shall not be placed under adverse weather conditions of precipitation. When placing asphaltic concrete surface mix, the surface temperature of the material to be overlaid shall be a minimum of 5 °C.

When paving on Aggregate Base, the Aggregate Base must be free from standing water. All prepared surfaces shall be cleaned of loose or foreign material prior to placing of the asphaltic concrete.

Milled and aged asphaltic concrete surfaces shall be treated with bituminous tack coat prior to the placing of asphaltic concrete.

The removed material shall be disposed of and the exposed surfaces shall be prepared as identified in the Contract Documents or as directed by the Engineer.

Contact edges of existing mats and contact faces of curbs, gutters, manholes, sidewalks and bridge structures shall receive an application of tack before placing the asphaltic concrete.

The temperature of the asphaltic concrete shall be a minimum of 125 °C prior to initial compaction.

The maximum temperature of the asphaltic concrete shall be 165 °C or the temperature recommended by the asphalt binder supplier.

When laying base and/or surface course, the alignment of the paver shall be controlled by a standard method, such as following a stringline, placed by the Contractor from an alignment designated by the Engineer.

Irregularities in alignment and grade along the outside edge of the asphaltic concrete shall be corrected by the addition or removal of asphaltic concrete before the edge is rolled.

The cross slope of the asphaltic concrete surface shall be within $\pm 0.5\%$ (± 15 mm when measured over 3 m, perpendicular to the centreline) of the cross slope specified in the Contract Documents or provided by the Engineer.

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In narrow base widening, deep or irregular sections, intersections, turn-outs or driveways where it is impractical to spread and finish asphaltic concrete by machine methods, the asphaltic concrete shall be spread by hand in accordance with standard hand placement practices.

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

Driveway entrances and aprons shall be paved concurrently or after the machine laying operation of the regular mat.

Spreading of asphaltic concrete by hand shall be kept to a minimum and shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Engineer.

Adjacent asphaltic concrete mats, including those placed on shoulders, shall be completed to approximately the same location at the end of each day's paving.

Damage to the mat as a result of contaminant spills from the Contractor's Equipment shall be immediately repaired by the Contractor to the satisfaction of the Engineer

All placement, spreading, compacting and rolling shall occur only during daylight hours, and any loads arriving at the Work Site such that these requirements cannot be met, shall be rejected by the Engineer.

609.04.07 Construction of Joints

Joints shall be constructed to ensure thorough and continuous bond and to provide a smooth riding surface.

Dirt or other foreign and loose material shall be removed from the faces against which joints are to be made.

All faces at which joints are to be made shall be painted with a thin uniform coating of joint painting material. Joints not meeting requirements shall be repaired to the satisfaction of the Engineer.

The Contractor shall remove and dispose of waste materials, resulting from joint construction or other work activity, outside the Work Site before the end of each week.

609.04.07.01 Requirements for Longitudinal Joints

The width of subsequent courses shall be adjusted to an off set of 150-300 mm to ensure that longitudinal joints do not coincide vertically.

When matching a compacted joint, the thickness of the uncompacted mat shall be set to allow for compaction, and the paver shall overlap the adjoining mat by at least 50 mm. After compaction the measured deviation across longitudinal joints other than at the crown shall not exceed 4 mm as measured with a 3 metre straight edge.

The following requirements shall apply when constructing longitudinal joints:

All longitudinal joints shall receive an application of tack coat.

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Longitudinal joints shall not be permitted between the edges of driving Lanes in the final lift of asphalt concrete.

Longitudinal joints shall be constructed to ensure that maximum compression under rolling is achieved.

On surface courses, the method of making joints shall be such that excess material is not scattered on the surface of the freshly laid mat and all excess material shall be carefully removed.

609.04.07.02 Requirements for Transverse Joints with New Asphaltic Concrete

Transverse joints between asphaltic concrete laid under this Contract (i.e. new asphaltic concrete) shall be constructed by cutting a straight vertical face to the full thickness of the proposed lift. Adjacent mats shall be staggered a minimum of 6 m to a maximum of 40 m. The excess material shall be removed to the full thickness of the proposed lift to maintain the required lift thickness.

The paver shall not move more than 20 m from any transverse joint until that joint has been compacted and measured with a straight edge by the Contractor.

Measurements of Transverse Joints shall be taken at right angles to the joint. Joint measurements shall be recorded at the centre and quarter points of the mat width. The 3 m straight edge shall be positioned to record the greatest measured deviation in any of the following positions:

- Extending back 3 m from the joint on the previously placed mat
- Projecting forward 3 m from the joint on the mat being placed.
- Centering the straight edge on the joint.

After compaction, the measured deviation across the transverse joints for A mixes shall not exceed 6 mm as measured with a 3 m straight edge. Transverse joints exceeding this measured deviation shall be repaired immediately.

After compaction, the measured deviation across the transverse joints for B mixes shall not exceed 4 mm as measured with a 3 m straight edge.

Transverse joints not meeting the measured deviation requirement shall be repaired to the satisfaction of the Engineer at the Contractor's own expense; the Contractor may be required to meet the measured deviation requirement by cold planing and replacing. Any joints considered for cold planing and replacing shall be planed the full travel or passing lane width and a minimum of 20 m in length. The depth of cold planing shall be the thickness originally specified for the mix being planed. The entire cold planing and replacing operation shall be done at the Contractor's own expense.

Replacement asphaltic concrete shall be with an approved asphaltic concrete mixture and shall be of the type originally specified.

Materials removed by cold planing shall become the property of the Contractor. The materials shall be hauled and stockpiled in accordance with environmental regulations. All costs associated with the hauling and stockpiling of this material shall be at the Contractor's own expense.

The repaired section shall be in accordance with Section 609.

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A Transverse Construction Joint shall be constructed at the end of each day's work and at other times when paving is halted for a period of time which will permit the asphaltic concrete to cool below 125°C.

Where the asphaltic concrete surface and/or base course has been terminated due to the conditions noted previously, a smooth 1.5m long taper shall be paved.

When paving resumes, tapers from surface courses previously laid shall be cut back to full mat thickness to expose fresh, straight vertical surfaces, free from broken or loose material and tacked.

609.04.07.03 Requirements for Transverse Construction Joints with Existing Asphaltic Concrete

Joints between asphaltic concrete laid under this Contract and existing asphaltic concrete shall be constructed as follows.

When matching into an existing asphaltic concrete pavement the transverse joint for the first lift shall be prepared by cutting the existing pavement to a straight vertical face and removing such area and depth of the existing pavement as may be necessary to ensure the full depth of asphaltic concrete thickness to be placed.

Successive lifts shall be offset from the previous joint by a minimum of 5 m and shall be prepared by cutting the existing pavement to a straight vertical face and removing such area and depth of the existing pavement as may be necessary to ensure the successive lift thickness.

Adjacent mats on the final lift of asphalt base and on the asphalt seal shall be offset a minimum of 3 m.

If a transverse key is cut in advance of paving the joint area, the Contractor shall immediately construct with hot mixed asphaltic concrete a smooth 1.5 m long taper at the joint area.

Prior to the placement of the asphalt mix, all transverse key joint surfaces shall be cleaned of loose foreign material and a tack coat applied.

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609.05 Quality Control Testing

609.05.01 General

The Contractor shall be totally responsible for quality control testing throughout every stage of the Work, from the crushing and production of aggregates, to the final accepted product, to ensure materials and workmanship conform with the requirements of this Specification.

609.05.01.01 Inspection Testing Plan (ITP)

The Contractor shall submit, in writing to the Engineer, an ITP covering all phases of the Contract performance, and the name of the party retained to conduct the ITP, within ten (10) days after the Contract award.

The ITP shall include, but not be limited to, identification and description of inspection and required test procedures to be used during the entire life of the Contract.

The ITP shall be sufficiently comprehensive and detailed, to assure the Engineer of the Contractor's willingness and ability to control the construction production and processes.

Once accepted by the Engineer the plan becomes a part of the Contract and shall be enforced accordingly.

The ITP may have to be updated and revised, by the Contractor, as conditions warrant.

609.05.01.02 Sampling and Test Results

Where specified, random sampling procedures shall be followed, and where no specific random sampling procedure is specified the sampling procedure shall be as identified by the Contractor.

The Contractor shall be responsible for the interpretation of the test results and the determination of any action to be taken to ensure that all materials and work conform to the requirements of the Contract.

At no time will the Engineer issue instructions to the Contractor, as to setting of dials, gauges, scales and meters.

However, the Engineer may advise the Contractor against the continuance of any operations or sequence of operations which will result in non-compliance with Specification requirements.

The Contractor shall maintain records of all inspection and tests.

Results of all quality control tests shall be available for examination by the Engineer at all times and copies shall be provided to the Engineer on a daily basis.

609.05.02 Quality Assurance Testing and Adjustments

The Contractor shall provide an end product conforming in quality and accuracy of detail to the dimensional and tolerance requirements of the Plans and Specifications.

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

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Certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied.

The Engineer shall test for compliance with these requirements as described in 609.05.02.

The test methods indicated in Table 609-3 will be used to determine material characteristics.

Table 609-3 Test Methods

Test Description	Test Method
Sampling Mixes	(TIR Test Method LTP-101A) ASTM D 979
Coring	ASTM D 5361
Ignition	(TIR Test Method LTP-418)
Percent Fracture	(TIR Test Method LTP-208)
Sieve Analysis	(TIR Test Method LTP-202) ASTM C 136/ASTM C 117
Bulk Relative Density	(TIR Test Method LTP-401) ASTM D 2726
Theoretical Maximum Relative Density	(TIR Test Method LTP-404) ASTM 2041
Voids Calculations, Asphaltic Concrete Specimens	(TIR Test Method LTP-405) ASTM 3203
Percent Compaction, Asphaltic Concrete Pavement	(TIR Test Method LTP-408)
Forming Marshall Specimens, Field Method	(TIR Standard Plant Procedures)
Moisture Content, Oven Method Asphaltic Concrete Mix	(TIR Test Method LTP-416) ASTM D 2172
Smoothness of Pavements, Profiler Method	ASTM E 950
Stratified Random Test Sites for ERS Projects	ASTM D 3665
Appeal Testing	As outlined in Specifications
Asphalt Binder: Flash and Fire Points Viscosity Rheological Properties Rolling Thin Film Oven Accelerated Aging (PAV) Flexible Creep Stiffness	AASHTOT 48 or ASTM D 92 AASHTO T316 or ASTM D 4402 AASHTO T315 AASHTO T240 AASHTO R28 AASHTO T313
TSR (Average of Conditioned & Freeze/Thaw TSR values)	AASHTO T283 (latest edition)
In all test methods used as reference in this specification, metric sieves as specified in ASTM E11 shall be substituted for any other specified wire cloth sieves.	

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

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

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

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The loose and core samples shall be taken by the Contractor in the presence of the Engineer.

The random locations shall be determined by the Engineer. Pavement sampling will be conducted using the Stratified Random Sampling Procedure.

The Engineer will be responsible for the labeling, storing, and transporting of the loose samples to the Owner's laboratories.

The Engineer shall be responsible for labeling the cores. Each sample shall be labelled with the contractor, contract number, highway number, date sampled, mix type, lot number, subplot number, lift number, design lift thickness, station location and offset of the highway

The Contractor shall be responsible for the storage and transportation of the cores to the Owner's Laboratory, within 2 hours of coring, for testing. Core samples shall be placed in a suitable container which will protect the sample integrity during transport and until testing.

Each core shall have a minimum nominal diameter of at least 150 mm and a maximum nominal diameter of 200 mm and shall consist of the full layer being sampled.

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

The Engineer will provide the Contractor with a copy of the results of acceptance tests within one (1) working day of their availability.

Acceptance test results for a given Lot will not be reported to the Contractor until the quality control results for that Lot have been reported to the Engineer.

If any one of the control characteristics of a Lot is outside the acceptance limits as listed in Table 609-4, then the Lot will be rejected automatically regardless of the values of the other control characteristics.

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

Random sampling methods will not be applied to the following areas:

Areas of obvious surface defects as indicated in 609.05.08, which shall be marked and repaired in accordance with 609.05.10.

Small areas such as tapers, aprons, Bridge approaches, gores and areas of handwork, and asphalt mix used for isolated levelling and repair of failed areas.

The procedure for dealing with an outlier test result shall be as follows:

When an individual test result from a Lot is questionable, the validity of the test result in question will be determined in accordance with ASTM E 178, Standard Practice for Dealing with Outlying Observations using a "t" test at a 5 percent significance level.

If the outlier test procedure shows that the challenged test result is valid then the test result will be used in the calculations.

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609.05.03 Asphalt Density

Compaction testing shall be based on a Lot average method.

Pavement samples will be taken on the road by coring, using stratified random sampling procedures. Four tests per Lot will be selected as follows:

The Lot will be divided into 4 segments of approximately equal length.

In each segment a test site will be located by using random numbers to determine the longitudinal distance from the end of the segment and the lateral distance from the edge of the segment.

In no case will a lateral distance be less than 0.3 m from the edge of a mat.

Cores will not be taken within 25 m of a loose sample location.

Cores shall be obtained in accordance with ASTM D5361, within a minimum of 12 hours and a maximum of 24 hours after the placement of the Lot.

The maximum may be extended to 72 hours in order to exclude Saturday and Sunday unless the Contractor is placing asphaltic concrete on either day.

The percent compaction will be determined by the Department on the random samples using the following procedure:

$$\% \text{ Compaction} = \frac{\text{BRD}}{\text{MMRD}} \times 100$$

Where MMRD = The mean maximum theoretical relative density of the subplot random cores determined by ASTM D2041.

BRD = The bulk relative density of a random core obtained from the lot, determined by ASTM D2726 for specimens that contain moisture.

The mean percent compaction for the lot will be determined by calculating the mean of the four subplot random core percent compaction results.

609.05.04 Asphalt Content, Gradation and Air Voids

Loose samples will be taken on the road behind the paver before compaction, with 3 samples per Lot selected as follows:

A Lot will be divided into 3 segments of approximately equal quantity.

For each segment random numbers will be used to determine the tonnage at which to obtain the sample.

Each sample will be split in two equal portions, one portion will be tested, and the other will be set aside in the event that an appeal is requested by the Contractor.

If the plant production is 600 t or less, one additional random loose sample will be obtained, and the production will be added to the previous Lot.

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609.05.05 Smoothness

The Profile requirements shall be specified in the Contract Documents.

The smoothness of the final lift of newly placed asphaltic concrete pavement will be checked with a High Speed Profiler as soon as possible after final rolling.

609.05.05.01 Definitions

International Roughness Index (IRI). IRI is a statistical measurement used to determine the amount of roughness in a measured longitudinal profile. IRI will be measured in mm/m and reported to two (2) decimal places for all procedures relating to this specification.

Reporting Interval. The reporting interval for this specification shall be 100 metres for overall IRI, and 10 metres for localized roughness.

Localized Roughness. Localized roughness is reported in 10 metre intervals where the IRI exceeds an established value as set out in Table 609-9 of this specification.

Segment. A segment of Roadway shall be defined by the full lane width (including paved shoulders) over a defined length. The segment length shall be 10 metres for localized roughness. The segment length shall be 100 metres for overall IRI, however, shorter segment lengths may exist as outlined in Item 609.05.05.04.02.

Project Chainage. The distance as measured by the High Speed Profiler will be referenced to the contract stake chainage, but will be the only chainage deemed accurate and acceptable for the smoothness specification.

609.05.05.02 References

All reference standards shall be current issue or latest revision at the first date of Tender advertisements. This specification refers to the following standards, specifications or publications:

- ASTM E 950 Standard Test Method for Measuring the Longitudinal Profile of Travelled Surfaces with an Accelerometer Established Inertial Profiling Reference
- PEITIR General Provisions and Contract Specifications for Highway Construction.

609.05.05.03 Equipment

A Class 1 inertial laser profiler, with moving average filter (high pass 300 ft and low pass 1 ft), will be used for all smoothness measurements under this specification. The equipment will be installed and operated in accordance with the manufacturer's recommendations and ASTM E 950.

609.05.05.04 Smoothness Testing Procedures

The Department or its designated representative will conduct smoothness testing in accordance with ASTM E 950. The Department's smoothness testing results will be used in determining payment adjustments and areas requiring Corrective Work.

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609.05.05.04.01 Profile Measurements:

The profiler will conduct three (3) complete passes in each lane, recording the right and left wheel path IRI values simultaneously at 10 metre intervals. The final IRI will be the average of the three passes reported at 10 metre intervals. The 100 metre interval averages will then be computed from the 10 metre interval average IRI values.

The profile measurements shall be collected in the direction of traffic. The start and end location of measurement for each lane shall be 20 metres from the transverse construction joints or in the case of a tapered lane at the locations defined by which the full lane width occurs.

609.05.05.04.02 Exclusions:

The 20 metre segments at both ends of the section under contract defined by the transverse construction joints shall be excluded from smoothness calculations. Bridge structures (excluding culverts and arches), underpass structures and overpass structures located within any 10 metre segment, including the 10 metre segments immediately before and after a structure will be excluded from payment adjustments under this specification.

Areas requiring hand work, tapers, intersections, gore areas, aprons, etc. will be excluded from this specification.

Individual 10 metre segments exhibiting roughness, which can be directly attributed to physical features of the roadway including iron works or curb/gutter match-ins, may be excluded from payment adjustments as determined by the Engineer.

609.05.05.05 Mandatory Penalty

The Contractor shall be subjected to a mandatory penalty of -\$2000.00 for each 10 metre segment with an IRI > 3.00 mm/m, with exception of areas defined in Section 609.05.05.04.02.

609.05.05.05.01 The Engineer reserves the right to require Compulsory Corrective Work on any 10 metre segments with an IRI > 3.00 mm/m. In any 10 metre segments where Compulsory Corrective Work is required, the Department will waive the -\$2000.00 penalty.

The Engineer shall notify the Contractor if Compulsory Corrective Work is required.

609.05.05.05.02 Compulsory Corrective Work Procedures:

Corrective work shall consist of Removal and Replacement of the surface course of asphaltic concrete pavement. The minimum length of any repair area shall be 10 metres.

Removal and Replacement: On each of the 10 metre segments affected, the Contractor shall remove (by cold planing) and replace the full width of the lane and the full depth of the surface course of asphaltic concrete pavement affected, including paved shoulders.

Compulsory Corrective Work Requirements: The asphaltic concrete repair shall conform with either Section 603 or 609 of the Department's Specification, as stated in the Contract.

Incidental Corrective Work: Corrective Work may result in additional incidental costs, including but not limited to: tack coat, additional shoulder gravelling, guardrail

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adjustments, re-application of pavement markings, etc. Such work shall be carried out in accordance with the Department's specifications and at the Contractor's expense.

Disposal of Asphaltic Concrete: Asphaltic concrete that has been removed as a result of Corrective Work undertaken by the Contractor shall become the property of the Contractor to haul, stockpile or otherwise dispose of in an environmentally acceptable manner, at the Contractor's expense.

609.05.05.05.03 Retesting Following Corrective Work:

After Corrective Work has been completed, each of the 100 metre segments containing corrective work will be retested, using the same profiler used in the original testing. The new IRI values will be used and the recalculated results will be binding.

Should the new IRI results indicate further Mandatory Penalty 10 metre segments as stated in Item 609.05.05.05, the Contractor shall be subject to the Mandatory Penalty as stated in Item 609.05.05.05.

609.05.05.05.03 Costs for Corrective Work:

All costs associated with Corrective Work shall be the responsibility of the Contractor.

609.05.06 Asphalt Binder

Asphalt binder samples shall be obtained and packaged as follows:

Samples shall be a minimum size of one (1) litre and shall be taken from the Contractor's storage tank in accordance with ASTM D140.

The sample containers shall be supplied by the Engineer.

The Contractor shall obtain one (1) asphalt binder sample per 5000 t of asphaltic concrete mix production, taken in accordance with ASTM D140 from the Contractor's asphalt binder storage tank(s).

If Asphalt Concrete HRA is used per section 609.03.01.01, the Contractor shall obtain one (1) asphalt binder sample per 10,000 t of asphaltic concrete mix production, taken in accordance with ASTM D140 from the Contractor's asphalt binder storage tank(s). The Engineer shall label the samples with the Contract number, date, time, grade and type of asphalt binder, supplier, refinery, and the name and the proportions of any additives added to the asphalt binder.

If a sample test result falls outside of the material requirements specified in 609.02.01, the Engineer may require that the Contractor suspend the asphaltic concrete mix production.

Compliance shall be verified by the Engineer before the asphaltic concrete mix production is allowed to continue.

609.05.07 Thickness

The Contractor shall place the asphaltic concrete in lifts at the thickness indicated in the Contract Documents and/or as specifically directed by the Engineer.

Thickness shall be evaluated on a Lot by Lot basis.

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The Pavement Thickness shall be determined from the test results of the cores obtained according to 609.05.03.

If the Thickness does not meet the requirements of Table 609-4 then the deficient area shall be repaired as indicated in 609.05.10.

**Table 609-4
Acceptance/Rejection Requirements by Lot**

Measurement	Types of Mix & Sieve Size	Lot Payment			Repair/ Replace Reject
		Increased	Full	Reduced	
Bulk Relative Density as (%) of Theoretical Maximum Relative Density (%)	All	> 92.5	92.5	92.4 – 89.5	< 89.5
Asphalt Content (%) (Mean of Deviations of Lot from JMF)	A, HRA	N.A.	0.0 – 0.4	0.41 – 0.65	> 0.65
	B	N.A.	0.0 – 0.3	0.31 – 0.50	> 0.50
Gradation (%) (Mean of Deviations of Lot from JMF) (See Note 1)	A, HRA (4.75mm) (75 µm)	N.A. N.A.	0.0 – 6.0 0.0 – 0.8	6.1 – 10.0 0.9 – 1.5	> 10.0 > 1.5
	B (4.75 mm) (75 µm)	N.A. N.A.	0.0 – 5.0 0.0 – 0.5	5.1 – 9.0 0.6 – 1.2	> 9.0 > 1.2
Cores with Thickness Within Tolerance (#) (See Note 2)	All	N.A.	3 of 4	N.A.	2 of 4
Air Voids (%) Mean of Deviations from Target Value of 3.5%	All	N.A.	1.00	1.01 – 2.0	> 2.0

NOTE 1 (Additional Requirements for Gradation):

- a) If the average of the Lot test results for the 4.75 mm sieve size falls outside the gradation limits of Table 609-1, the Lot will be rejected.
- b) If the average of the Lot test results for the 75 µm sieve size exceeds the upper gradation limit of Table 609-1, the following will apply:
Exceeds by ≤ 1.0%, the Lot Payment will be reduced by \$5.00/t;
Exceeds by > 1.0%, the Lot will be rejected.

NOTE 2 (Thickness):

- a) Thickness = Measured Thickness obtained from core samples.
- b) Lift Thickness Tolerance by Type of Mix
Tolerance = 0.80 x Specified Thickness (HRA)
Tolerance = 0.85 x Specified Thickness (A, B)
- c) If the thickness of either lift of base mix is less than the tolerance, the Contractor shall place the next lift of asphaltic concrete to achieve a thickness equivalent to the total thickness of the two lifts as specified in the Contract. The total thickness of the two lifts for the deficient Lot shall be verified by coring the two lifts in the area of the deficient Lot.

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609.05.08 Surface Defects

The finished surface of any Pavement course shall have a uniform texture and be free of visible signs of poor workmanship and bumps and/or dips exceeding 3 mm as measured with a 3 m straight edge.

Any obvious defects, as determined by the Engineer, will be cause for rejection of the Pavement course.

Such defects shall include but not necessarily be limited to the following:

- Segregated areas.
- Areas of excess or insufficient asphalt binder.
- Roller marks.
- Cracking or tearing.
- Improper matching of longitudinal and transverse joints.
- Tire marks.
- Sampling locations not properly reinstated.
- Improperly constructed patches.
- Improper cross slope.
- Contaminant spills on the mat.
- Flushed Areas

609.05.09 Appeal of Lot Test Results

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

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

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

The following procedures will apply for an appeal:

The Contractor shall serve notice of appeal to the Engineer, in writing, within 48 hours of receipt of the test results.

The Contractor and the Engineer shall agree on a time at which the cores for the appeal of the Lot will be taken.

The cores for the appeal of the Lot shall be taken within 48 hours of the submission of the notice for the appeal.

If the density or thickness of the Lot is appealed, the Contractor shall take 4 more cores at random locations, as determined by the Engineer. These cores will be tested by the Owner.

If the asphalt content, gradation or air voids is appealed, the Engineer will take the remaining portion of the samples obtained in 609.05.04 and test them at the Owner's Laboratory.

The Contractor may have a representative present during the period of the testing; the Contractor's representative shall comment on anything concerning the testing which he

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does not consider to be valid and the Engineer shall respond to all comments in order to resolve them.

Prior to leaving the testing Laboratory, any unresolved comments regarding the testing procedures are to be given to the Engineer in writing.

Any comments, with respect to the testing procedures, which are made subsequent to the Contractor's representative leaving the Laboratory, will not be considered.

The test results from the original Lot will be combined with the test results of the new samples.

A new Sample Mean or the Mean of the Deviations for the combined test results will be determined and this value will be used for acceptance and Unit Price adjustment.

For thickness appeals 6 of the 8 test results must meet or exceed the lift thickness tolerance specified in Table 609-4.

The new Lot test results so obtained shall be binding on both the Contractor and the Owner.

609.05.10 Repairs

609.05.10.01 General

Repairs to the Work to improve smoothness shall be carried out in accordance with Item 609.05.05.02 and within thirty (30) days from the time the Contractor receives the Engineer's written assessment of the Work.

Repairs to correct surface defects shall be carried out in accordance with this Item within one (1) year from the time the Contractor completes placement of the asphaltic concrete.

The asphaltic concrete used for replacement or overlay to correct surface defects shall be the same asphaltic concrete mix designation as that which is removed or overlaid.

Any asphaltic concrete which does not conform to the requirements of this Item shall not be incorporated in the Work.

Repairs required in accordance with 609.05.05 shall be carried out for the full width of the driving Lane, including the paved shoulders.

609.05.10.02 Removal and Replacement

The full thickness of the appropriate lift of pavement in the rejected Lot shall be removed by cold milling or other means as approved by the Engineer.

All joints shall be tack-coated.

Repaired areas will be retested for acceptance; those failing will be rejected and shall require further repair.

Material removed shall become the property of the Contractor, who shall dispose of the material outside the Work Site.

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609.05.10.03 Overlaying

The overlay shall extend the full width of the underlying pavement surface and have a finished compacted thickness of not less than 50 mm for a base course and 40 mm for a surface course.

A key shall be constructed at each end of the overlaid section.

If an overlay results in the need for repairs or adjustments to the adjacent materials within the Work Area, the Contractor shall carry out the repairs and adjustments at his own expense and to the satisfaction of the Engineer.

Repaired areas will be retested for acceptance.

- Those failing will be rejected and a second overlay will not be permitted.
- The Contractor shall then carry out repairs in accordance with 609.05.10.02.
- Removal depth shall be sufficient to remove the full thickness of the overlay lift and the original unsatisfactory surface lift.

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609.06 Measurement for Payment

609.06.01 Method of Measurement - Asphaltic Concrete

The quantity to be measured under this Section shall be the number of tonnes of each class of asphaltic concrete acceptably placed subject to payment adjustments.

The quantity of asphaltic concrete for a Lot shall not exceed that calculated as follows:

- Specified length x specified width x specified thickness x density x 1.1.

609.06.02 Unit Price Adjustment (UPA) of the Lot

The UPAs for asphaltic concrete are as shown in Tables 609-5, 609-6, 609-7 and 609-10.

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

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

$$UP_{Lot} = UP + \sum (UP_{Density} + UPA_{Asphalt\ Content} + UPA_{Gradation} + UPA_{Air\ Voids})$$

609.06.03 Payment Adjustment for Smoothness

The Engineer will provide the Contractor with a copy of the smoothness test results, including detailed payment adjustment summaries and Compulsory Corrective Work requirements.

609.06.03.01 100 Metre Segments:

Payment adjustments for 100 metre segments will be calculated based on the overall average IRI in mm/m for each 100 metre segment in each lane in accordance with Table 609-8.

609.06.03.02 Localized Roughness:

With the exception of areas described in Item 609.05.05.04.02, each 10 metre segment with an IRI value greater than those shown in Table 609-9 shall be defined as localized roughness, resulting in negative payment adjustments. The total localized roughness payment adjustment shall be the numerical summation of all the individual localized roughness payment adjustments for the defined section of Roadway.

609.06.03.03 Total Payment Adjustments:

The total payment adjustment shall be the summation of all the individual payment adjustments for each 100 metre segment in each lane, including localized roughness payment adjustments. If the total 100 metre segment payment adjustment is a positive value (bonus), the Contractor will be assessed the total 100 metre segment payment adjustment, and the total localized roughness payment adjustment for the defined section of Roadway.

If the total 100 metre segment payment adjustment is a negative value (penalty), the Contractor will be assessed either the total 100 metre segment payment adjustment or the total localized roughness payment adjustment, whichever is numerically less (i.e., whichever results in a greater penalty to the Contractor). The two penalties shall not be applied in summation.

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609.06.03.04 Segments Less Than 100 Metres:

For segments less than 100 metres in length, price adjustments will be determined from 10 metre segments that are not subject to exclusions as described in Item 609.05.05.04.02. Payment adjustments under Item 609.06.03.01 and Item 609.06.03.02 shall apply to these areas based on the actual number of 10 metre segments that are not excluded. Price adjustments shall be prorated based on the number of non excluded 10 metre segments in the 100 metre segment, as detailed in Table 609-8.

Example 1: 100 metre Segment (Station 7+700 - 7+800)
Exclusions apply in four (4) of the individual 10 m segments (20 m bridge + 10 m at each end)

10 Metre Segment	IRI (mm/m)	Exclusion Applies? (yes/no)	Localized Roughness Payment Adjustment	Average IRI over 60 metre Segment	IRI Payment Adjustment (See Table 609-8)	Total Payment Adjustment (for this 60 metre Segment)
7+700 -7+710	0.53	No	\$0	$\frac{(0.53+0.39+0.34+0.23+0.28+1.42)}{6} = 0.53$	$+\$470 \times 6/10 = +\$282$	$+282 - \$250 = +\$32$
7+700 - 7+720	0.39	No	\$0			
7+720 - 7+730	0.34	No	\$0			
7+730 - 7+740	0.23	No	\$0			
7+740 -7+750	0.28	No	\$0			
7+750 - 7+760	1.15	Yes (Bridge Approach)	\$0			
7+760 - 7+770	1.86	Yes (Bridge Approach)	\$0			
7+770 - 7+780	2.43	Yes (Bridge Approach)	\$0			
7+780 - 7+790	0.91	Yes (Bridge Approach)	\$0			
7+790 - 7+800	1.42	No	-\$250			

Example 2: 30 metre Segment (Station 6+420 - 6+450) at end of paving section
Exclusions Apply in one (1) of the individual 10 m segments

10 Metre Segment	IRI (mm/m)	Exclusion Applies? (yes/no)	Localized Roughness Payment Adjustment	Average IRI over 60 metre Segment	IRI Payment Adjustment (See Table 609-8)	Total Payment Adjustment (for this 60 metre Segment)
6+420 -6+430	0.88	No	\$0	$\frac{(0.88+1.45)}{2} = 1.16$	$-190 \times 2/10 = \$38$	$-\$38 - \$250 = \$288$
6+430 - 6+440	1.45	No	-\$250			
6+440 - 6+450	1.65	Yes (Manhole)				

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609.06.04 Method of Measurement - Asphalt Cement

The quantity to be measured for payment under this section shall be the number of tonnes of asphalt cement utilized by the Contractor in producing hot mix asphaltic concrete as determined by the extractions from the random samples provided by the contractor to the Department and calculated for the tonnage of hot mix asphaltic concrete produced.

Provided Asphalt Concrete HRA is used as per section 609.03.01.01, the quantity to be measured for payment under this section shall be the number of tonnes of asphalt cement supplied by the Contractor in producing hot mix asphaltic concrete as determined by the extractions (extractions adjusted for the mean reclaimed asphalt cement content of RAP as per section 609.03.01.02) from the random samples provided by the Contractor to the Department and calculated for the tonnage of hot mix asphaltic concrete produced.

**Table 609-5
Unit Price Adjustment for Density (UPA_{Density})**

% of Theoretical Maximum Relative Density (Lot Average)	Unit Price Adjustment (\$ per Tonne)	% of Theoretical Maximum Relative Density (Lot Average)	Unit Price Adjustment (\$ per Tonne)
93.0	+1.00	91.1	-2.80
92.9	+0.80	91.0	-3.00
92.8	+0.60	90.9	-3.40
92.7	+0.40	90.8	-3.80
92.6	+0.20	90.7	-4.20
92.5	0.00	90.6	-4.60
92.4	-0.20	90.5	-5.00
92.3	-0.40	90.4	-5.40
92.2	-0.60	90.3	-5.80
92.1	-0.80	90.2	-6.20
92.0	-1.00	90.1	-6.60
91.9	-1.20	90.0	-7.00
91.8	-1.40	89.9	-8.00
91.7	-1.60	89.8	-9.00
91.6	-1.80	89.7	-10.00
91.5	-2.00	89.6	-11.00
91.4	-2.20	89.5	-12.00
91.3	-2.40	<89.5	reject
91.2	-2.60		

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**Table 609-6
Unit Price Adjustment for Asphalt Content ($UPA_{\text{Asphalt Content}}$)**

Mean of the Deviations of Actual Asphalt Content From the Approved Asphalt Content		Unit Price adjustment for Asphalt Content (\$ per Tonne)
Type A/HRA	0.00 to 0.40	0.0
	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
	> 0.65	reject
Type B	0.00 to 0.30	0.00
	0.31 to 0.35	-1.00
	0.36 to 0.40	-2.00
	0.41 to 0.45	-3.00
	0.46 to 0.50	-4.00
	> 0.50	reject

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**Table 609-7
Unit Price Adjustment for Gradation (UPA_{Gradation})**

Sieve Size ASTM Designation	Mean of the Deviations of the Gradation from the JMF		Unit Price Adjustment for Gradation
4.75 mm	Type A/HRA	Type B	\$ per Tonne
	0.0 to 6.0	0.0 to 5.0	0.00
	6.1 to 6.2	5.1 to 5.2	-0.50
	6.3 to 6.4	5.3 to 5.4	-1.00
	6.5 to 6.6	5.5 to 5.6	-1.50
	6.7 to 6.8	5.7 to 5.8	-2.00
	6.9 to 7.0	5.9 to 6.0	-2.50
	7.1 to 7.2	6.1 to 6.2	-3.00
	7.3 to 7.4	6.3 to 6.4	-3.50
	7.5 to 7.6	6.5 to 6.6	-4.00
	7.7 to 7.8	6.7 to 6.8	-4.50
	7.9 to 8.0	6.9 to 7.0	-5.00
	8.1 to 9.0	7.1 to 8.0	-10.00
	9.1 to 10.0	8.1 to 9.0	-15.00
	>10.0	>9.0	reject
75 µm	0.0 to 0.8	0.0 to 0.5	0.00
	0.9	0.6	-0.50
	1.0	0.7	-1.50
	1.1	0.8	-3.00
	1.2	0.9	-5.00
	1.3	1.0	-7.50
	1.4 to 1.5	1.1 to 1.2	-12.00
	>1.5	>1.2	reject
In addition to the above 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 4.75 mm size falls outside the gradation limits specified in Table 609-1. (b) The Lot payment will be reduced by \$5.00 per Tonne if the average of the Lot test results for the 75 µm size exceeds, up to a maximum of 1.0%, the upper gradation limit specified in Table 609-1. (c) The Lot will be rejected if the average of the Lot test results for the 75 µm size exceeds, by more than 1.0%, the upper gradation limit specified in Table 609-1.			

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**Table 609-8
Payment Adjustment for Smoothness**

IRI (mm/m)	Payment Adjustment
0.00 – 0.10	\$950.00
0.11 – 0.20	\$860.00
0.21 – 0.30	\$770.00
0.31 – 0.40	\$670.00
0.41 – 0.50	\$570.00
0.51 – 0.60	\$470.00
0.61 – 0.70	\$370.00
0.71 – 0.80	\$270.00
0.81 – 0.90	\$160.00
0.91 – 1.00	\$50.00
1.01 – 1.10	(\$70.00)
1.11 – 1.20	(\$190.00)
1.21 – 1.30	(\$320.00)
1.31 – 1.40	(\$450.00)
1.41 – 1.50	(\$590.00)
1.51 – 1.60	(\$740.00)
1.61 – 1.70	(\$900.00)
1.71 – 1.80	(\$1070.00)
1.81 – 1.90	(\$1260.00)
1.91 – 2.00	(\$1480.00)
2.01 – 2.10	(\$1720.00)
2.11 – 2.20	(\$2040.00)
2.21 – 2.30	(\$2750.00)
2.31 – 2.40	(\$3290.00)
2.41 – 2.50	(\$3300.00)
2.51 – 3.00	(\$3300.00)

**Table 609-9
Localized Roughness**

Localized Roughness IRI (mm/m) for 10 metre Segments	Payment Adjustment (for each occurrence)
> 1.40 and ≤ 3	(\$250.00)
> 3	(\$2000.00) or Compulsory Corrective Work

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**Table 609-10
Unit Price Adjustment for Air Voids (UPA_{Air Voids})**

Mean of Deviations of Air Voids from Target Value Air Voids (3.50%)	Unit Price Adjustment (\$/t)
0.00 to 1.00	0.00
1.01 to 1.10	-0.50
1.11 to 1.20	-1.00
1.21 to 1.30	-2.00
1.31 to 1.40	-4.00
1.41 to 1.50	-6.00
1.51 to 1.60	-8.00
1.61 to 1.70	-10.00
1.71 to 1.80	-12.00
1.81 to 1.90	-14.00
1.91 to 2.00	-16.00
>2.00	reject

609.07 Payment

609.07.01 Payment Adjustment for Use of Remix Paver or Material Transfer Vehicle

A unit price adjustment as defined in 609.04.03 or 609.04.05 shall apply to the total quantity of asphaltic concrete acceptably placed using either a remix paver or material transfer vehicle in accordance with this Item with prior written approval for use by the Engineer.

609.07.02 Basis of Payment - Asphaltic Concrete

Payment under this Section shall be at the unit bid price per tonne for each type of hot mix asphaltic concrete and this price shall be full compensation for materials, other than those supplied by the Department; handling, hauling, storing, stockpiling, cutting of existing pavement, painting of joints, mixing, hauling, placing and compacting hot mix asphaltic concrete, tools, labour, equipment, materials and incidentals necessary to complete the work.

609.07.03 Basis of Payment - Asphalt Cement

The supply and transportation of performance grade asphalt cement will be paid for at the Contractor's unit bid price per tonne of asphalt cement. This price shall be full compensation for any and all expenses that may be incurred for the supply, transport and delivery of the performance grade asphalt cement to the Contractor's plant, including the cost of any anti-stripping additive required to meet design mix requirements as well as any storage, heating and handling requirements.

The unit bid price per tonne of PG Grade asphalt cement specified shall be adjusted using the PG Grade 58-28 price index as posted 48 hours prior to closing of tender and the time when the asphalt cement is incorporated into the work. The price index to be used for comparison shall be the price as determined in the Maritime Suppliers Rack Price or as artificially established by the Department in the Special Provisions.

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This index can be found at: <http://www.gov.pe.ca/tir/index.php3?number=1038714&lang=E>

The payment adjustment will be in dollars per tonne of asphalt binder. A payment adjustment will be established for each month of paving in which the price index for the month differs by more than \$10/tonne from the price index for the month in which tenders for the Contract were opened. When the price index differential is less than \$10/tonne there will be no adjustment established for that month.

The payment adjustment for the month will be calculated as follows, where:

PA = Payment Adjustment for asphalt binder in dollars
T = PG asphalt binder price index for the month of Tender Opening
P = PG asphalt binder price index for month of paving
Q = Quantity of asphalt binder in tonnes

When $P > (T + \$10/\text{tonne})$, the Contractor receives an additional payment from the Owner as follows:

$$PA = (P - (T + \$10/\text{tonne})) \times Q$$

When $P < (T - \$10/\text{tonne})$, the Owner deducts from payments due to the Contractor as follows:

$$PA = ((T - \$10/\text{tonne}) - P) \times Q$$

Examples:

1. A Contractors unit bid price for asphalt cement was \$325 for a tender that closed in February. The posted price index 48 hours prior to tender closing was \$283.75 and the work was undertaken in May when the price index was \$293.25.

$$\$283.75 - \$10 = \$273.75$$

$$\$283.75 + \$10 = \$293.75$$

Since the price index at time of paving (\$293.25) falls within the $\pm \$10/\text{tonne}$ range of the price index 48 hours prior to tender closing there would be no adjustment to the unit price of the asphalt cement.

2. A Contractors unit bid price for asphalt cement was \$325 for a tender that closed in February. The posted price index 48 hours prior to tender closing was \$283.75 and the work was undertaken in June when the price index was \$260.00 and 250t of cement was used.

$$\$283.75 - \$10 = \$273.75$$

$$\$283.75 + \$10 = \$293.75$$

Since the price index at time of paving (\$260.00) falls outside the $\pm \$10/\text{tonne}$ range of the price index 48 hours prior to tender closing an adjustment to the amount paid to the Contractor would be required.

The price would be adjusted using the $P < (T - \$10/\text{tonne})$ formula. Thus, the Owner will deduct the following amount from payment to the Contractor:

$$PA = ((283.75 - 10) - 260) \times 250 = \$3437.50$$

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3. A Contractors unit bid price for asphalt cement was \$325 for a tender that closed in February. The posted price index 48 hours prior to tender closing was \$283.75 and the work was undertaken in August when the price index was \$310 and 250t of cement was used.

$$\$283.75 - \$10 = \$273.75$$

$$\$283.75 + \$10 = \$293.75$$

Since the price index at time of paving (\$310.00) falls outside the $\pm \$10/\text{tonne}$ range of the price index 48 hours prior to tender closing an adjustment to the amount paid to the Contractor would be required.

The price would be adjusted using the $P > (T + \$10/\text{tonne})$ formula. Thus, the Owner will add the following amount to the payment to the Contractor:

$$PA = (310 - (283.75 + 10)) \times 250 = \$4062.50$$

Compensation to the Contractor or the Owner for differences between the asphalt binder content as determined by extracted asphalt content, and the assumed asphalt binder content specified in 609.03.03.01 for the total payable tonnage, will be as follows:

Payment to the Contractor will be made for asphalt content in excess of the assumed asphalt binder content specified in 609.03.03.01 for the total payable tonnage, subject to the following limitations:

The maximum amount of asphalt content used in the above calculation will be the "Approved Asphalt Binder Content," from the JMF and subsequent approved adjustments, plus 0.65 % for Type A/HRA mix and 0.5 % for Type B mix.

Credit shall be given to the Owner for all asphalt binder content below the assumed asphalt binder content for the total payable tonnage.

Payments and credits will be based on the actual price per tonne as bid to the Contractor by the supplier for the Work.

Payments and credits will be determined on a day by day basis.

This determination is independent from and has no relationship to calculations for determining Unit Price adjustments as determined under 609.05.02.

In the case that the Contractor initiates an appeal under 609.05.09, the following shall apply:

If the new test results after the appeal process indicates that a penalty no longer applies, then the testing costs incurred by the Owner during the appeal procedures for that Lot will be borne by the Owner.

Payment to the Contractor will be made for the sampling costs.

If the new test results after the appeal process verify that a penalty still applies or rejection remains valid for that Lot, the testing costs incurred by the Owner during the appeal procedure shall be charged, in accordance with Table 609-11, to the Contractor.

If the Contractor carries out improvements for smoothness as outlined in Item 609.05.05, the smoothness shall be retested.

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The Contractor shall be charged for the smoothness retesting in accordance with Table 609-11.

**Table 609-11
Fixed Rates**

Item Reference	Description	Unit	Fixed Rate
609	Smoothness Retesting	Per Hour	\$100.00
609	Payment of Appeal Testing Costs (Density)	Per Core	\$40.00
609	Approval of 2 nd and Subsequent Mix Design(s)	Per Mix Design	\$2000.00
609	Payment of Appeal Testing Costs	Lump Sum	
	Density		\$500.00
	Asphalt Content		\$400.00
	Asphalt Content and Gradation		\$500.00
	Thickness		\$200.00
	Air Voids		\$500.00

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

HMA DRIVEWAY MIX

610**610.01** Description

This Section defines the requirements for the materials, equipment and methods to be followed for production, transportation of hot mixed, hot laid asphaltic concrete for driveway pavement construction and other purposes.

610.02 Material

Hot Mix Asphaltic Concrete used under this section shall be in accordance to section 603. Asphalt Cement used under this section shall be in accordance to section 501.

610.03 Method of Measurement

Measurement for this item shall be the number of tonnes of each type of asphaltic concrete acceptably placed for driveway hookups measured from the outside pavement edge of the mainline paving work to a location determined by the Department for each driveway.

610.04 Basis of Payment

Payment under this item shall be at the unit bid price per tonne for each type of hot mix asphaltic concrete acceptably placed and this price shall be full compensation for labour, materials, equipment, preparation, supply of Hot Mix Asphalt, compacting and all other incidentals required to perform the work.

Asphalt Cement used in this item shall be paid in accordance with Section 501.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

REHABILITATION		700
701	Pulverize in Place	
702	Pulverize, Stockpile and Replace RAP	
703	Pulverize and Stockpile RAP	
704	Cold Plane, Stockpile and Replace RAP	
705	Cold Plane Construction Joint	
706	Cold Plane and Patch	
707	Transverse Crack Repair with Reinforcement Mesh	
708	Polystyrene Foam Board Placement	
709	Pavement Restoration	
710	Cutting Asphalt	
711	Excavate and Patch	
712	Cold Plane, Stockpile and Replace RAP as Shoulder Material	
713	Longitudinal Cold Plane Construction Joint	
714	Curb Removal	
715	Cold Plane, Transport and Pave	
716	Cold Plane, Transport and Stockpile	

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

PULVERIZE IN PLACE

701

701.01 Description

This work shall consist of pulverizing asphaltic concrete, portland cement, soil-cement or combinations thereof in place and utilization of the pulverized material as a base course.

701.02 Construction Method

The Contractor is responsible for determining the depth of pulverization required for the pavement structure.

The Contractor shall cut back shoulder material along the edge of the asphaltic concrete to be pulverized to the depth specified by the Engineer to prevent contamination of the pulverized material. The Contractor will pulverize the existing materials to its full depth using an approved method. After being pulverized, the material shall conform to the gradation specified in Table 701-1.

Table 701-1 Gradation Requirement for Pulverized Material after Processing

Sieve Size	Passing (%)
50 mm	100
25 mm	75-100
12.5 mm	55-83
4.75 mm	35-60
1.18 mm	15-45
600 µm	10-35
300 µm	5-25
75 µm	0-10

The pulverized material shall be uniformly graded to the specified lines and grades within a tolerance of 25 mm and thoroughly compacted in accordance with Section 209 to 95% Standard Proctor Density.

Limit shoulder and pulverizing operation to what can be graded daily to allow safe passage of traffic.

When 100 mm or less of new granular material is to be added, it must be thoroughly mixed with the pulverized roadbed. Grading and compaction shall be in accordance with this Section.

Maintain the grade and compaction of entire roadbed until the project is complete. The pulverized material may be spread across an area smaller or larger than the original pavement.

701.03 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of pavement pulverized in-place.

New granular material added to the roadbed will be measured for payment as specified in accordance with Section 207.

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PULVERIZE IN PLACE

701

701.04 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for cutting back shoulders, pulverizing, grading, compacting, maintaining the graded base course, tools, labour, equipment, water for compaction and incidentals necessary to carry out the work.

New granular material added will be paid for in accordance with Section 207.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

PULVERIZE, STOCKPILE AND REPLACE RAP

702

702.01 Description

This work includes pulverizing the existing asphaltic concrete, stockpiling pulverized material and placing the Reclaimed Asphalt Pavement (RAP) on the roadbed as a base material.

702.02 Construction Method

The Contractor shall cut back shoulder material along the edge of the asphaltic concrete to be pulverized to the depth specified by the Engineer to prevent contamination of the RAP.

The Contractor shall break the existing asphaltic concrete to its full depth using an approved method. The Contractor shall prevent soil-cement, sub-base material or other contaminants from mixing with the broken asphaltic concrete.

The Contractor shall limit shoulder and pulverizing operation to what can be graded daily to allow safe passage of traffic.

The Contractor shall provide a suitable stockpile site and submit a proposed site plan and stockpile procedures to the Engineer for review; strip and stockpile the topsoil and overburden. The Contractor shall provide security for the stockpile, which may involve a gate with lock and key, to prevent losses; and ensure the RAP stockpile site meets all safety and environmental regulations. At the completion of the contract, the contractor will reinstate the topsoil and overburden, and be responsible for seeding the area of the stockpile site.

The RAP shall meet the gradation specified in Table 702-1.

Table 702-1 Gradation Requirement for RAP

Sieve Size	Passing (%)
50 mm	100
25 mm	75-100
12.5 mm	55-83
4.75 mm	35-60
1.18 mm	15-45
600 µm	10-35
300 µm	5-25
75 µm	0-10

The pulverized material shall be uniformly placed and graded to the specified lines and grades within a tolerance of 25 mm and thoroughly compacted in accordance with Section 209 to 95% Standard Proctor Density.

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PULVERIZE, STOCKPILE AND REPLACE RAP

702

702.03 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of asphalt actually removed from the road.

702.04 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for cutting back shoulders, pulverizing asphaltic concrete, preparing, cleaning, and reinstating stockpile sites, providing the necessary environmental and safety protection, security, transporting RAP, crushing, placing, grading, compacting, maintaining the replaced material, tools, labour, equipment, water for compaction and incidentals necessary to carry out the work.

New granular material added to the roadbed shall be paid for in accordance with Section 207.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

PULVERIZE AND STOCKPILE RAP

703

703.01 Description

This work includes pulverizing the existing asphalt concrete, transporting the Reclaimed Asphalt Pavement (RAP) and constructing a RAP stockpile.

703.02 Construction Method

The Contractor shall cut back shoulder material along the edge of the asphalt concrete to be pulverized to the depth specified by the Engineer in order to prevent contamination of the RAP.

The Contractor shall break the existing asphaltic concrete to its full depth using an approved method. The Contractor shall prevent soil-cement, sub-base material or other contaminants from mixing with the broken asphaltic concrete.

The size of the RAP shall not be greater than the maximum size that can be efficiently loaded into trucks.

The RAP shall be transported to a designated site and the RAP shall be crushed by an approved method so that all material will pass a 50 mm Sieve. The crushed RAP shall be placed in a stockpile in such a manner that it does not become contaminated with other material.

The Contractor shall provide security for the RAP stockpile, which may include a gate with lock and key, to prevent losses.

After the broken asphalt concrete has been removed, the roadbed shall be graded to provide safe passage for traffic. The shoulder and pulverizing operation shall be limited to what can be graded daily to allow safe passage of traffic during non-working hours in accordance with Section 105.06.

703.03 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of road actually pulverized and stockpiled.

703.04 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for cutting back shoulders, breaking asphaltic concrete, RAP transportation to stockpile site, providing for the necessary environmental and safety protection, security, RAP crushing, construction of RAP stockpiles, all tools, material, equipment and incidentals necessary to carry out the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD PLANE, STOCKPILE AND REPLACE RAP

704

704.01 Description

This work includes the cold planing, removal and stockpiling of asphaltic concrete from the roadway, and placement of the Reclaimed Asphalt Pavement (RAP) on the roadbed.

704.02 Construction Method

The cold planer shall be a self-propelled commercially designed unit, equipped with automatic longitudinal and transverse grade and slope controls. Minimum planing width capability shall be 2 m. All RAP material shall pass a 50 mm Sieve.

The cold planer shall be further equipped with a loading conveyor to facilitate the removal and transportation of the RAP directly by truck. Depositing of the RAP directly on the roadway shall not be permitted.

The longitudinal and transverse grade and slope controls shall be equipped to operate from a ski or matching shoe and capable of maintaining a profile grade elevation or cross slope.

The contractor will reshape or remove any material required to establish proper drainage at the end of each days milling production.

With full depth removal, care shall be taken in the removal of the asphaltic concrete not to contaminate the RAP with the underlying base material. If the Contractor removes the specified thickness in more than one layer, then material from each layer must be stockpiled separately as directed by the Engineer. For partial depth removal, the loose material remaining after removal of the RAP shall be cleaned from the surface prior to opening to traffic.

The contractor shall provide a suitable stockpile site and submit a proposed site plan and stockpile procedures to the Engineer for review. The contractor shall strip and stockpile the topsoil and overburden in accordance with Section 204; and provide security for the stockpile, which may involve a gate with a lock and key, to prevent losses. At the completion of the contract, the contractor will reinstate the topsoil and overburden and be responsible for seeding the area located at the stockpile site.

Proper stockpiling procedures shall be followed in constructing RAP stockpiles. Stockpiles shall be built up in 1 m deep layers. RAP placed in stockpiles by trucks shall be uniformly stop-dumped to prevent segregation. The use of heavy equipment in constructing the stockpiles shall be such to prevent compaction of the RAP. The Contractor must ensure stockpile site meets all safety and environmental regulations.

Stockpiles shall be placed on a level well drained base capable of supporting the entire weight of the stockpile and in such a manner to ensure maximum recovery of the RAP without contamination.

The RAP shall be uniformly placed and graded to the specified lines and grades within a tolerance of 25 mm and thoroughly compacted in accordance with Section 209 to 95% Standard Proctor Density.

When 100 mm or less of new granular material is to be added, it must be thoroughly mixed with the RAP.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD PLANE, STOCKPILE AND REPLACE RAP

704

704.03 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of asphaltic concrete cold planed.

704.04 Basis of Payment

Cold planing of asphaltic concrete, shall be paid for at the unit bid price per square metre and this price shall be full compensation for cold planing, preparing the site for stockpiling and reinstating, security, construction of Rap stockpile, providing environmental and safety protection necessary, transporting, placing, mixing, and compacting cold planed Rap, equipment, tools, labour and incidentals necessary to complete the work.

New granular material added to the road bed shall be paid for in accordance with Section 207.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD PLANE CONSTRUCTION JOINT

705

705.01 Description

Work under this Section includes cold planing existing asphalt concrete across the width of the road at the beginning and end of the Contract limits. The purpose of this work is to allow the proper grade transition with the existing pavements.

The depth to cold plane shall be determined by the new overlay thickness. Cold planed material will be removed and placed as directed.

705.02 Construction Method

The Contractor shall cold plane the existing asphaltic concrete surface to satisfy the paving requirements for transverse construction joints as detailed in Sub-Provision 603.13.03.

All areas which have been cold planed shall be swept and tacked.

Subject to Section 104.14, the Rap material resulting from this work shall be deemed surplus or waste by the Engineer.

705.03 Method of Measurement

The quantity to be measured under this Section shall be the number of square metres of pavement which have been cold planed and tacked.

705.04 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for all work, tools, equipment, disposal of waste material, labour, tack and incidentals necessary to complete the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD PLANE AND PATCH

706

706.01 Description

This work shall consist of cold planing designated areas to a depth determined by the Engineer, and patching with hot mix asphaltic concrete.

706.02 Construction Method

The Contractor shall cold plane areas to be patched to a depth determined by the Engineer.

The cold planed edges are to be vertical and the area shall be broomed clean prior to tack coat application.

The areas shall be patched with an approved asphaltic concrete mix determined by the Engineer. The asphaltic concrete production and placement shall be in accordance to Section 603.

Work shall be scheduled so that at the end of each day all patches are flush with the adjacent pavement and so that no planed areas are left open.

Subject to Section 104.14, the Rap material resulting from this work shall be deemed surplus or waste by the Engineer.

706.03 Method of Measurement

The quantity to be measured under this Section shall be the number of square metres of patch completed. If the Contractor is required to cold plane to a depth greater than 50 mm, as designated by the Engineer, then the additional depth beyond 50 mm shall also be measured for payment under this section.

706.04 Basis of Payment

Payment for this work shall be at the unit bid price per square metre and this price shall be adjusted for cold planing depths greater than 50 mm according to the following formula:

$$\frac{(50 \text{ mm} + \text{Additional Depth in mm}) \times \text{Unit Bid Price}}{50 \text{ mm}}$$

The unit price bid shall be full compensation for planing, preparation and cleaning, supply and placement of tack coat material, supply and placement of asphaltic concrete, compaction, and all equipment, tools, labour, and incidentals necessary to complete the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ASPHALT REINFORCEMENT MESH PLACEMENT

707

707.01 Description

This item relates to the strengthening of cracks or joints to be treated.

The Engineer shall designate the cracks or joints to be treated.

All relevant sections of Division 600 shall be in effect.

707.02 Material

The road reinforcement mesh must be self adhesive type made of glass fibre strand: GLASGRID 8502(R) or equivalent in terms of tensile strength, area weight, elongation, melt point and bond.

Asphaltic concrete for patching shall be Class C or Class B in accordance with Section 603.

Tack coat shall be in accordance with Section 601.

707.03 Coordination with Other Work

Successful completion of this work requires coordination with the asphaltic concrete levelling course placement. The timing and order of individual tasks may be affected.

707.04 Construction Method

A sectional view shall be shown on the Drawings that illustrates the location of the reinforcement in the pavement.

(1) Transverse Cracks and Longitudinal Cracks

- a) The crack shall be cold planed to a width of 500 mm and to a depth of 50 mm. All planed asphaltic concrete shall be reclaimed and spread on a designated road.
- b) The planed area shall be thoroughly cleaned in preparation for patching.
- c) Tack coat shall be applied to the planed area.
- d) The planed area shall be repaved full depth and width with asphaltic concrete Class C or Class B. Patch smoothness is important to ensure a successful bond with the reinforcement mesh.
- e) Immediately prior to placement of the levelling course, the Contractor shall supply and install the reinforcement mesh over the patches according to the manufacturer's instructions. Unless otherwise directed by the Engineer, the Contractor shall arrange to have a manufacturer's representative on site to provide technical support and assistance to the work crews on the first day of application.
- f) Reinforcement mesh shall be bonded to the pavement by rolling in place with a pneumatic roller weighing no less than ten (10) tonnes.
- g) A second course of reinforcement mesh may be placed, as directed by the Engineer, between subsequent layers of asphaltic concrete at the crack location.

(2) Longitudinal Joints

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ASPHALT REINFORCEMENT MESH PLACEMENT

707

- a) Tack Coat shall be applied to the longitudinal joint.
- b) Immediately prior to placement of the levelling course, the Contractor shall supply and install the reinforcement mesh over the joint according to the manufacturer's instructions. Unless otherwise directed by the Engineer, the Contractor shall arrange to have a manufacturer's representative on site to provide technical support and assistance to the work crews on the first day of application.
- c) Reinforcement mesh shall be bonded to the pavement by rolling in place with a pneumatic roller weighing no less than ten (10) tonnes.
- d) A second course of reinforcement mesh may be placed, as directed by the Engineer, between subsequent layers of asphaltic concrete at the joint location.

707.05 Method of Measurement

The quantities to be measured for payment under this Section shall be the number of square metres of reinforcement mesh acceptably placed.

707.06 Basis of Payment

Reinforcement mesh shall be paid at the unit bid price per square metre and this price shall be full compensation for preparing the pavement surface, supplying, placing and rolling the mesh.

Cold planing and patching shall be paid for in accordance with Section 706.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

POLYSTYRENE FOAM BOARD PLACEMENT

708

708.01 Description

This Section applies to the supply and placement of polystyrene foam boards (600 mm x 2.4 m) for the purpose of roadbed insulation.

The material shall be polystyrene foam board (600 mm x 2.4 m) having a compressive strength rating equal to or greater than 415 kPa and meeting or exceeding CGSB 51.20-M87, Type IV.

708.02 Construction Method

The foam boards shall be placed as shown in the contract drawings and plans. For the most part, the boards shall be placed directly on the existing paved surface except for a nominal 600 mm extension beyond the edge of the existing paved shoulder; and except for the transition zones at either end of the job, in which case the foam boards shall be placed on grade as shown in the detailed contract Drawings.

The foam boards shall be placed in areas designated in the Contract, lengthwise and parallel to the centreline of the roadway to obtain tight butt joints and staggered transverse joints. The boards should be secured during the backfilling process by placing small piles of the specified granular material on the boards immediately after installation.

Placement of granular base shall be in accordance with Section 207, except that when placed over the polystyrene foam boards; it shall be placed in 1 lift by end dumping and spreading.

Traffic shall not be permitted on the polystyrene foam board sections until the full depth of the granular base course has been placed and compacted in accordance with Section 207.

At the end of each working day, the polystyrene foam board placement shall have progressed to the same station on both sides of the centreline and a minimum 10 m temporary ramp of granular material shall be constructed to provide traffic a smooth transition between existing and granular base grades. When placement resumes, care shall be taken during the removal of the temporary ramps to ensure that the foam boards are not damaged and that a true edge is exposed and available to join on to.

708.03 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of road surface covered with polystyrene foam boards based on board count for the various thicknesses used.

708.04 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for all of the work and for all labour, equipment, materials, polystyrene foam boards and incidentals necessary to complete the work.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

PAVEMENT RESTORATION**709**

709.01 Description

The work carried out under this Section shall include the restoration of pavement surfaces cut or damaged during the course of other work.

709.02 Construction Method

The Contractor shall excavate, level and clear the area to be restored to a depth of 150 mm if the adjacent pavement is asphaltic concrete combined with soil-cement stabilization or to the subgrade if the adjacent pavement consists of full depth asphaltic concrete or asphaltic concrete combined with a granular base course.

Each layer shall be compacted, in accordance with Section 209, to 95% Standard Proctor Density except the top 150 mm which shall be compacted to 100% Standard Proctor Density.

Where the adjacent pavement includes a granular base course, the Contractor shall place equivalent granular material by hand in the area to be restored in layers not exceeding 150 mm and shall compact each layer, in accordance with Section 209 to 95% Standard Proctor Density. The granular material shall be placed to the top of the granular base course in the adjacent pavement.

The Contractor shall clean and apply tack coat to the edges of adjacent pavement.

The Contractor shall place hot mix base course asphaltic concrete, Class "A", approved by the Engineer, by hand in uniform layers not exceeding 75 mm in thickness in accordance with Section 603. Sub-section 603.14 General Requirements for Compaction shall not apply to asphalt placed under this Section.

The Contractor shall place a layer of hot mix seal course asphaltic concrete, Class "C", on top of the base course asphalt in layers not exceeding 50 mm and shall compact it in accordance with Section 603. Sub-section 603.14 General Requirements for Compaction shall not apply to asphalt placed under this Section.

709.03 Method of Measurement

The quantity to be paid for under this Section shall be the number of square metres of pavement restored as authorized by the Engineer.

No measurement shall be made for granular base course material, tack coat or hot mix asphaltic concrete placed under this Section.

No measurement for payment shall be made under this Section for pavement restoration required as a result of the Contractor's negligence in performing any components of the work.

709.04 Basis of Payment

Pavement restoration shall be paid for at the unit bid price per square metre and this price shall be full compensation for excavation, supply and placement of granular base course material, supply and placement of tack coat material, supply and placement of hot mix asphaltic concrete, compaction, warranty of the work, equipment, tools, labour and incidentals necessary to complete the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CUTTING ASPHALT

710**710.01** Description

This work shall consist of cutting pavement in neat and straight lines or as directed by the Engineer.

710.02 Construction Method

The Contractor shall cut to the full depth of pavement, using a saw or jackhammer, the lines on the pavement surface as designated by the Engineer. The Contractor shall ensure that all such cuts are neat, straight, vertical and that pavement to be left in place is not damaged.

710.03 Method of Measurement

Measurement for payment under this Section shall only apply to pavement cut with the Engineer's approval.

The quantity to be measured under this Section shall be the number of linear metres of pavement cut to full depth. If the depth of cut is greater than 100 mm then the additional depth beyond 100 mm shall also be measured for payment under this Section.

710.04 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre of cut pavement and this price shall be adjusted for cuts greater than 100 mm according to the following formula:

$$\frac{100 \text{ mm} + \text{Additional Thickness} \times \text{Unit Bid Price}}{100 \text{ mm}}$$

The unit bid price shall be full compensation for equipment, tools, labour and incidentals necessary to complete the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

EXCAVATE AND PATCH

711

711.01 Description

This work shall consist of the restoration of the pavement to the lines as directed by the Engineer.

711.02 Construction Method

The Contractor shall cut to the full depth of the pavement, excavate and level.

The Contractor shall clean and apply tack coat to the edges of the adjacent pavement.

The Contractor shall place an approved asphaltic concrete mix determined by the Engineer in the excavated area in accordance with Section 603.

Subject to Section 104.14, the Rap material resulting from this work shall be deemed surplus or waste by the Engineer.

711.03 Method of Payment

The quantity to be paid for under this Section shall be the number of square metres of pavement excavated and patched.

711.04 Basis of Payment

The number of square metres of pavement excavated and patched shall be paid for at the unit bid price per square metre and this price shall be full compensation for excavation, supply and placement of tack coat material, supply and placement of asphaltic concrete, compaction, and all equipment, tools, labour and incidentals necessary to complete the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD PLANE, STOCKPILE AND REPLACE RAP AS SHOULDER MATERIAL

712

712.01 Description

This work includes the cold planing, removal, screening, and stockpiling of asphaltic concrete from the roadway, and placement of the screened Reclaimed Asphalt Pavement (RAP) as shoulder material.

712.02 Construction Method

The cold planer shall be a self-propelled commercially designed unit, equipped with automatic longitudinal and transverse grade and slope controls. Minimum planing width capability shall be 2 m. The Contractor shall be required to screen all RAP material so that it passes a 50 mm sieve.

The cold planer shall be further equipped with a loading conveyor to facilitate the removal and transportation of the RAP directly by truck. Depositing of the RAP directly on the roadway shall not be permitted.

The contractor will reshape or remove any material required to establish proper drainage at the end of each days milling production.

The longitudinal and transverse grade and slope controls shall be equipped to operate from a ski or matching shoe and capable of maintaining a profile grade elevation or cross slope.

With full depth removal, care shall be taken in the removal of the asphaltic concrete not to contaminate the RAP with the underlying base material. If the Contractor removes the specified thickness in more than one layer, then material from each layer must be stockpiled separately as directed by the Engineer. For partial depth removal, the loose material remaining after removal of the RAP shall be cleaned from the surface prior to opening to traffic.

The contractor shall provide a suitable stockpile site and submit a proposed site plan and stockpile procedures to the Engineer for review. The contractor shall strip and stockpile the topsoil and overburden in accordance with Section 204; and provide security for the stockpile, which may involve a gate with a lock and key, to prevent losses. At the completion of the contract, the contractor will reinstate the topsoil and overburden and be responsible for seeding the area located at the stockpile site.

Proper stockpiling procedures shall be followed in constructing RAP stockpiles. Stockpiles shall be built up in 1 m deep layers. RAP placed in stockpiles by trucks shall be uniformly stop-dumped to prevent segregation. The use of heavy equipment in constructing the stockpiles shall be such to prevent compaction of the RAP. The Contractor must ensure the stockpile site meets all safety and environmental regulations. Oversize RAP material shall be stockpiled separately from screened RAP material.

The Stockpiles shall be placed on a level well drained base capable of supporting the entire weight of the stockpile and in such a manner to ensure maximum recovery of the RAP without contamination.

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COLD PLANE, STOCKPILE AND REPLACE RAP AS SHOULDER MATERIAL

712

The Contractor should provide security for the stockpile, which may include a gate with lock and key, to prevent losses.

The Contractor shall prepare the shoulder, as provided for elsewhere in the contract, and shall ensure that any debris has been removed from the shoulder.

The RAP material shall be placed by a shouldering machine previously approved by the Engineer.

The Contractor shall produce a final graded surface having a uniform 4% cross-slope towards the ditch except on the outer edge of a super-elevated curve where the Contractor shall consult with the Engineer for direction.

Where shoulder material is to be placed after paving, compaction of aggregate shall be achieved by using an appropriate rubber-tired roller, in accordance with Section 209, to 95% of the Standard Proctor Density. The Engineer may approve the use of an alternative type of roller if safe operation of a rubber-tired roller cannot be achieved. Excess shoulder material shall be removed at the Contractor's own expense.

712.03 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of asphaltic concrete cold planed.

712.04 Basis of Payment

Cold planing of asphaltic concrete, shall be paid for at the unit bid price per square metre and this price shall be full compensation for cold planing, preparing the site for stockpiling, screening of all cold planed material, reinstatement of stockpile site, security of stockpiled material, providing environmental and safety protection necessary, placing cold planed RAP, equipment, tools, labour and incidentals necessary to complete the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

LONGITUDINAL COLD PLANE CONSTRUCTION JOINT

713

713.01 Description

Work under this Section includes cold planing along the longitudinal edge of the existing asphalt. The purpose of this work is to add additional width of asphalt to the existing structure, in multiple lifts of varying thickness, as directed by the Engineer.

The depth and width to cold plane will be determined by the Engineer. Cold planed material will be removed and placed as directed. The longitudinal cold planing will correspond with the placement of the individual lifts of asphalt. As directed by the Engineer, the cold planing may be required to be completed over a period of days due to safety concerns for the travelling public.

713.02 Construction Method

The Contractor will cold plane the existing asphaltic concrete surface to satisfy the paving requirements for longitudinal construction joints as detailed in Sub-Provision 603.13.01.

All areas which have been cold planed will be swept.

The RAP material resulting from this work may be used in other work as directed by the Engineer, or otherwise disposed of by the Contractor.

713.03 Method of Measurement

The quantity to be measured under this Section will be the number of square metres of pavement which has been cold planed.

713.04 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for all work, tools, equipment, labour and incidentals necessary to complete the work. No additional payments will be authorized for float charges if the cold planer is removed and returned to site.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CURB REMOVAL		714

714.01 Description

This work includes the removal & disposal of the existing concrete curb or asphaltic concrete curb and the adjacent material.

714.02 Construction Methods

The Contractor shall remove the existing curb along with the adjacent material to a maximum of 0.5 metres behind the existing curb. The work will include loading the curb, adjacent material and disposing of the material; sweeping and cleaning of the area as required.

714.03 Method of Measurement

Measurement of payment under this section shall be the number of linear meters of curb removed.

714.04 Basic of Payment

Payment under this section shall be at the unit bid price per linear meter and this price shall be full compensation for removing and disposing of the curb and adjacent material, sweeping, general clean up, tools, labour, equipment, and incidentals necessary to carry out the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD PLANE, TRANSPORT AND PAVE**715**

715.01 Description

This work includes the cold planing, removal and transporting of asphaltic concrete from the roadway, screening and placement of the screened Reclaimed Asphalt Pavement (RAP) on a roadbed as a paving operation.

715.02 Construction Method

The cold planer shall be a self-propelled commercially designed unit, equipped with automatic longitudinal and transverse grade and slope controls. The longitudinal and transverse grade and slope controls shall be equipped to operate from a ski or matching shoe and capable of maintaining a profile grade elevation and cross slope. The cold planer shall have a minimum planing width capability of 2 m. The Contractor shall be required to screen all RAP material so that it passes a 50 mm sieve.

The cold planer shall be further equipped with a loading conveyor to facilitate the removal and transportation of the RAP directly by truck. The contractor will deliver the RAP directly to an alternate site, directed by the Engineer, and place with an approved asphalt spreader and compaction equipment in accordance with Section 603.05.

With full depth removal, care shall be taken in the removal of the asphaltic concrete not to contaminate the RAP with the underlying base material. If the Contractor removes the specified thickness in more than one layer, then material from each layer must be placed as directed by the Engineer. For partial depth removal, the loose material remaining after removal of the RAP shall be cleaned from the surface prior to opening to traffic.

The length of haul from the cold planing operation to the placement operation will be specified by the Engineer. The Rap shall meet the gradation specified in Table 715-1.

Table 715-1 Gradation Requirement for RAP

Sieve Size	Passing (%)
50 mm	100
25 mm	75-100
12.5 mm	55-83
4.75 mm	35-60
1.18 mm	15-45
600 µm	10-35
300 µm	5-25
75 µm	0-10

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD PLANE, TRANSPORT AND PAVE

715

715.03 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of asphaltic concrete cold planed.

715.04 Basis of Payment

The cold planning of asphaltic concrete, shall be paid for at the unit bid price per square metre and this price shall be full compensation for cold planning, transporting, placing cold planed RAP, compacting, equipment, tools, labour, and incidentals necessary to complete the work.

Open haul rates shall apply to this item. Should the actual haul distance differ from the specified distance, a price adjustment (increase and decrease) shall apply based on the actual haul distance.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

COLD PLANE, TRANSPORT AND STOCKPILE

716

716.01 Description

This work includes the cold planing of the existing asphalt concrete, transporting the reclaimed asphalt pavement (RAP) and constructing a RAP stockpile.

716.02 Construction Method

The cold planer shall be a self-propelled commercially designed unit, equipped with automatic longitudinal and transverse grade and slope controls. Minimum planing width capability shall be 2 m. All RAP material shall pass a 50 mm Sieve.

The cold planer shall be further equipped with a loading conveyor to facilitate the removal and transportation of the RAP directly by truck.

The longitudinal and transverse grade and slope controls shall be equipped to operate from a ski or matching shoe and capable of maintaining a profile grade elevation or cross slope.

The contractor will reshape or remove any material required to establish proper drainage at the end of each days milling production.

With full depth removal, care shall be taken in the removal of the asphaltic concrete not to contaminate the RAP with the underlying base material. If the Contractor removes the specified thickness in more than one layer, then material from each layer must be stockpiled separately as directed by the Engineer. For partial depth removal, the loose material remaining after removal of the RAP shall be cleaned from the surface prior to opening to traffic.

The Engineer shall provide a stockpile location for the RAP. The Contractor shall provide equipment to construct the stockpile.

Proper stockpiling procedures shall be followed in constructing RAP stockpiles. Stockpiles shall be built up in 1 m deep layers. RAP placed in stockpiles by trucks shall be uniformly stop-dumped to prevent segregation. The use of heavy equipment in constructing the stockpiles shall be such to prevent compaction of the RAP. The Contractor must ensure stockpile site meets all safety and environmental regulations.

716.03 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of asphaltic concrete cold planed.

716.04 Basis of Payment

Cold planing of asphaltic concrete, shall be paid for at the unit bid price per square metre and this price shall be full compensation for cold planing, transporting and preparing the site for stockpiling, construction of Rap stockpile, providing environmental and safety protection necessary, equipment, tools, labour and incidentals necessary to compete the work.

This shall be an open haul. Should the actual haul distance differ from the specified distance, a price adjustment (increase or decrease) shall apply based on the actual haul distance.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ENVIRONMENT		800
801	Check Dams	
802	Water for Dust Control	
803	Hydro Seeding	
804	Seeding	
805	Mulching	
806	Silt Fence	
807	Erosion Control Mats	
808	Sediment Trap	
809	Sodding	
810	RESCINDED (2016)	
811	Straw Bale Barrier	
812	Compost	
813	Gabions	

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CHECK DAMS

801

801.01 Description

This work shall consist of the in-place construction of rip rap or straw bale check dams or flow checks. They shall be constructed across roadside drainage ditches and throughout cut sections to trap sediment and to prevent erosion of a small gully or ditch bottom and to trap sediment by reducing velocity and concentration.

*Refer to Section 7.1.1 Check Dams for TIE'S Environmental Protection Plan.

801.02 Material and Construction Method - General

All materials are to be supplied by the Contractor. Geotechnical fabric shall be in accordance with the requirements of Section 218. Random rip rap shall be supplied in accordance with the requirements of Section 213. Check dams are to be installed during construction and after the ditches are brought to final grade.

Check dams are to be constructed along any new ditching of the highway at spacings determined in sensitive areas by dividing 61 metres by the ditch grade in percent. This spacing provides for the placement of the check dams so that the crest of the downstream structure is at the same elevation as the toe of the upstream structure. Spacing may be increased where site conditions warrant, for example, in long stretches where the ditches are very flat. In these instances, the maximum spacing shall not exceed 500 metres.

801.03 Maintenance

The Contractor shall maintain check dams in a functional condition until the grass on seeded slopes and ditch bottom is sufficiently established to be an effective deterrent to erosion. This includes inspections after each rainfall, immediate repairs to structures found not functioning properly and removal of sediment deposits.

The Contractor shall dispose of the sediment deposits at a location at least 30 m away from a watercourse, and in such a manner that the sediment will not be returned to the work area or watercourse.

The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 100 mm of the crest of the notch.

The Engineer may require that some or all check dams be maintained after substantial completion of the work.

801.04 Decommissioning

The Contractor shall remove the check dams after the site has been stabilized and level and seed the areas that are disturbed during the removal.

801.05 Rip Rap Check Dam

Check dams in this section are to be installed as indicated on Figures 801-01 and 801-02. Rip Rap check dams are to be used in ditches where the ditch slope is greater than 2 (%) two percent.

The Contractor shall comply with the following procedure:

Excavate a sediment pit just upstream of where the check dam is to be constructed.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CHECK DAMS

801

Key the check dam 150 mm into the slopes and ditch surface to prevent undermining. Place geotechnical fabric on the prepared area starting at the toe of slope of the sediment pit and overlap edges by 100 mm. Roll out the fabric in the direction of flow and extend underneath the apron. Note that the aprons in these structures are not keyed into the soil.

Place riprap for the check dam and apron on the fabric being careful not to cause any damage.

Make the top of the check dam at least 300 mm wide. The crest of the spillway on the dam is to be located 300 mm below the elevation at the ends of the dam to ensure flow over the spillway and to avoid overtopping at the edges where erosion may occur. The height of the spillway shall be a minimum of 300 mm.

801.06 Straw Bale Check Dams

Straw bale check dams are more suitable for treating runoff from small drainage areas or where ditches have relatively flat gradients, equal to or less than 2 (%) two percent, and have low velocities. Straw bale check dams shall be comprised of a minimum of 5 bales, with additional bales installed as required.

Check dams in this section are to be installed as indicated on Figures 801-03 and 801-04. The Contractor shall comply with the following procedure:

Remove rocks, roots, logs and other debris and grade as required.

Prepare 100 mm deep trench along entire footprint of check dam. Embed straw bales in trench and place the bales tightly together. Drive two sturdy wooden stakes through each bale, deep enough to anchor them securely. Drive the stakes in each bale toward the previously laid bale to force the bales together.

Wedge loose straw between any cracks or openings, the subsequent movement of the loose straw tends to seal any undetected openings in the barrier.

On both sides of the check dam, the bales shall extend up the ditch side slope to ensure flow over the spillway and to avoid overtopping at the edges of the check dam where erosion may occur. The crest of the spillway on the dam is to be located a minimum of 300 mm below the elevation where the upper most bale and the ditch intersect.

A sediment collection pit shall be excavated upstream of the check dam.

801.07 Method of Measurement

The quantity to be measured for payment shall be the number of check dams that are constructed and maintained as per this specification.

801.08 Basis of Payment

Payment for work under this item shall be a unit price for each type of check dam and shall be full compensation for all labour, equipment and material to install, maintain and decommission the check dams including the disposal of all surplus materials and accumulated sediments, and site reinstatement to a condition acceptable to the Engineer.

Maintenance and decommissioning is the responsibility of the contractor until the end of the warranty period.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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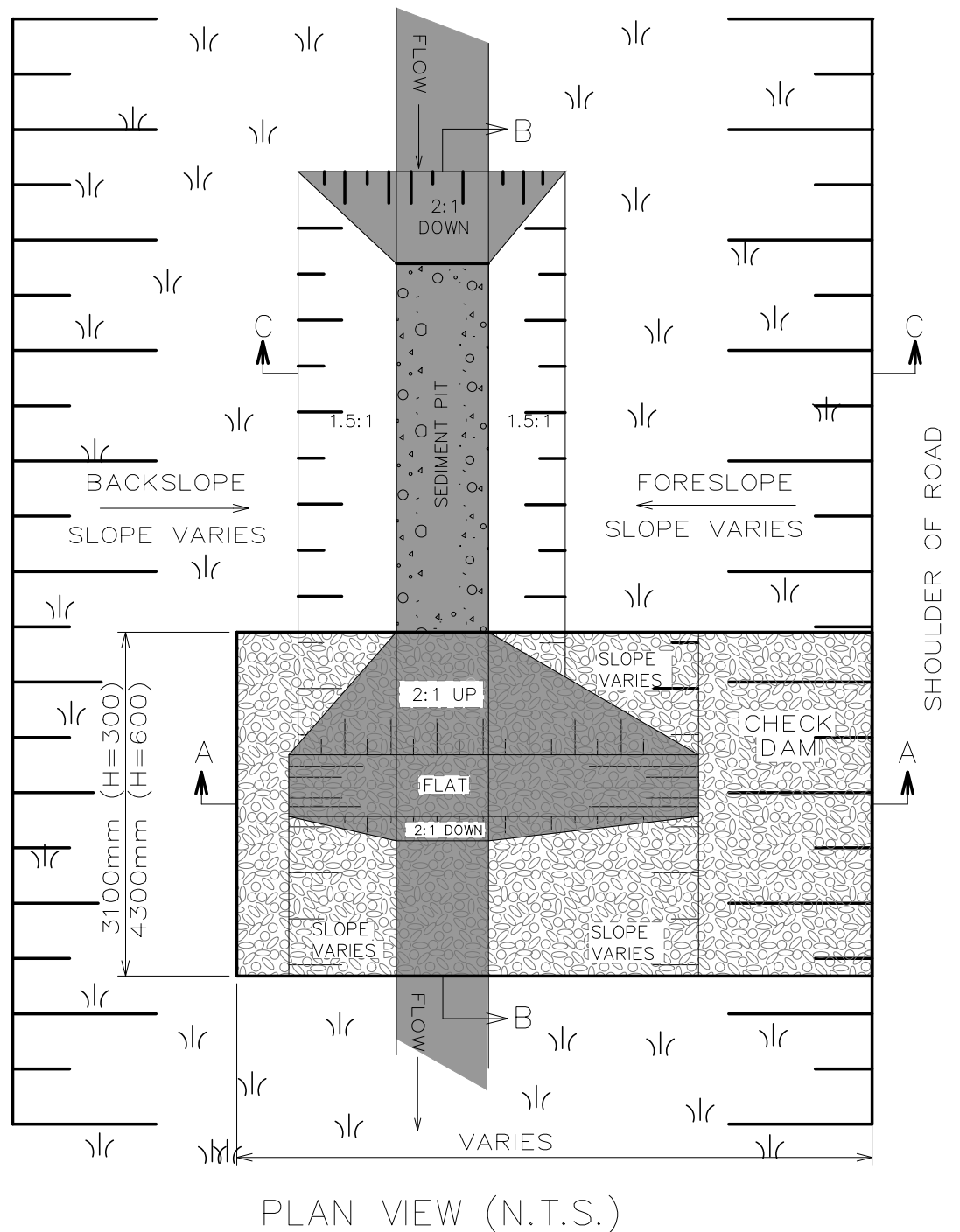
DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CHECK DAMS

801

Payment for rip rap required under this section shall be in accordance with Section 213 - Random Rip Rap.

Payment for geotechnical fabric required under this section shall be in accordance with Section 218 - Geotechnical Fabric.



Notes:

1. Depth, width and side slopes of sediment pit may vary with soil conditions (as directed by engineer)
2. All riprap shown is R-5
3. See Figure 801-02 for section details.

FIGURE 801-01 RIP RAP CHECK DAM
REVISED 2002

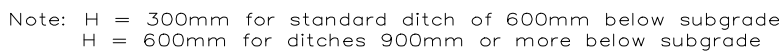
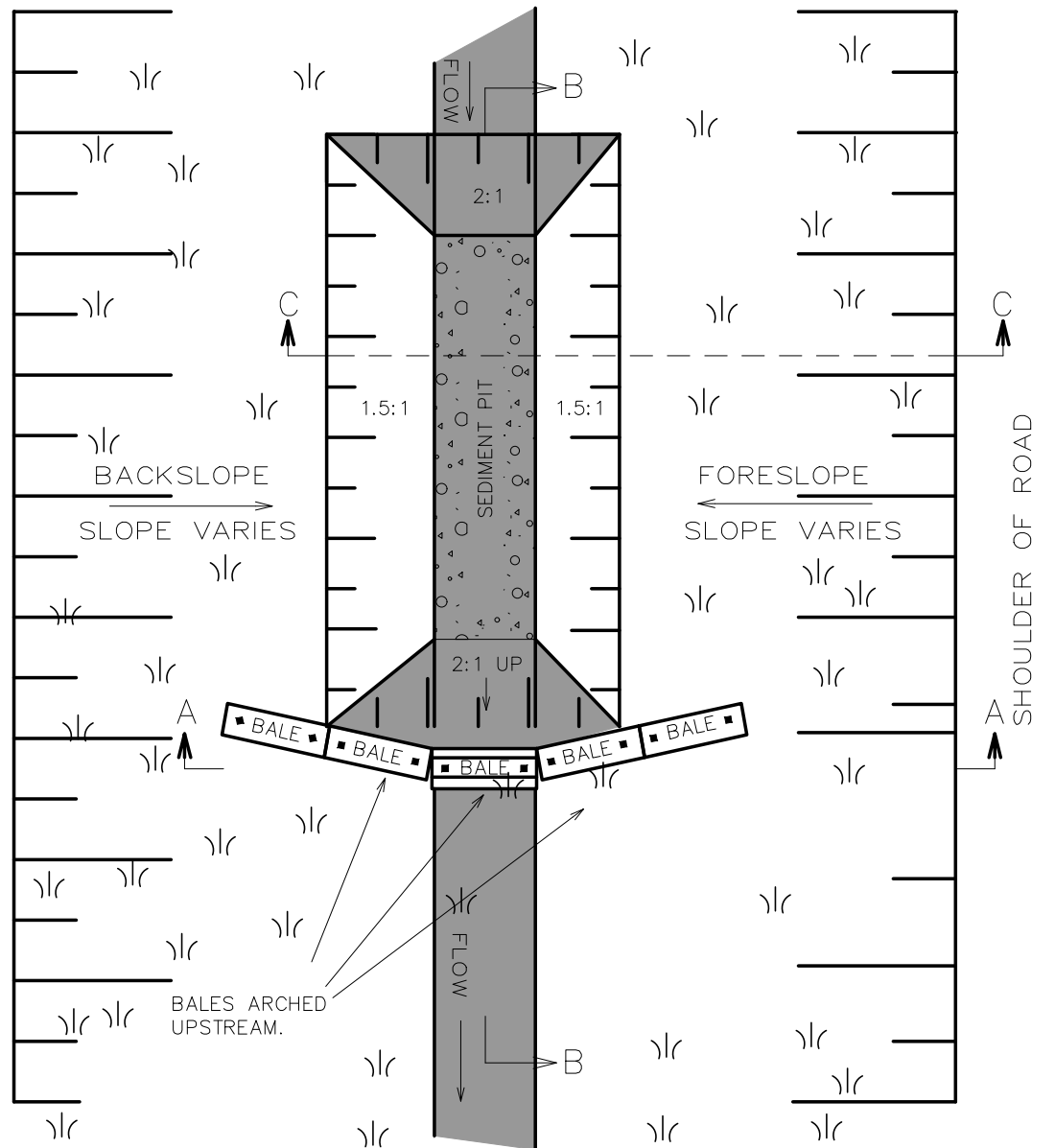


Figure 1 is a schematic diagram of the experimental setup. It shows a cross-section of a flume with a sediment pit and a geotechnical fabric. The total width of the flume is 4000mm. The sediment pit is 300mm deep and 150mm wide. The geotechnical fabric is 2100mm wide (H=300mm) and 3300mm wide (H=600mm). The flow direction is indicated by arrows labeled 'FLOW'. The sediment pit is labeled 'SEDIMENT PIT' and the geotechnical fabric is labeled 'GEOTECHNICAL FABRIC'.

FIGURE 801-02 SECTION DETAILS FOR RIP RAP CHECK DAM
REVISED 2002



Notes:

1. Number of bales required varies depending on backslope and foreslope and ditch width/depth.
2. Depth, width and sideslopes of sediment pit may vary with soil conditions as directed by engineer.
3. See Figure 801-4 for section details.

FIGURE 801-03 STRAW BALE CHECK DAM
REVISED 2002

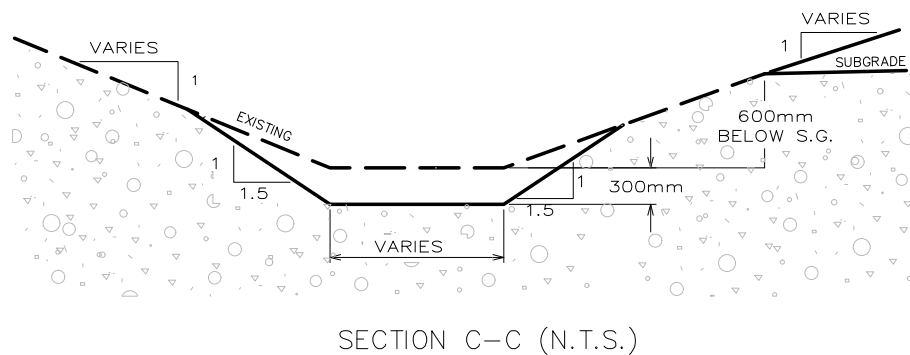
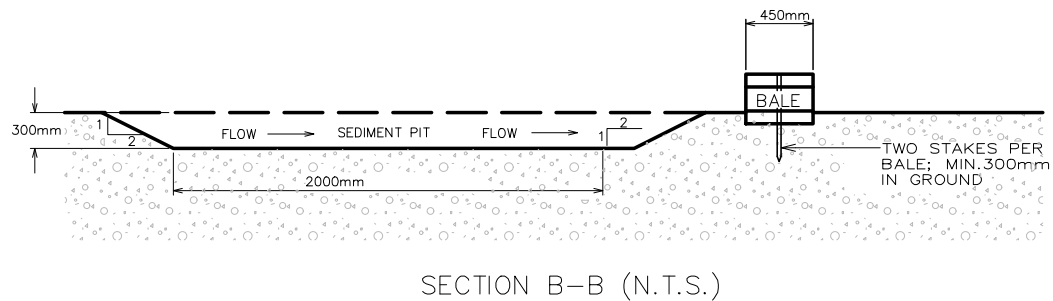
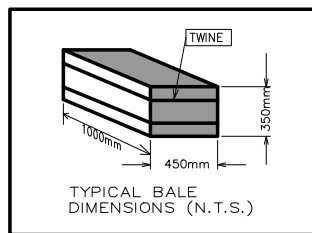
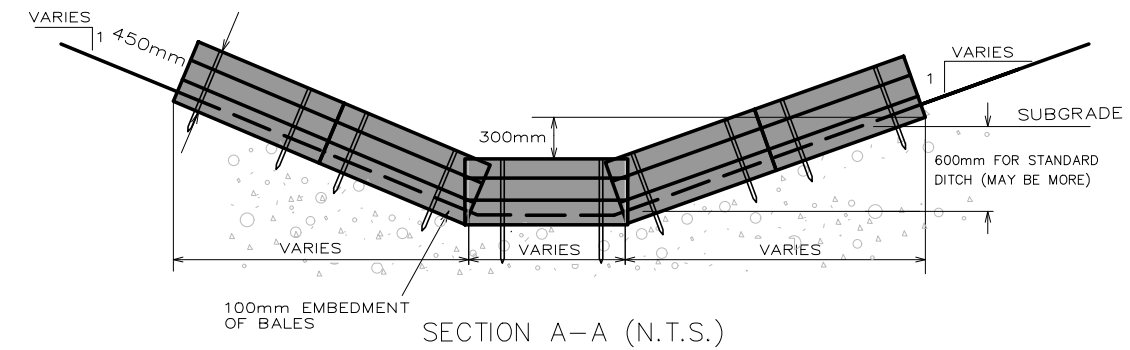


FIGURE 801-04 SECTION DETAILS FOR STRAW BALE CHECK DAM
REVISED 2002

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

WATER FOR DUST CONTROL

802

802.01 Description

This work shall consist of supplying and placing water to be used for dust control.

802.02 Construction Method

Locations where water is to be applied, the amount of water to be applied and the times at which it shall be applied shall be determined by the Engineer.

At least one mobile water application unit of at least 4.5 kR capacity for applying water shall be available on the work site at all times. Water shall be applied by means of a pressure type distributor equipped with a spray system of nozzles that will ensure a uniform application of water.

The intake hose to the tank shall be equipped with a device satisfactory to the Engineer to prevent fish from being pumped into the tank.

802.03 Method of Measurement

Measurement for payment under this Section shall be the volume of water applied as directed by the Engineer measured in kilolitres.

802.04 Basis of Payment

Payment under this Section shall be at the unit bid price per kilolitre of water applied and this price shall be full compensation for supply, transportation and placement of water for dust control, tools, labour, equipment, materials and incidentals necessary to perform the work.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

HYDRO SEEDING

803

803.01 Description

This work shall consist of hydraulically seeding areas designated by the Engineer adjacent to the highway to produce a uniform cover of grasses. Once established, the grasses will protect against erosion and sedimentation, reduce runoff flow velocities and improve infiltration, and provide for sediment removal (buffer strip).

*Refer to Section 7.1.5 Seeding and Hydroseeding of TIE's Environmental Protection Plan.

803.02 Material

The composition of seed shall be Canada No. 1 Mixture as defined by Table 803-1.

The following proportion of seeds should be added as a "nurse crop" to the Canada No. 1 Mixture of Table 803-1.

May 1 - July 31: Add 25% oats, minimum seed purity 98%, minimum germination 80%.

Aug. 1- Sept 30: Add 25% winter rye, minimum seed purity 98%, minimum germination 85%.

A nurse crop is a quick growing annual added to permanent mixtures that germinates and grows rapidly holding the soil until the slower growing perennial seedlings become established.

Table 803-1 Composition of Seed Mixture

Mixture Composition (Canada No.1)	Proportion (%)	Germination (%)	Purity (%)
Creeping Red Fescue	55	85	97
Red Top Canada	5	94	98
Timothy	10	92	96
Kentucky Blue Grass	10	85	98
White Dutch Clover	10	90	94
Perennial Rye Grass	10	95	98

The mixture for mulching and seeding shall, for each 1000 R of water, consist of 5 kg of seed mixture, 50 kg of 10-10-30 fertilizer, 220 kg of dolomitic lime and 60 kg of hydraulic mulch material.

The hydraulic mulch material shall be capable of dispersing rapidly in water to form a homogeneous slurry and of remaining in this state when agitated or mixed with other specified materials. When applied, the hydraulic mulch shall be capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil. It shall contain no growth or germination inhibitor. The mulch shall be dry, be free of weeds and all other foreign material and shall be supplied in packages indicating the weight.

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HYDRO SEEDING**803**

The hydraulic mulch shall be a mixture consisting of cellulose pulp and natural sun-dried fibres processed in 20 mm minimum and 25 mm maximum lengths.

803.03

Construction Method

After the areas to be treated have been brought to grade, they shall be harrowed to bring the top 50 mm to a loose friable condition. This area shall be left with a true uniform smooth surface. Any stones greater than 50 mm shall be removed and disposed of.

Hydro seeding shall not be permitted on hardened or crusted soil. Areas to be hydro seeded shall be dressed as above or otherwise left in a loosened condition free of ruts, ridges or deleterious materials such as sticks, roots or large rocks.

Hydro seeding shall be carried out as soon as possible after completing surface preparation.

Depending on conditions and the size of the project, the Engineer may require that hydro seeding be done in stages as the work progresses.

The hydraulic method of seeding and mulching shall be used. The work shall be done with an approved machine operated by a competent crew. The materials shall be mixed with water in the tank of the machine and kept agitated to ensure a uniform mix and suspension at all times during the operation. The equipment must be designed and operated to uniformly distribute seed, fertilizer and mulch on the designated areas at the rates specified.

The rate of application shall be 22.5 kR of mixture per hectare.

On a trial basis, beginning in 2016, TIE will provide a representative of the Department to be present during the preparation of the hydroseed mix to ensure that the composition (as identified in the specification manual) is being met. Additionally, TIE will provide a representative to measure the application of the hydroseed to ensure that the specification is being met. This effort and the results will be used to determine whether or not changes need to be made to the specification of the hydroseed.

Seeded shoulders shall be rolled to the satisfaction of the Engineer.

Areas of poor growth which exceed five percent of the total area seeded shall be re-seeded. The success of the seeding will be judged on its growth at the end of the growth season.

No work under this Section shall be carried out prior to May 1 or after September 30 without written approval from the Engineer.

Hydro seeding should not be performed under windy conditions or during periods of rainfall, in standing water, or under adverse conditions, as determined by the Engineer.

Within 30 m of a watercourse, the following schedule will apply:

- if hydro seeding prior to June 1 or after September 30, the hydro seed shall be completely covered with an erosion control material within 48 hours. This material shall be either: (a) Mulching "1" (as per Section 805) covered with jute mat (as per Section 807); or (b) erosion control blanket (as per Section 807).

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HYDRO SEEDING

803

- if, due to lateness of the season, hydro seeding is not possible, the exposed area shall be completely covered for "over-wintering" with an erosion control material being either: (a) Mulching "1" (as per Section 805) covered with jute mat (as per Section 807); or (b) erosion control blanket (as per Section 807). Then, early in the next growing season, the erosion control material shall be removed, the area shall be harrowed, smoothed and stones removed as described above, and then hydro seeded.

803.04 Maintenance

The Contractor shall inspect regularly and after rainfalls of 5 mm or more accumulation, and re-seed areas as required until the area has stabilized.

Additional fertilizer may be applied to facilitate thicker growth.

The Contractor shall not remove sediment control structures until the seeded area has been properly stabilized. Disturbed areas shall be levelled and seeded.

803.05 Method of Measurement

Measurement for payment under this Section shall be the area of land hydro seeded and measured in square metres.

Measurement for payment for any required erosion control material shall be as per the applicable sections (i.e. Section 805 Mulching and Section 807 Erosion Control Mats) for specified materials.

803.06 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre and this price shall be full compensation for preparation of the area to be hydro seeded, supply of the hydro seed mixture, placement of the mixture, all tools, labour, equipment, materials and other incidentals necessary to perform the work.

Payment for any required erosion control material shall be as per the applicable sections (i.e. Section 805 Mulching and Section 807 Erosion Control Mats) for specified materials.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

SEEDING**804**

804.01 Description

This work shall consist of seeding areas as designated by the Engineer.

*Refer to Section 7.1.5 Seeding and Hyrdroseeding of TIE's Environmental Protection Plan.

804.02 Material

Grass seed shall be certified No. 1 Grade, Government of Canada Seeds Regulation, with a minimum germination of 75% and a minimum purity of 97%. The grass seed mixture shall be as recommended by the Department of Agriculture. Fertilizer shall be completely synthetic, slow release fertilizer with maximum 35% water soluble nitrogen. Fertilizer to contain proportions of nitrogen, phosphoric acid and potash as recommended for the area by the Department of Agriculture.

804.03 Construction Method

The Contractor shall cultivate areas to be seeded to 100 mm depth and shall fine grade the area free from humps and hollows and free of deleterious and refuse material. Waste material shall be disposed of in accordance with Provision 104.14. Commercial fertilizer shall be spread and raked at a rate of 2.3 kg per 93 m² on areas to be seeded.

The Contractor shall seed the designated area during early spring or between August 15 and October 15. Sow during calm weather using suitable equipment to the approval of the Engineer. Spread seed evenly at a rate of 2.3 kg per 93 m². Sow half of the required amount of seed in one direction and the remainder at right angles. Incorporate seed into soil to a minimum depth of 5 mm. Mix carefully with a light chain harrow or wire rakes and roll area immediately afterward with a water ballast type lawn or agricultural type roller.

Lawns planted during the spring season shall be maintained after planting and as long as is necessary to establish a close stand of grass, free of weeds and undesirable grasses. Lawns planted during the fall planting season shall be maintained in the same manner as for spring planting but they shall not be deemed acceptable until the following July 1st, provided a lawn of close stand of grass of varieties specified free of weeds and undesirable grasses is established.

The Contractor shall apply water immediately after rolling with a fine spray to a depth penetration of at least 50 mm. Water shall be potable and free of impurities that would inhibit germination.

804.04 Method of Measurement

The quantity to be measured under this Section shall be the number of square metres of seeding deemed acceptable by the Engineer.

804.05 Basis of Payment

Seeding shall be paid for at the unit bid price per square metre and this price shall be full compensation for materials, equipment tools, labour and incidentals necessary to complete the work.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

MULCHING

805**805.01** Description

This item consists of the supply and application of hay as a mulch on slopes and other exposed ground including selected sensitive ditch locations as directed by the Engineer. This is a temporary measure to control erosion, and thereby minimizing the transfer of sediment-laden runoff to watercourses, by protecting the soil surface from raindrop impact, reducing the velocity of overland flow, fostering the growth of vegetation by reducing moisture loss, and providing insulation against extreme heat and cold.

*Refer to Section 7.1.6 Mulching of TIE's Environmental Protection Plan.

805.02 Material

Hay mulch shall be supplied by the Contractor. It shall be reasonably free of noxious weeds as per the Weed Control Act and other undesirable materials. It shall not be so wet, decayed or compacted that it inhibits even and uniform spreading.

805.03 Construction Method and Maintenance

Prior to mulching, complete the required grading, surface roughening, and seeding. Remove large rocks and other debris that may prohibit uniform coverage.

To avoid the mulch from being blown around, the length of hay should be chopped to 200-300 mm. Mulching should be spread by the use of mechanical means such as a bale buster unless the job is small enough to be done by hand.

Hay mulch shall be spread evenly and uniformly over the designated areas at a rate of 6000 kg per hectare with a coverage rate of 85% as deemed acceptable by the Engineer. At the request of the Engineer, the contractor shall be required to provide weigh scale documentation showing that the specified spread rate is being met.

Mulch shall be applied immediately after the area is shaped and seeded to the Engineer's satisfaction to minimize the amount of exposed soil at any one time. Mulch may also be placed as temporary erosion control on unseeded areas. Anchoring of the mulch shall be done immediately after the mulch is applied by application of a binder or tackifier, or by mechanically incorporating the mulch into the soil surface.

Rough ground and steep slopes require more mulch and binder than finished or flatter ground and the Contractor shall adjust application rates to ensure the soil is covered with an appropriate thickness of mulch.

Mulched areas should be inspected regularly and after rainfalls of 5 mm or more accumulation and repaired as required, until the area has stabilized.

The Contractor shall maintain the mulch by repairing all damaged mulch and by re-mulching bare spots resulting from the shifting of mulch by wind, water or other means. This shall include additional mulch as required.

805.04 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of ground surface acceptably mulched.

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MULCHING

805

805.05 Basis of Payment

Mulching shall be paid for at the unit bid price per square metre and this price shall be full compensation for all materials, tools, labour, equipment and incidentals necessary to perform and maintain the work.

Re-mulching of bare spots caused by the shifting of the mulch by wind, water or other cause beyond the control of the Contractor will also be measured for payment at the unit bid price at the discretion of the Engineer.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

SILT FENCES

806

806.01 Description

Work under this Section will consist of the construction of silt control fences at locations as indicated on Plans or by the Engineer. Silt fencing is commonly used to surround a disturbed work site.

806.02 Type 1 Silt Fence

* Refer to Section 7.1.3 Silt Fences on Land of TIE's Environmental Protection Plan.

Type 1 silt fences are used on land as a temporary sediment control measure in situations where sheet or overland flows are expected. Straw bale barriers may be required to reinforce.

The silt fence shall be installed just up-slope of the area to be protected in order to prevent silt from being conveyed to an adjacent property or watercourse/ wetland.

The silt fence may be setback from the toe of slopes provided that sufficient area is available. This provides for more sediment storage area and locates the fence where runoff velocities are lower.

806.02.01 Material

Geotextile filter fabric shall be 600 mm in width and conform to the minimum requirements of Table 806-1.

Wooden stakes shall be 50 mm square and a minimum length of 1.5 m. Staples will be heavy duty wire staples of 25 mm minimum length.

Table 806-1 Requirements for Geotextile Filter Fabric For Type 1 Silt Fence

Property	Min.	ASTM
Grab tensile Strength (N)	400	D-4632
Elongation at Break Point (%)	25 max.	D-4632
Permativity (cm/s)	0.230	D-4491
Apparent Opening Size (µm)	480	D-4751
UV Degradation (%)	70	D-4355

806.02.02 Construction Method

At designated locations, the Contractors will excavate a 100 mm x 100 mm trench on the up- slope side of the fence as shown in Figure 806-1. The silt fence may be set back from the toe of slopes, area permitting and provided setbacks are maintained. This provides more sediment storage area and lowers runoff velocities.

The Contractor shall drive the sturdy 50 mm square wooden stakes, spaced 2 m apart, at least 400 mm into the ground along the down-slope side of the trench. The filter fabric will be in a continuous roll cut to the length of the barrier to avoid joints. When joints are

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SILT FENCES

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unavoidable, filter fabric will be spliced together on a support stake with a minimum 150 mm overlap.

The filter fabric will be attached to the stake on the upstream side extending the bottom 200 mm into the trench as shown on Figure 806-1 using 25 mm heavy duty wire staples.

The Contractor shall backfill and compact the excavated soil in the trench over the filter fabric.

Prefabricated silt fence systems, at the discretion of the Engineer, may be used if they meet the above material requirements. They will be installed as per the manufacturer's instructions should they differ from the above method.

806.02.03 Maintenance

The Contractor shall contain sediment runoff and maintain the silt fence in a functional condition as long as necessary as follows:

- inspect all silt fences after each rainfall and at least daily during periods of prolonged rainfall;
- all silt fences or parts thereof that are damaged will be repaired immediately to the satisfaction of the Engineer;
- trapped sediment will be removed when it has accumulated to a level half the height of the fence and will be disposed of at a location approved by the Engineer in consultation with the County Environmental Officer and in compliance with the terms and conditions of the EMS Approval to Proceed, see section 7.1.3 - Silt Fences on Land of TIR's EPP.

The Engineer may require that some or all silt fences be maintained after substantial completion of the work.

806.02.04 Decommissioning

If specified by the Engineer, the Contractor shall remove the silt fence at the completion of the job and dress and seed the area to the satisfaction of the Engineer.

At the discretion of the Engineer, the Contractor shall gather silt fencing and stakes that are no longer required and place these in neat piles for collection and reuse by the Engineer.

806.02.05 Method of Measurement

Measurement for payment for Type 1 Silt Fence under this Section will be the number of linear metres of silt fence installed.

806.02.06 Basis of Payment

Type 1 Silt Fences will be paid for at the unit bid price per linear metre. This price will be full compensation for supplying, placing, maintaining and decommissioning of all items required to carry out the work as specified herein and as instructed by the Engineer.

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SILT FENCES

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Maintenance and decommissioning that is required after substantial completion of the site work shall be paid for under Section 810.

806.03 Type 2 Silt Fence

* Refer to Section 7.1.4 Silt Containment in Water of TIE's *Environmental Protection Plan*.

Type 2 Silt Fences are used in or alongside aquatic environments. The Type 2 silt fence is similar to the Type 1 silt fences used on land. They are typically used along the toe of slopes of embankments that are constructed in a tidal zone of a river or an estuary. They will be configured in accordance with Figure 806-2.

806.03.01 Materials

The Geotextile filter fabric for the Type 2 Silt Fence and the Silt Boom will conform to the minimum requirements of Table 806.03.01.

**Table 806.03.01
Requirements for Geotextile Filter Fabric For Type 2 Silt Fences and Silt
Booms**

Property	Woven	Non- Woven	Test Method
Grab Tensile Strength (N)	1275	1000	Can 2-4-2-M77
Mullen Burst (kPa)	3600	2500	Can 2-4-2-M77
Tear Strength (N)	475	475	Can 2-4-2-M77
Elongation at Break (%)	18	70-100	Can 2-4-2-M77
Filtration Opening Size (um)	220	60	MOT, Ont.

Note: Because of the smaller Filtration Opening Size of the non-woven material, it is recommended that this material be used in dredging projects.

For the Type 2 Silt Fence, all posts will consist of a local species, non-treated timber. The posts will be planed smooth and be straight and true to line. Post lengths will vary and be 150 mm X 150 mm as a minimum. The geotextile material will be fastened to the posts by wooden laths.

806.03.02 Construction Method

The Contractor shall, for Type 2 Silt Fence, drive posts along the required alignment to a point where support for the fence is attained and cut posts off 500 mm above HHW.

The Contractor shall install geotextile fabric to the posts using the wooden laths; overlap fabric as required to ensure connections are tight and place rip rap along the bottom of the geotextile fabric as shown in Figure 806-02.

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SILT FENCES

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806.03.03 Maintenance

The Type 2 Silt Fence will be maintained in a like new condition. Repairs required because of damages will be made immediately or as instructed by the Engineer.

A sufficient amount of replacement geotextile filter fabric and posts will be maintained on site for emergency repairs.

806.03.04 Decommissioning

Following completion of all construction activities in the contract, the contractor will dismantle the Type 2 Silt Fence. This work will include the removal of all posts, bracing, rip rap, fabric and all other items incorporated into the work. If the posts are unable to be removed, they should be cut off 75 mm below the mudline.

At the discretion of the Engineer, the Contractor shall gather silt fence materials including fabric, posts, riprap and bracing that are no longer required and place these in neat piles for collection and reuse by the Engineer.

806.03.05 Method of Measurement

Measurement for payment for Type 2 Silt Fence under this Section will be the number of linear metres of silt fence installed.

806.03.06 Basis of Payment

Measurement for payment for Type 2 Silt Fence under this section will be on a linear metres basis for the supply , placing, maintaining and decommissioning of all items required to carry out the work as specified herein and as instructed by the engineer.

There will be no separate payment for the supply and placing of posts, bracing, geotextile filter fabric, rip rap, connections or any other items.

806.04 Silt Boom

* Refer to Section 7.1.4 Silt Containment in Water of TIR's Environmental Protection Plan.

* Refer to section 4.Prevention of the Transportation/Introduction of Invasive Species in Appendix 2, Environmental Requirements

Silt booms are used in aquatic environments and are anchored at the bottom but have a floating boom at the top to keep the boom or containment structure above the water level. Silt Booms are particularly used in dredging projects, or bridge replacement projects . They minimize sediment transport from a disturbed area of work so as to provide a stagnant area. They will be in accordance with Figure 806-03.

806.04.01 Materials

The Geotextile filter fabric for the Silt Boom will conform to the minimum requirements of Table 806.03.01.

Flotation, whether PVC pipe or foam, will have sufficient buoyancy to provide continuous support and a minimum 50 mm freeboard. Typical flotation should be a minimum 100 mm diameter.

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SILT FENCES

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Silt curtain load lines attached along the flotation material will be 8 mm steel cable or 19 mm nylon or polypropylene rope.

Silt curtain ballast should be 8 or 10 mm steel chain.

806.04.02 Construction Method

The silt curtain of the boom will have a sleeve sewn along the entire top edge so as to contain the flotation and the load line within the sleeve. A sleeve is also sewn along the bottom edge so as to contain the ballast. The ballast will hold the fabric down and prevent sediment laden water from seeping out under the bottom of the curtain.

The silt boom should be placed a minimum of 5 metres beyond the work area. The silt curtain depth should be 450 mm (slack) deeper than the water depth (during high tide).

Anchors (kedge anchors, concrete blocks, danforth anchors) will be used to provide positive positioning to ensure the silt curtain will not be dislocated.

806.04.03 Maintenance

The silt boom will be maintained in a like new condition. Repairs required because of damages will be made immediately or as instructed by the Engineer.

A sufficient amount of replacement geotextile filter fabric and floatation material will be maintained on site for emergency repairs.

806.04.04 Decommissioning

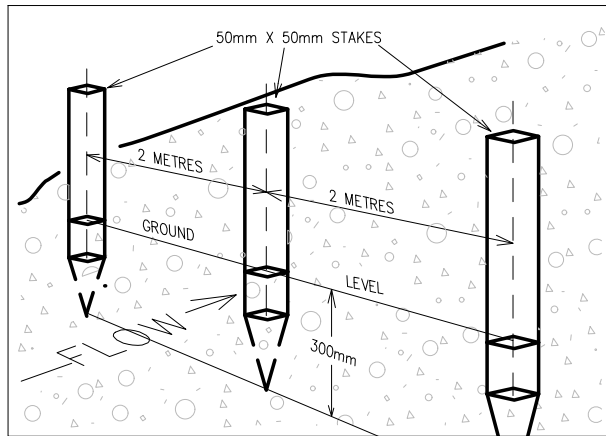
Following completion of all construction activities in the contract, the contractor will dismantle the entire Silt Boom. This work will include the removal of all flotation, silt curtains fabric, steel cable, steel chain anchors and all other items incorporated into the work.

806.04.05 Method of Payment

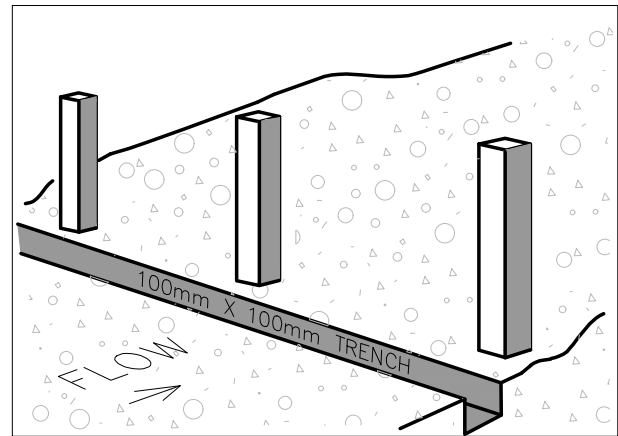
Measurement for payment under this section will be on a linear metre basis for the supply, placing, maintaining and decommissioning of all items required to carry out the work as specified herein and as instructed by the engineer.

806.04.06 Basis of Payment

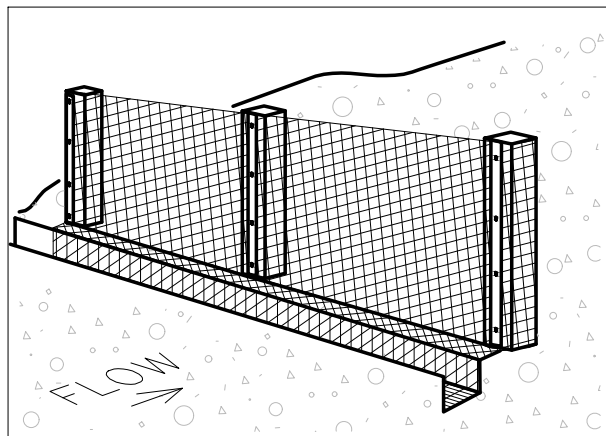
Work done under this section will be paid for at the linear metre, bid price. The bidder will include in the linear metre bid price all costs of labour, tools, equipment, materials, installation, maintenance, decommissioning and incidentals to complete the work to the satisfaction of the engineer.



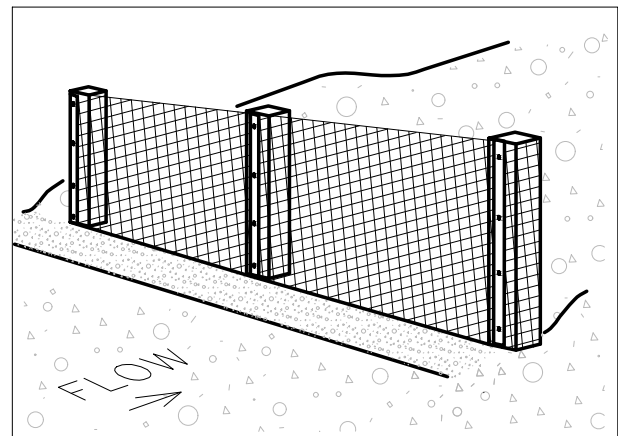
1. Set the stakes 2 metres c/c and a minimum of 300mm into the ground



2. Excavate a 100mm x 100mm trench just upslope and along the line of the stakes.



3. Staple filter material to the stakes and extend the bottom into the trench. Face material with a 40mm lathe nailed vertically to each the stake.

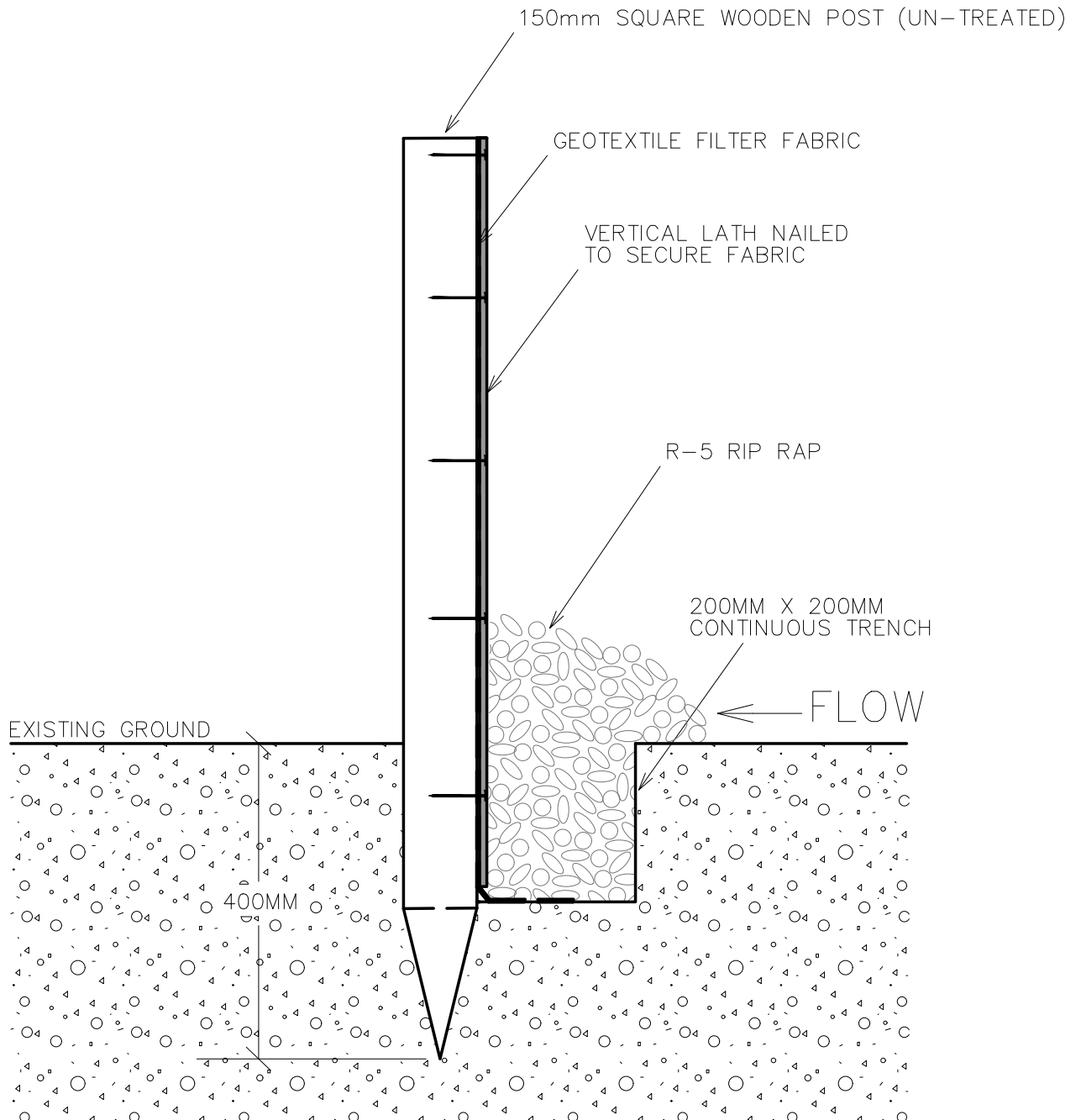


4. Backfill and compact the excavated soil.

PERSPECTIVE VIEWS (N.T.S.)

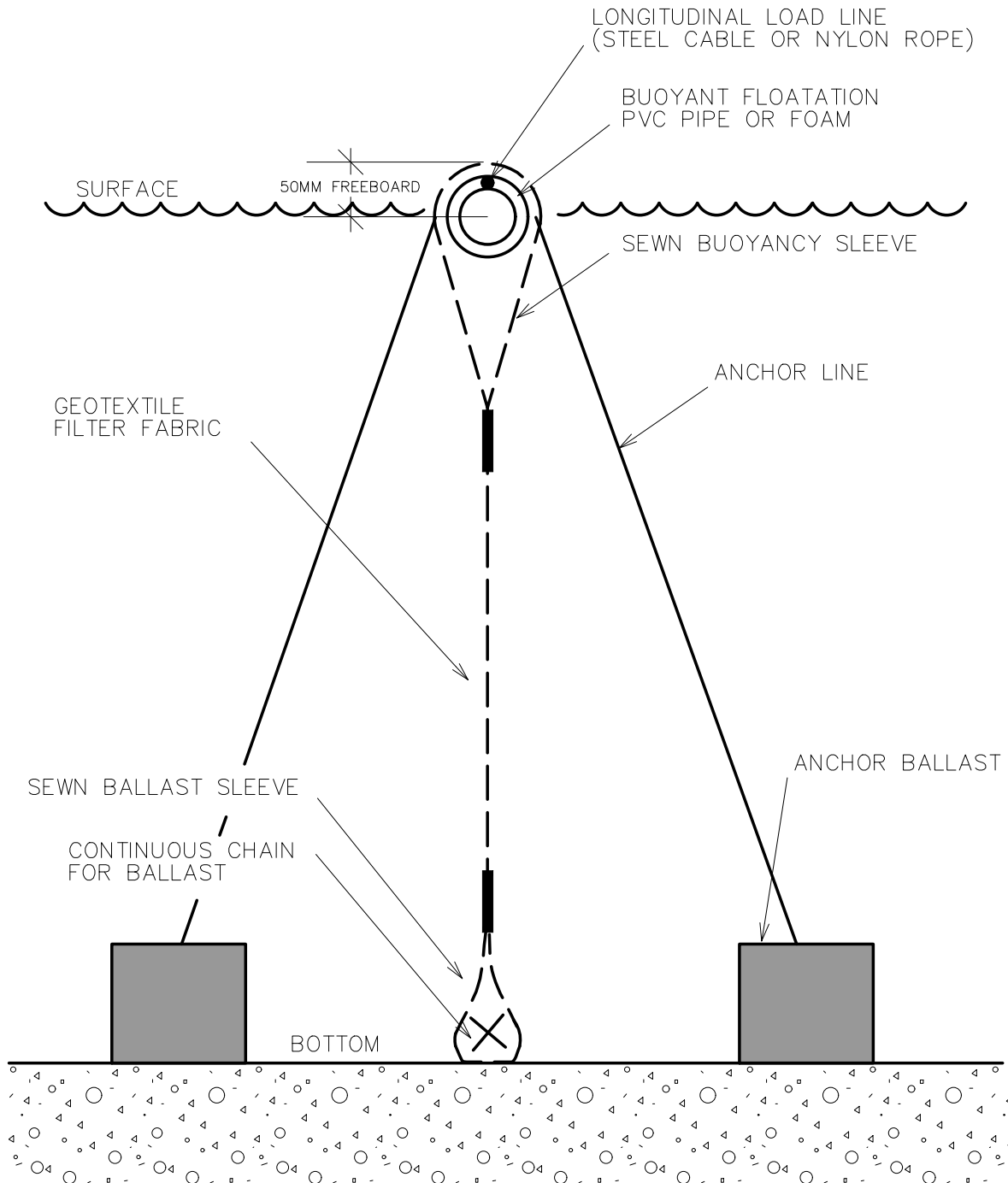
Note: If prefabricated fence is used, use the manufacturers installation specifications.

FIGURE 806-01 CONSTRUCTION OF A TYPE 1 SILT FENCE
REVISED 2001



SECTION (N.T.S.)

FIGURE 806-02 TYPE 2 SILT FENCE
REVISED 2001



SECTION (N.T.S.)

FIGURE 806-03 SILT BOOM
REVISED 2001

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

EROSION CONTROL MATS

807

807.01 Description

The work in this Section consists of the installation of temporary erosion control mats, either jute mat or erosion control blankets, to protect newly seeded soils from erosion caused by overland flows or to provide cover for overwinter protection of late season grading work. Note that, throughout this Section, the term erosion control mat pertains to both (a) jute mat and (b) the various types of erosion control blankets.

These mats are for application on steep slopes and stream banks where erosion hazard is high, in newly constructed ditch areas located just upstream of watercourses that are seeded outside of the normal construction period (refer to Section 803 Hydro seeding), in areas where moving water is likely to wash out new vegetation (e.g., in grassed waterways, diversion ditches, and drainage ditches), and where mulch is applied and wind protection is important. As well, erosion control material is recommended for the back slope, fore slope and bottom of ditches where the ditch is located within 30 m of a watercourse and the ditch gradient is greater than 5%.

*Refer to Section 7.1.7 Erosion Control Mats of TIE's Environmental Protection Plan.

807.02 Material Types

The selection of erosion control mat type is dependant upon many factors including slope, water flow volume and velocity, the length of time that temporary protection is required, and area sensitivity.

For all erosion control mat types, staples for anchoring the mat shall be U-shaped No. 11 gauge wire or heavier. Their length shall be 150 mm to 300 mm, with the longer staples used on loose, sandy or unstable soils.

Jute Mat

#1 For low to moderate embankment slopes, and for low flow channels where protection is required for a short period before vegetation is established, Jute Mat is recommended.

#2 Jute Mat is useful as a cover material for mulched areas.

Jute Mat shall be a cloth of uniform plain weave of undyed and unbleached single jute yarn, 1.22 mm in width plus or minus 25 mm and weighing an average of 600 g/per linear metre with a tolerance of plus or minus 5%. The yarn shall be of a loosely twisted construction having an average twist of not less than 1.6 turns per 25 mm and shall not vary in thickness by more than ½ its normal diameter.

Erosion Control Blanket - Straw Blanket

For moderate to steep embankment slopes and low flow channels where protection is required for a short period before vegetation is established, a straw blanket is recommended. Depending on the erosion conditions, the straw blanket will be sewn together by either a single biodegradable net on top or by a straw filter matrix between two biodegradable nets.

Erosion Control Blanket - Straw-Coconut Fibre Blanket

For severe embankment slopes and medium flow channels requiring long-term protection before vegetation is established, a straw-coconut fibre blanket is recommended. This blanket shall include ultraviolet stabilized netting and a high quality straw, either single or double matrix, supplemented with coconut fibre or an excelsior blanket of curled wood

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EROSION CONTROL MATS

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excelsior of 80% 150 mm or longer fibre, covered on top with a biodegradable plastic mesh.

Erosion Control Blanket - Coconut Blanket

For extreme embankment slopes and high velocity flow channels, and for applications requiring semi-permanent to permanent protection and vegetal reinforcement, a coconut blanket is recommended. This blanket shall include a 100% coconut filter matrix between two heavy duty, ultra violet stabilized nets or curled wood excelsior blanket of 80%, 150 mm or longer fibre and with each side covered with black, extra heavy duty extruded plastic mesh netting.

807.03 Construction Method

Figures 807-1 and 807-2 correspond to the text in this Section, and are applicable for both jute mat and erosion control blanket installations.

After the site has been shaped and graded to the approved design, the Contractor shall prepare a uniformly even seedbed relatively free from gullies, large roots, rocks greater than 40 mm in diameter, and other debris/obstructions that will prevent uniform contact of the protective covering with the soil surface.

The most critical aspect of installing erosion control mats is obtaining firm, continuous contact between the material and the mulch and/or the soil. Without good contact, erosion may occur.

The Contractor shall not stretch the mat material but allow it to lay loosely on the soil.

In ditches or channels, the erosion control mat is to be laid out in the direction of flow. On steep slopes, the mat is to be laid out with its length extending from the top to the bottom of the slope. The Contractor shall start laying the mat from the top of the ditch or slope and unroll down grade.

Anchor slots: At the up slope end of the site, the Contractor shall construct a 150 mm deep trench and staple the upper edge of the matting into the trench using staple spacing of 300 mm; then backfill and firmly compact the trench (i.e., anchor slot.)

Overlap: Where the erosion control mat lengths are laid side by side on the down slope, the sides will be overlapped by a minimum of 100 mm, and the overlapped materials will be stapled down the centre of the overlap every 450 mm, making sure the mat material is smooth and in firm contact with the soil.

Where mat lengths are installed with no overlap, staple spacing along their outside edges can be 600 mm.

Joining Lengths of Erosion Control Mat: Where two mat lengths must be joined end-to-end, the down slope mat shall be first stapled into an anchor slot trench which shall be backfilled and compacted as outlined above. Then, the up slope mat shall be laid overtop of the finished anchor slot, overlapping the slot and the exposed down slope mat by 300 mm. The overlap shall be then stapled at 300 mm spacing on centre.

Additional Erosion Check Slots: On slopes or ditches more than 30 m long, there should be an erosion check slot installed at 15 m intervals. Check slots are trenches 100 mm deep by 100 mm wide. During the mat lay out process, the mat shall be installed in the trench, stapled at 300 mm spacing along the down slope side of the trench, and then the mat will continue to be laid (on the down slope side of the ditch or slope). The trench

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shall be backfilled and the soil compacted firmly. It may be beneficial to determine the need for erosion check slots, and construct the trenches accordingly, before laying the erosion control mat.

All staples are to be flush with the ground and secured as per the manufacturer's specifications. Additional staples may be required to secure the erosion control mat in depressions.

The Contractor shall make sure that the erosion control mat is well anchored so that it does not slip or wash out.

Any water that may accumulate underneath the fabric must be prevented from moving downward with sufficient velocity to cause erosion.

If a berm or dyke is located at the top of the slope, the Contractor shall extend the erosion control mat over the berm and anchor it behind the berm.

At a point where the erosion control mat is discontinued or where the mat meets a structure, the Contractor shall fold 100 mm of the material underneath and staple at a minimum interval of every 300 mm across the width of the mat.

If the manufacturer's installation requirements are more stringent than those identified above, then the manufacturer's requirements are to be followed.

807.04 Maintenance

Inspect regularly and after rainfalls of 5 mm or more accumulation, and repair areas if/as required, until the area has stabilized.

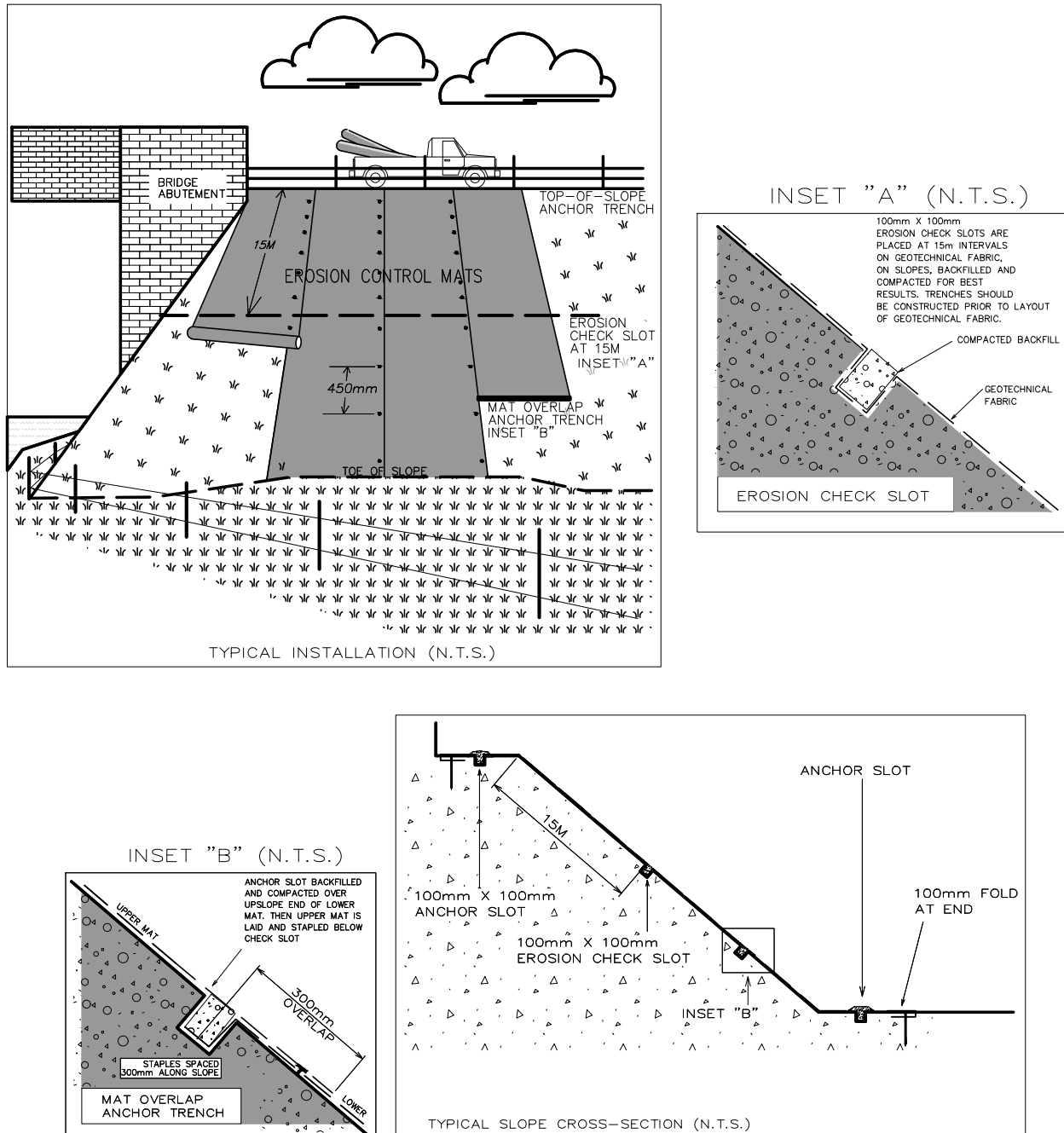
Do not remove sediment control structures until the area has been properly stabilized.

807.05 Method of Measurement

The areas covered with the erosion control mat as outlined in Provision 807.03 shall be measured for payment in square metres and no compensation for mat overlap will be considered.

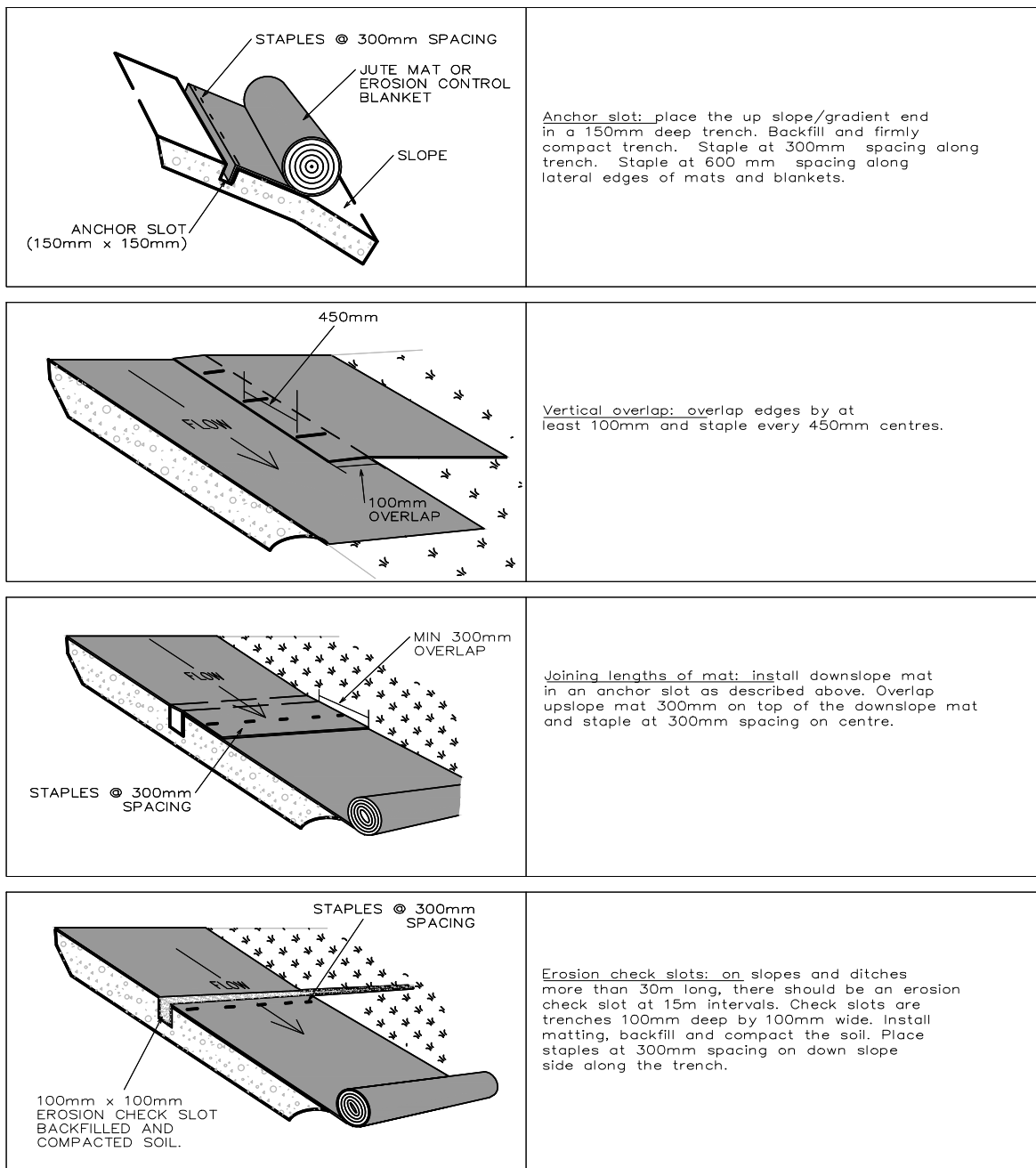
807.06 Basis of Payment

Payment under this Section shall be at the unit bid price per square metre for the erosion control mat as specified and this price shall be full compensation for all labour, equipment, material, mats or blankets, staples, maintenance, materials and incidentals necessary to perform the work.



Note: Any water that may accumulate under the fabric must be prevented from moving downward with sufficient velocity to cause erosion

FIGURE 807-01 APPLICATION OF EROSION CONTROL MATS
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PERSPECTIVE VIEWS (N.T.S)

Note: Follow suppliers installation requirements if more stringent than those identified above.

FIGURE 807-02 EROSION CONTROL MAT INSTALLATION DETAILS
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SEDIMENT TRAPS

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808.01 Description

Work under this Section consists of the construction of a temporary sediment trap/pond, by building an earthen embankment with a stone outlet, to detain silt-laden run-off from small disturbed areas (generally less than 2 ha) long enough to allow the majority of sediment to settle. These sediment traps receive concentrated runoff flows and are commonly installed in newly constructed road ditches at the down gradient point of the ditch work or immediately adjacent to this point of the ditch, to function as a last location for sediment settling prior to release of the runoff water.

*Refer to Section 7.1.2 Sediment Traps of TIE's Environmental Protection Plan.

808.02 Material

The random rip rap for the stone outlet shall be Class R-5 in accordance with Section 213. The geotechnical fabric shall have the minimum specifications as shown in Table 808-1.

Table 808-1 Requirements for Geotechnical Fabric

Property	Min.
Non- Woven Tensile Strength (N)	690
Tear Strength	310
Equivalent Open Size- EOS (µm)	50-150
Elongation at Break (%)	70-100

808.03 Construction

Sediment traps should be an initial installation at a work site, constructed prior to grubbing the site. Sediment traps should not be located within 20 metres of an inlet or an outlet of a cross road drainage structure.

The sediment trap should be designed to ensure that the ponding behind the structure achieves the purpose of providing adequate opportunity for suspended solids in the runoff water to settle.

The trap length should be at least twice the average width, and the trap depth should be approximately 1 m to provide adequate sediment retention capacity and to lessen the frequency of clean-out. The trap depth can be increased should a greater retention volume be desired.

The trap shall have earthen embankments (berms) that will form an impoundment area. The area under the embankments shall be cleared, grubbed and stripped of any vegetation or roots before clean, excavated fill is placed and compacted in 150 mm layers. The embankment side slopes should be no steeper than 1:1. The top and outside slopes of the earthen embankments shall be hydro seeded or seeded and covered with jute mat immediately after installation.

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Immediately beyond the downstream end of the stone outlet, an apron area shall be excavated to a depth of approximately 300 mm (below the bottom of impoundment elevation) to receive the overflow water and to minimize associated erosion.

Following preparation of the impoundment embankments and the apron area, the stone outlet area shall be prepared. The outlet shall be located at the downstream end of the trap, with its main spillway elevation approximately 300 mm below the top of the impoundment embankments to ensure that discharge occurs through the spillway. The spillway shall have a minimum width of 600 mm in accordance with Figure 808-1.

Once the subgrade for the base and side slopes of the outlet as well as the apron are brought to grade, the geotechnical fabric shall be placed on these prepared earthen surfaces. The edges of the fabric will overlap onto the earthen embankment areas at least 100 mm. At the upstream side of the outlet, the fabric shall be securely toed-in to the earthen base of the impoundment. At the downstream side of the outlet, the fabric shall extend into the apron area and be securely toed-in to its earthen base material.

The riprap for the spillway core will then be placed on the fabric, being careful not to damage the fabric. The top of the spillway shall be 300 mm lower than the adjacent embankments, and the spillway core will extend across the full width of the outlet.

The core riprap then needs to be wrapped with geotechnical fabric. At the upstream side of the outlet, the fabric shall again extend down to the impoundment base and be securely toed-in to the earthen base of the impoundment. This will avoid undermining at the upstream side of the outlet. The fabric will wrap overtop of the spillway riprap core, down the downstream side of the core, and will extend into the apron and be securely toed-in to its earthen base material. This fabric will extend at least as far into the apron as the previously installed fabric so that runoff flows overtop of the fabric and undermining of the apron is avoided.

Finally, place remaining riprap on the side slopes of the outlet and on the downstream side of the spillway (covering the fabric in these locations), and in the apron area (including overtop of the fabric in the apron).

808.04

Maintenance

The Contractor shall inspect regularly and after rainfalls of 5 mm or more accumulation and repair any damaged areas.

Sediment shall be removed and the trap restored to its original dimensions when the trap is $\frac{2}{3}$ full of sediment in accordance with Section 810.

The Contractor shall dispose of sediment at a location approved by the Engineer in consultation with the County Environmental Officer and in compliance with the terms and conditions of the EMS Approval to Proceed, see section 7.1.2 - Sediment Traps and Sediment Collection Areas of TIE's EPP.

The Contractor shall remove the sediment trap after the area has stabilized and the trap is no longer needed for siltation control. Then, the site should be levelled and revegetated.

The Engineer may require that some or all sediment traps be maintained after substantial completion of the work.

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808.05 Measurement of Payment

Measurement for payment under this Section shall be the number of sediment traps constructed and maintained.

808.06 Basis of Payment

Payment under this Section shall be at the unit bid price per sediment trap and this price shall be full compensation for the excavation, embankment construction, placement of filter fabric, placement of riprap, labour and incidentals necessary to build, install, maintain, dispose of all surplus materials including sediments, and level and revegetate the site to a condition acceptable to the Engineer.

Payment for rip rap required under this section shall be in accordance with Section 213 - Random Rip Rap.

Payment for geotechnical fabric required under this section shall be in accordance with Section 218 - Geotechnical Fabric.

Maintenance and decommissioning is the responsibility of the contractor until the end of the warranty period.

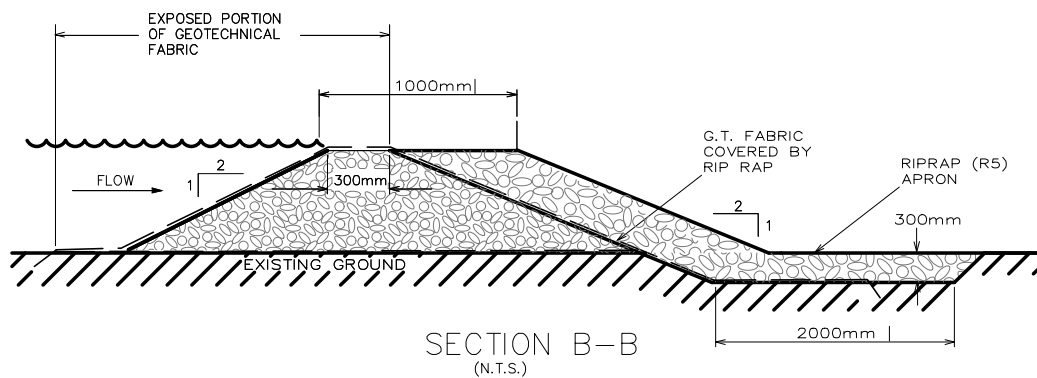
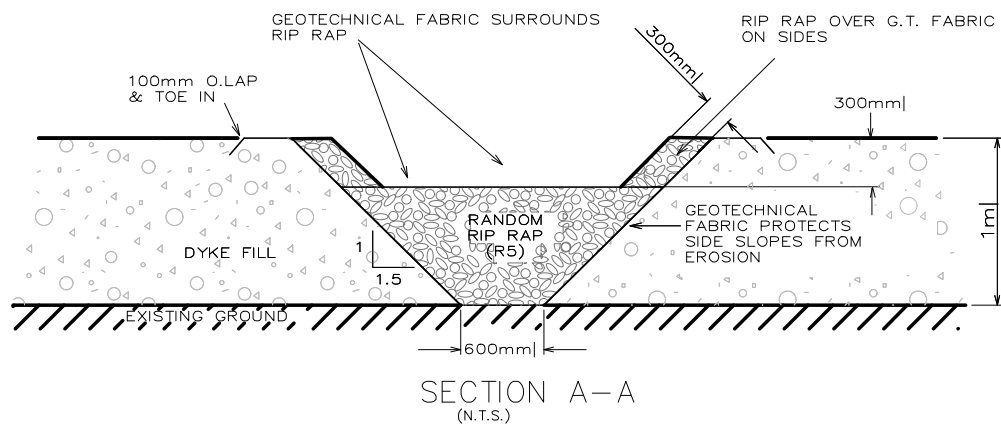
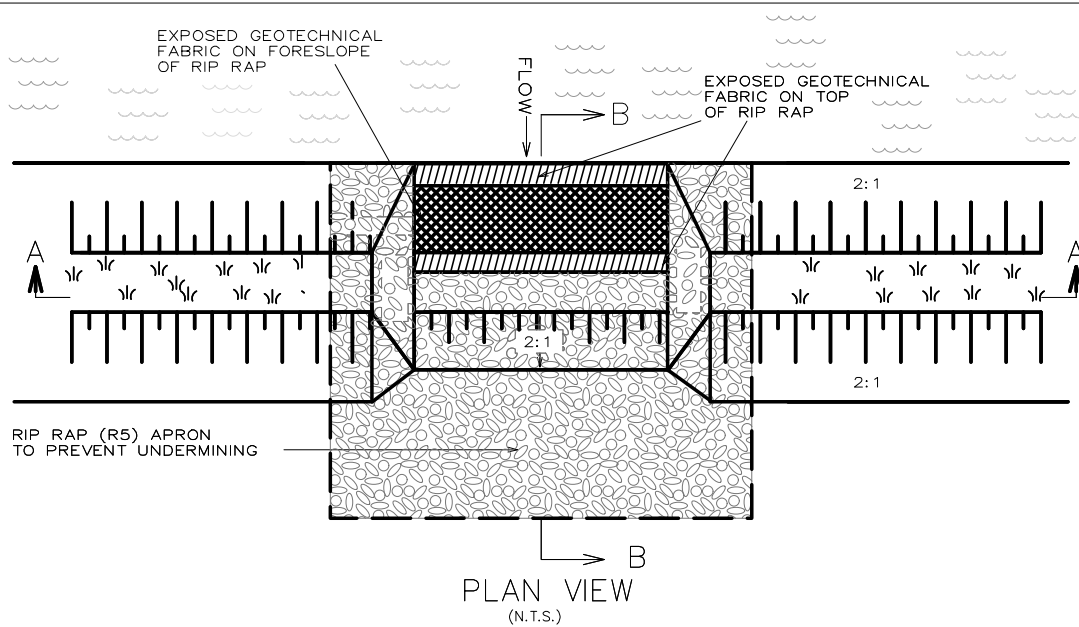


FIGURE 808-01 SEDIMENT TRAP
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**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

SODDING

809

809.01 Description

This Section specifies the requirements for the supply, transportation and placement of sod behind curbs, as indicated on Drawings, or for the maintenance of sodded areas.

*Refer to Section 7.1.8 Sodding of TIEs Environmental Protection Plan.

809.02 Source Quality Control

Obtain Engineer's approval of sod at the source of supply.

When the proposed source of sod is approved, use no other source without written notification.

809.03 Delivery and Storage

Schedule deliveries in order to keep storage at the work site to a minimum without causing delays.

Deliver, unload and store sod on pallets.

Deliver sod to the site within 24 hours of being lifted and lay sod within 36 hours of being lifted.

Do not deliver small, irregular or broken pieces of sod.

During wet weather allow sod to dry sufficiently to prevent tearing during lifting and handling.

During dry weather protect sod from drying and water sod as necessary to ensure its vitality and prevent dropping of soil in handling. Dry sod will be rejected.

809.04 Scheduling

Schedule sod laying to coincide with the topsoil operations of Section 204 and/or 212.

809.05 Material

Nursery sod shall provide sod with good cover of living or growing grass including grass that is seasonally dormant during the cold or dry seasons and that is capable of renewing growth after the dormant period. Cut sod from living, thickly matted turf, relatively free from weeds or other undesirable foreign plants, stones or roots.

Topsoil shall be in accordance with Section 204 and/or 212.

Fertilizer shall be 6-12-12 grade, uniform in composition, free flowing and suitable for application with approved equipment. The fertilizer shall be supplied in unopened waterproof bags fully labelled. Fertilizer other than the standard for grades specified must be approved by the Engineer and must not have less than the minimum requirements for the grades specified. At least 50% of the fertilizer's components are to be derived from organic sources.

Lime shall be ground agricultural or dolomitic limestone, containing not less than 85% total carbonates. It shall be ground so that 100% will pass a 10-mesh screen and 50%

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SODDING**809**

will pass a 100-mesh screen. Lime may be substituted for ground agricultural limestone at the discretion of the Engineer.

Water shall be potable.

809.06 Construction Method

809.06.01 Spreading Topsoil

Do not spread topsoil until Engineer has inspected subgrade.

Apply 100 mm topsoil to areas to be sodded.

Spread topsoil with adequate moisture in uniform layers during dry weather over approved, dry, unfrozen subgrade, where sodding is indicated.

The topsoil shall be graded so that the finished grade for sodded areas matches the surrounding landscape.

Remove stones, roots, grass, weeds, construction materials, debris and foreign, non-organic objects from topsoil.

Roll topsoil with 45 kg roller, 900 mm wide, to compact and retain surface.

809.06.02 Soil Additives

Apply lime, or other soil additives at a rate determined from the soil sample.

Mix soil additives well into full depth of the topsoil by cultivating or rotor-tilling prior to the application of fertilizer.

809.06.03 Fertilizer

Apply fertilizer at least one week after lime application and at least six (6) days before sodding.

Spread fertilizer with mechanical spreaders over entire area at manufacturer's recommended rate of application.

Mix fertilizer thoroughly into upper 50 mm of soil.

809.06.04 Laying of Sod

Obtain approval of topsoil grade and depth before starting sodding.

Lay sod during growing season. Sodding during dry summer period, at freezing temperatures or over frozen soil is not acceptable.

Lay sod in rows, perpendicular to slope, smooth and even with adjoining areas and with staggered joints. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.

Provide close contact between sod and soil by means of light rolling. Heavy rolling to correct grade irregularities is not permitted.

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SODDING

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Water immediately after sod laying to obtain moisture penetration in top 100 mm of topsoil. Provide adequate protection of sodded areas against erosion and mechanical damage.

Remove protection after lawn areas have been accepted.

809.07 Maintenance

Take care and maintain all sodded areas until final acceptance of the work.

Water all sodded areas throughout the twelve (12) month maintenance period.

Repair damaged areas to the approval of the Engineer.

Mow sodded areas an average of three (3) cuts per month during the entire growing season.

Cut grass to height of 40 mm. Use equipment that is in good working order with sharp cutting blades.

Remove grass clippings from sodded areas. Hand trim or use trimmer for grass adjacent to structures, curbs, trees, fences or where necessary.

Ensure clippings do not get on to hard surfaces.

Apply weed killer in accordance with manufacturer's instructions if broadleaf weeds start to develop.

809.08 Acceptance

Grassed areas will be accepted by the Engineer at the end of the maintenance period provided that:

- Grassed areas are properly established
- Turf is free of bare and dead spots and without weeds

Areas grassed in the fall will be accepted the following spring one (1) month after the start of the growing season provided the conditions specified are fulfilled.

809.09 Method of Measurement

Measurement for payment under this Section shall be the number of square metres of sod placed.

809.10 Basis of Payment

Payment for sodding shall be at the unit bid price per square metre and this price shall be full compensation for the supply and placement of nursery sod, soil additives, watering, maintenance and incidentals necessary to complete the work.

Topsoil shall be paid according to Section 204 and/or 212.

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MAINTENANCE AND DECOMMISSIONING OF SEDIMENT CONTROL STRUCTURES

810

810.01 Description

This work shall consist of the maintenance and decommissioning of check dams, silt fences, sediment traps, and straw bale barriers, and the removal of sediment therefrom after substantial completion of the work. The work requires prior approval by the Engineer

All work under this section will be considered as extra work.

*Refer to Section 7.1.12 Removal of Non-Permanent Erosion Control Devices of TIE's Environmental Protection Plan.

810.02 Monitoring

To ensure that erosion and sediment control measures are in effective working order, their condition must be monitored prior to forecasts of storm events, during a storm event and following a storm event.

810.03 Maintenance

Sediment that is accumulated by check dams and settlement traps shall be removed in a manner that avoids escape of silt to the downstream side of the structure so as to avoid damage to the control structure.

Accumulated sediment shall be removed when it reaches a depth of one-half the effective height of the control structure.

Accumulated sediment shall be removed immediately prior to the removal of the control measures.

The sediment removed shall be disposed of as per the Engineer's instructions.
or all control structures accumulated sediment shall be removed as necessary to perform Maintenance of the sediment control structure shall comply with the appropriate section.

810.04 Decommissioning

Decommissioning of the sediment control structure shall comply with the appropriate section.

810.05 Method of Measurement

Measurement for payment under this section shall be the time spent for the extra work as directed by the Engineer.

810.06 Basis of Payment

Payment for extra work will be full compensation for all labour, equipment and materials required to do the work.

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STRAW BALE BARRIER

811

811.01 Description

This work shall consist of the installation and maintenance of straw bales (or hay bales as directed by the Engineer) to control sediment-laden runoff and prevent sediments from leaving the construction site.

They shall be installed as perimeter containment for temporary material stockpiles, as reinforcement for perimeter silt fencing, or down gradient of disturbed areas where erosion occurs in the form of sheet or rill erosion.

811.02 Material and Construction Method

All materials are to be supplied by the contractor.

The Contractor shall place the bales on their sides and tightly together so that the twine is not in contact with the ground.

Bales shall be secured by driving two sturdy wooden or steel stakes through each bale, deep enough to anchor them securely. The Contractor shall drive the first stake in each bale toward the previously laid bale to force the bales together.

The Contractor shall wedge loose straw between any cracks or other openings and scatter loose straw over the soil on the uphill side of the barrier. Subsequent movement of the loose straw tends to seal any undetected openings in the barrier.

Straw bale barriers shall be installed as shown on Figure 811-1. Straw bale barriers shall be keyed-in to a 100 mm deep trench at the Engineer's discretion.

811.03 Maintenance

The Contractor shall comply with the following procedure:

Inspect regularly and after rainfalls of 5 mm or more accumulation and repair as required. Undercutting and end flow are a common problem.

Clean out accumulated sediment regularly and before it reaches one half the height of the barrier.

Dispose of sediment at an approved location in consultation with the County Environmental Officer and in compliance with the terms and conditions of the EMS Approval to Proceed, see section 7.1.3 - Silt Fences on Land of TIE's EPP.

If weather forecasts indicate that a significant rainfall may occur, it is recommended that barriers be checked and cleaned out prior to the rainfall as a preventative measure.

Bales should be replaced if they become clogged with sediment.

Remove structures after the area has stabilized, level and seed areas disturbed during removal, and inspect regularly and repair if / as required until the area has stabilized.

The Engineer may require that some or all straw bale barriers be maintained after substantial completion of the work.

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STRAW BALE BARRIER

811

811.04 Method of Measurement

Measurement for payment under this Section shall be the number of straw bales that are installed and maintained as per this specification.

811.05 Basis of Payment

Payment for straw bale barriers shall be at the unit bid price per straw bale and this price shall be full compensation for the supply and installation of the bale, stakes and loose straw, labour, equipment, tools and incidentals necessary to install, maintain, decommission the barrier including disposal of all surplus materials and accumulated sediments, and site reinstatement to a condition acceptable to the Engineer.

Maintenance and decommissioning is the responsibility of the contractor until the end of the warranty period.

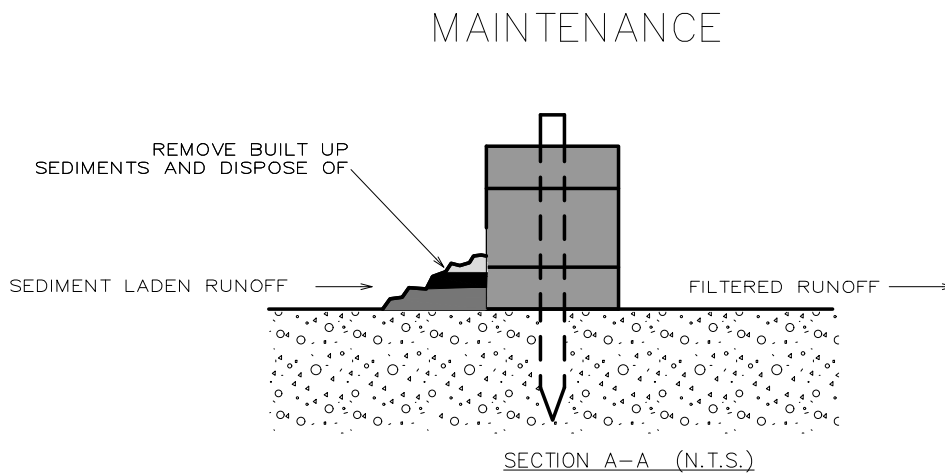
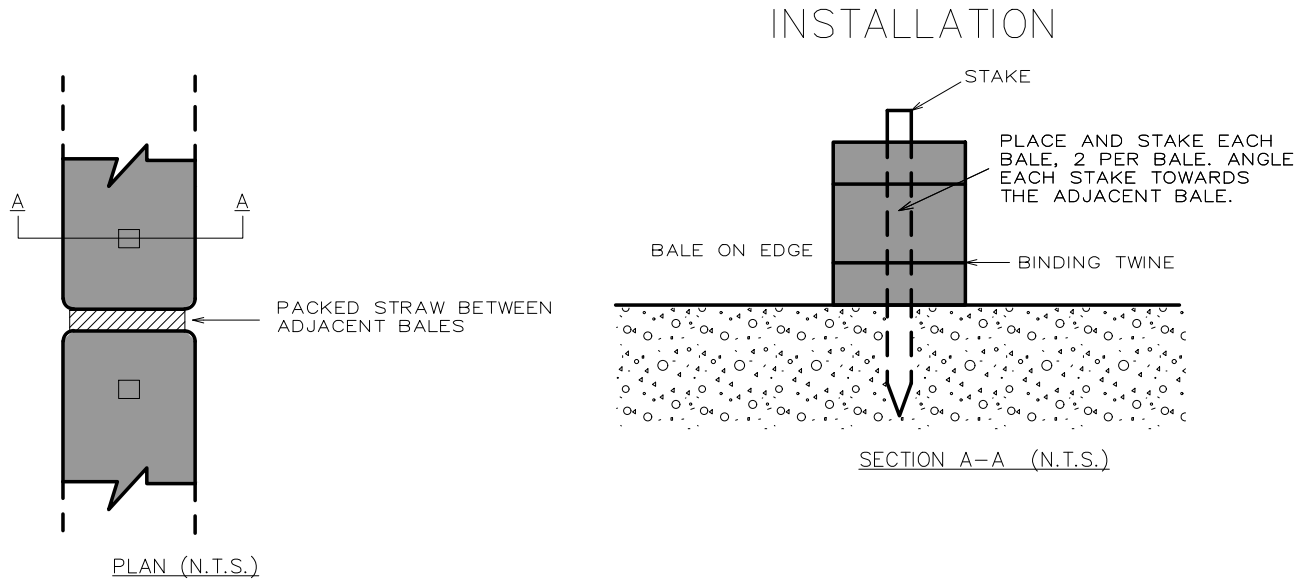


FIGURE 811-01 STRAW BALE BARRIER
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COMPOST

812**812.01** Description

This item consists of the supply and application of approved compost material as shown on the plans or as directed by the Engineer.

This specification refers to standards, specifications or publications noted below. All reference standards shall be current issue or latest revision at the first date of tender advertisement.

- CCME Guidelines for Compost Quality
- ADI International (PEI) Inc. Compost from Organic-based Waste Resources Brochure 1-.3-.3
- IWMC Compost from Organic-based Waste Resources Brochure 1-.4-.5
- Canada Fertilizers Act and Regulations

812.02 Material

The compost material shall be supplied by the Contractor, and shall be an organic substance produced from the aerobic decomposition of organic matter. The compost material shall not contain any visible refuse material nor any material toxic to plant establishment or growth. The composted material may be derived from, but not limited to, leaves, yard trimmings, food scraps, food processing residues, manure and other agricultural residues, bark and other forest residues, soiled or un-recycled paper and biosolids.

Compost materials shall meet all applicable provincial and federal regulations and guidelines for compost production (see above reference materials). Compost material shall meet the CCME Guidelines for Category A. Compost material shall meet the physical requirements shown in Table 1 or meet requirements designated by the Engineer.

812.02.01 Submissions and Design Requirements

Prior to delivery of compost to the site, the Contractor shall provide the Engineer with the following information:

- Correspondence verifying that the compost meets CCME Guidelines for Category A Compost
- Correspondence verifying that the compost material meets the physical requirements in Table 1.

The Engineer may require the Contractor to provide a sample of the compost for confirmatory purposes.

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COMPOST

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Table 1 (as received basis)

Compost for Manufactured Topsoil	Erosion Control Compost	General Use Compost
Organic Matter Content >30% dry mass	Organic Matter Content: 40-60% dry mass	Organic Matter Content: 40-60% dry mass
Moisture Content :40-60%	Moisture Content :40-60%	Moisture Content :40-60%
Particle Size: 100% passing 25 mm sieve	Particle Size: 100 % passing 80 mm and approx.. 70% passing 25 mm sieve	Particle Size: 100% passing 25 mm and approx.. 70% passing 10 mm sieve
Soluble Salts: 5.0 max. dS/m	Soluble Salts: 5.0 max. dS/m	Soluble Salts: 5.0 max. dS/m
pH: 5.0 – 8.5	pH: 5.0 – 8.5	pH: 5.0 – 8.5

812.03 **Construction Method**

After the designated areas have been graded according to the lines and grades approved by the Engineer, compost of the specified type shall be placed according to the following descriptions. Compost materials shall be loose and friable and be free of dust at the time of application. No compost materials shall be stored on site within 30 m of a watercourse.

812.03.01 **Compost Manufactured Topsoil**

Compost manufactured topsoil shall consist of soil material amended with 20 - 30% compost by volume. The soil material shall be free from trash, branches and other objectionable materials, and shall be approved by the Engineer prior to beginning the mixing process.

Blended On-site

Compost shall be evenly spread in a uniform layer over the previously prepared slope and thoroughly mixed to the depths shown on the plans or as directed by the Engineer.

Pre-blended

Topsoil manufactured off-site shall be spread over the prepared slope in a uniform layer to a depth of 10 - 20 cm. The topsoil shall be free of objectionable materials.

812.03.02 **Erosion Control Compost**

Compost materials shall be spread evenly over the prepared subgrade or slopes to form a uniform layer of a thickness of 50 - 75 mm or as shown on the plans. Compost shall not be used for erosion control on slopes steeper than 2:1.

812.03.03 **General Use Compost**

General use compost shall be applied as a top dressing over established areas of turf, grass or other ground cover to the depth specified on the plans or as directed by the Engineer.

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COMPOST

812**812.04 Method of Measurement**

Measurement for compost shall be the area in square metres where compost manufactured topsoil (both blended on-site and pre-blended), erosion control compost, general use compost has been acceptably applied and in place, measured along the slope of the ground.

812.05 Basis of Payment**812.05.01 Compost manufactured topsoil****812.05.02 Erosion control compost****812.05.03 General use compost**

Payment at the contract unit price for the above tender item(s) shall be full compensation for all labour, equipment and material necessary to perform the work, and shall include supply and transport.

Where soil material used in the production of Compost Manufactured Topsoil originates from off-site locations, payment for the soil material shall be consistent with terms described in Sections 205.04 and 206.05.

Slope preparation prior to use of compost materials and removal of objectionable materials will not be measured for payment, but shall be considered as incidental to the bid items under which the excavation or embankment construction of such areas was carried out.

If hydroseeding is required, payment for hydroseeding will be made as per Section 803.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GABIONS

813

813.01

Description

This Item consists of the supply and installation of gabion baskets fabricated from wire mesh and filled with rock.

*Refer to Section 7.1.9 Gabions of TIE's Environmental Protection Plan.

813.02

Materials

All materials shall be supplied by the Contractor.

Gabion baskets shall be fabricated of galvanized wire mesh.

Fasteners to secure the baskets shall be supplied in a material compatible with the material type and properties of the basket.

Rocks used in the construction of gabions shall be clean, hard, sound and durable, with the least dimension of any rock equal to or greater than one and one-half times the mesh size, and shall not exceed 300 mm in greatest dimension.

Rock used for basket fill material, when tested by Los Angeles Abrasion test method in accordance with ASTM C131 and/or C535, shall have an abrasion loss not greater than 40%.

Rocks shall be of a size that at least two layers of overlapping rock are required to fill the gabion.

Geotextile shall be supplied in accordance Section 218, Type N1. Gabion baskets shall conform to the following minimum standards:

Factory fabricated so that the sides, ends, lid and internal diaphragms can be readily assembled at the work area into rectangular baskets of the sizes indicated in the Contract Documents.

When the length exceeds horizontal width, diaphragms of the same mesh as the gabion basket walls shall be used to divide the basket into equal cells of a length not in excess of the horizontal width.

Wire mesh shall be a uniform regular pattern, with a maximum nominal opening size of 80 by 100 mm, and fabricated to be non-ravelling.

Selvedge edges of the mesh shall be securely fastened together so that the joints, which are formed, are as strong as the body of the mesh.

Hot dip galvanized wire shall have a minimum coverage of 260 grams/square metre and shall conform to ASTM Tests: A641, A90, and A764.

Wire shall be dimensioned, as a minimum, as indicated in Table 813.1

The Contractor shall supply free draining backfill behind the gabion Structure.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GABIONS**813**

Table 813.1 Minimum Twisted Galvanized Wire Dimensions

Application	Diameter
Mesh	2.95 mm
Selvages	3.80 mm
Binding	2.20 mm
Interlocking Wire Fasteners	3.17 mm

813.03 Submittals

The Contractor shall submit, in advance of the work, a mill certificate for the gabion materials to be supplied.

The Contractor shall submit, upon request, the manufacturer's recommended procedures for installation and instructions for handling of the selected gabion.

The Contractor shall notify the Engineer, in writing, for approval of the source of supply of rock, at least 14 days in advance of obtaining material from the source proposed.

Submittals are required in accordance with any cross-referenced Item forming part of this Item.

813.04 Construction

The Contractor shall carry out the work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

The Contractor shall prepare the grades and slopes of the underlying material as shown on the Plans or as directed by the Engineer.

The Contractor shall place the gabions on a prepared compacted soil foundation grade and shall assemble the gabions according to the manufacturer's instructions and recommendations.

The gabion baskets in any row shall be filled in stages to minimize void spaces and so that local deformations are avoided.

The upstream and downstream ends of a gabion basket shall be blended into the existing bank with the use of rock, rip rap, or vegetation.

The rock for the exposed rock face(s) of the gabion basket shall be hand placed to ensure proper alignment and a neat, compact, square appearance.

Bulges in the gabions shall not exceed 40 mm at the most extreme point measured in any cell.

The geotextile shall be placed in accordance with Section 218.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GABIONS

813

813.05 Measurement for Payment

The quantity to be measured under this Section shall be the volume in cubic metres of gabions supplied and installed in accordance with this Item.

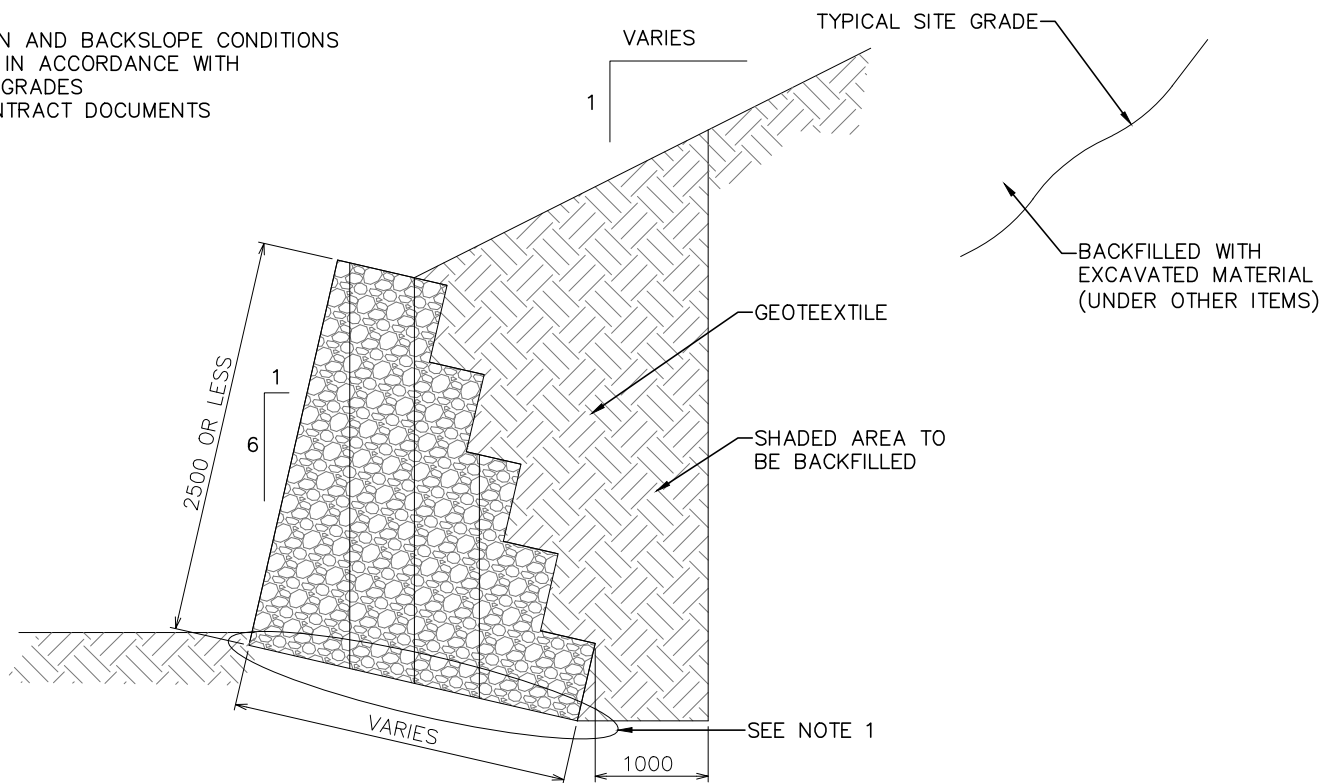
Measurement additional backfill material and geotextile will be made in accordance with the respective Specification Section.

813.06 Basis of Payment

Payment for work under this Item shall be at the unit bid price for the number of cubic metres of gabions supplied and installed and shall be full compensation for all materials, including rock, work, additional costs associated with backfill materials and incidentals necessary to complete the work unless specified otherwise in this section.

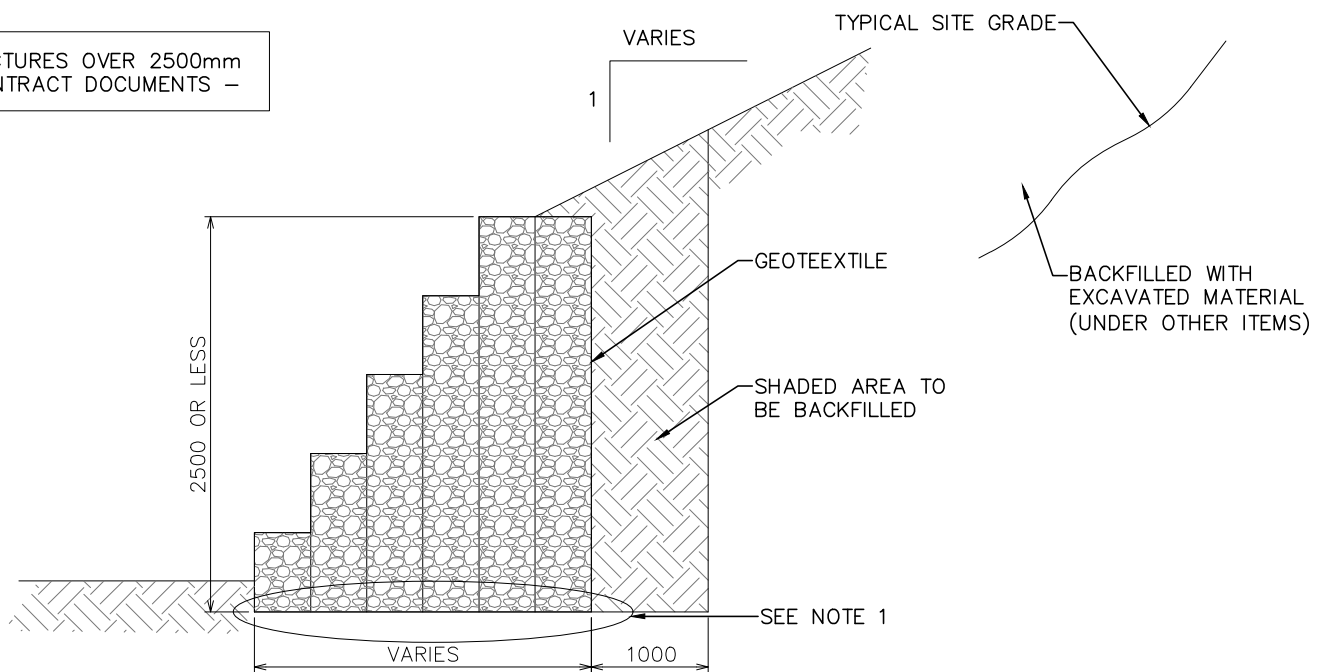
Payment for free draining backfill, additional backfill material and geotextile will be made in accordance with the respective Specification Section.

NOTE 1:
FOUNDATION AND BACKSLOPE CONDITIONS
MAY VARY IN ACCORDANCE WITH
ADJACENT GRADES
— SEE CONTRACT DOCUMENTS



SLOPING FRONT

FOR STRUCTURES OVER 2500mm
— SEE CONTRACT DOCUMENTS —



STEPPED FRONT

FIGURE 813-1 GABION DETAILS

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

SAFETY		900
901	Traffic Control Persons	
902	Removal of Flex Beam Guiderail	
903	Flex Beam Guiderail	
904	Pavement Edge Delineation	
905	Temporary Marking	
906	Traffic Control Devices	
907	Vehicle Configurations and Restrictions	
908	Traffic Control Plan	
909	Installation of Guiderail End Treatment	

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TRAFFIC CONTROL PERSONS

901

901.01 Description

This work shall consist of the provision of traffic control persons to direct traffic safely through the work site or around detours.

901.02 Personnel

The traffic control persons must meet the requirements of Section 13.1 of the 2016 Temporary Workplace Traffic Control Manual and Section 50.4 of the Occupational Health and Safety Act Regulations.

901.03 Equipment

The Contractor shall ensure that all traffic control persons on the work site are clothed and equipped as specified in Section 13.1 of the 2016 Temporary Workplace Traffic Control Manual and Part 50 of the Occupational Health and Safety Act Regulations. All traffic control persons working on projects must be equipped with two-way radios of a quality acceptable to the Engineer.

901.04 Methods

The Contractor shall ensure that the traffic control persons comply with Section 13.1 of the 2016 Temporary Workplace Traffic Control Manual and Part 50 of the Occupational Health and Safety Act Regulations when directing traffic.

901.05 Requirements

The Contractor shall ensure that traffic control persons are at the work site and at the proper location to direct traffic as required by Section 13.1 of the 2016 Temporary Workplace Traffic Control Manual and Part 50 of the Occupational Health and Safety Act Regulations.

Traffic control persons shall ensure that a valid accreditation certificate is carried with them at all times while on the job site.

901.06 Method of Measurement

The quantity to be measured for payment under this section shall be the number of hours which traffic control persons actually control traffic.

901.07 Basis of Payment

Payment for traffic control persons shall be at the unit price per hour set by the Department and this shall be full compensation for labour, equipment, and incidentals to carry out the work. No compensation shall be provided to the Contractor for holiday pay or overtime expenses that may occur.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

REMOVAL OF FLEX BEAM GUIDERAIL

902

902.01 Description

This work shall consist of the removal of flex beam guiderail from a roadway.

902.02 Construction Method

The Contractor shall remove existing guiderail from areas designated by the Engineer. This work shall include removal of bolts, pulling of posts and filling post holes with approved material as directed by the Engineer.

All material recovered in the dismantling operation including, but not limited to, posts, blocks, delineators and guiderail sections shall remain the property of the Department. The Contractor shall stockpile all such materials in a manner and at a location approved by the Engineer.

902.03 Method of Measurement

The quantity to be measured under this Section shall be the number of linear metres of guiderail removed excluding overlapped guiderail.

902.04 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre and this price shall be full compensation for dismantling the guiderail, transporting materials to the stockpile, stockpiling materials, tools, labour, materials, equipment and incidentals necessary to carry out the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

FLEX BEAM GUIDERAIL

903**903.01** Description

This work shall consist of the supply and erection of a flex beam guiderail.

903.02 Material

Unless otherwise specified, all materials shall be supplied by the Contractor.

903.02.01 Posts and Blocks

All guiderail posts and posts shall be manufactured from a suitable hardwood species and conform with the requirements for No. 1 Structural Posts and Timber, graded in accordance with the National Lumber Grading Authority (NLGA) Standard Grading Rules for Canadian Lumber.

The dimensions of hardwood guiderail posts shall be 150mm x 200mm x 2100 mm. Matching hardwood blocks shall be 150mm x 200mm x 356mm. All posts and blocks shall be treated with chromated copper arsenate (CCA) in accordance with CSA-080. Penetration and retention of preservatives shall conform to the requirements of CSA 080.14, Table 1.

Structural steel posts and blocking shall conform to CAN/CSA-G40.21-350W steel and shall be hot dipped galvanized after fabrication in accordance with G164- 610 g/m². Size and dimensions of steel posts shall be as shown on Standard Sketch 903-01.

903.02.02 Beams

All steel beams dimensions and cross-section shall be in accordance with Figure 903-1. The rail shall be Class A, Type 2, W-beam steel beams, conforming to AASHTO M180.

Rails shall be punched for bolt holes in conformity with the AASHTO Standard, to the designated spacings as shown in Figure 903-1. There shall be no onsite alteration or drilling of new holes.

Properties of the base metal for the rails shall conform to the following requirements:

Minimum Yield Point 345 MPa
Minimum Tensile Strength 483 MPa
Minimum Elongation Minimum 12% in 50 mm length

The rails and terminal elements thickness shall be manufactured according to Table 2 (Class A, Type 2) of AASHTO Standard M180 with nominal base metal thickness of 2.82 mm (2.59 mm minimum).

903.03 Construction Method

The Contractor shall erect guiderails at the locations and for the length directed by the Engineer.

Erection of guiderails shall be in accordance with Figures 903-1 and 903-2.

The Contractor shall thoroughly compact the bottom of the hole. The guard rail posts shall rest directly and solidly on the bottom of the hole at the time of installation. Backfill

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

FLEX BEAM GUIDERAIL

903

shall be compacted, in layers not exceeding 150 mm, for the full depth of the excavation. The contractor shall ensure the final elevation of fill matches the adjacent grade.

Guard rail and guide posts shall be installed plumb, and set according to alignment and grade, as shown on the drawings or as directed by the Engineer. The rail elements shall be erected to produce a smooth continuous rail parallel to the line and grade of the highway surface as directed by the Engineer. All rail elements shall be lapped in the direction of traffic.

903.04 Method of Measurement

The quantity to be measured under this Section shall be the number of linear metres of guiderail erected excluding overlapped guiderail.

903.05 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre and this price shall be full compensation for supply of guiderail system materials, erection of the guiderail, burying of guardrail ends as required, tools, labour, equipment and incidentals necessary to complete the work.

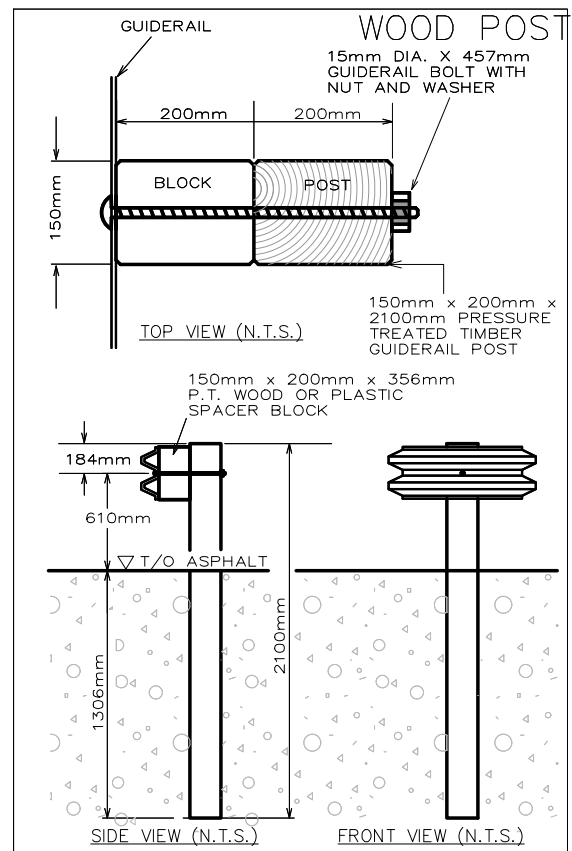
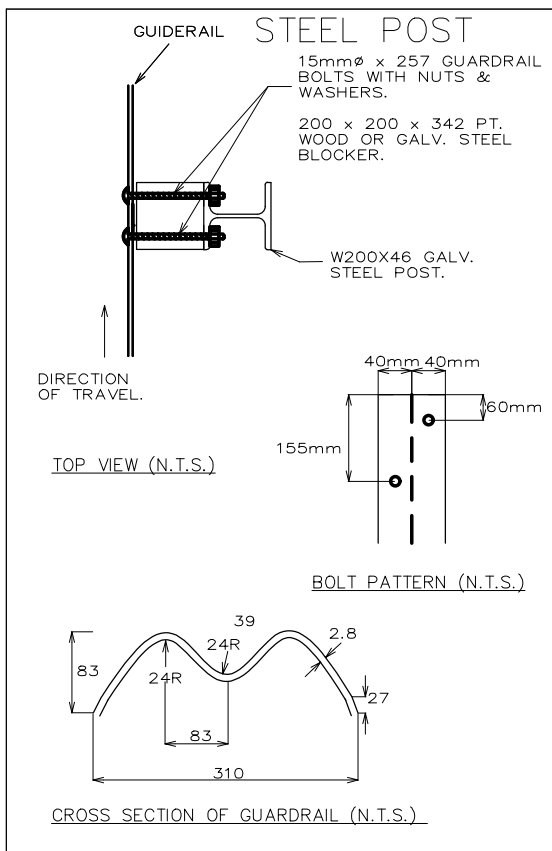
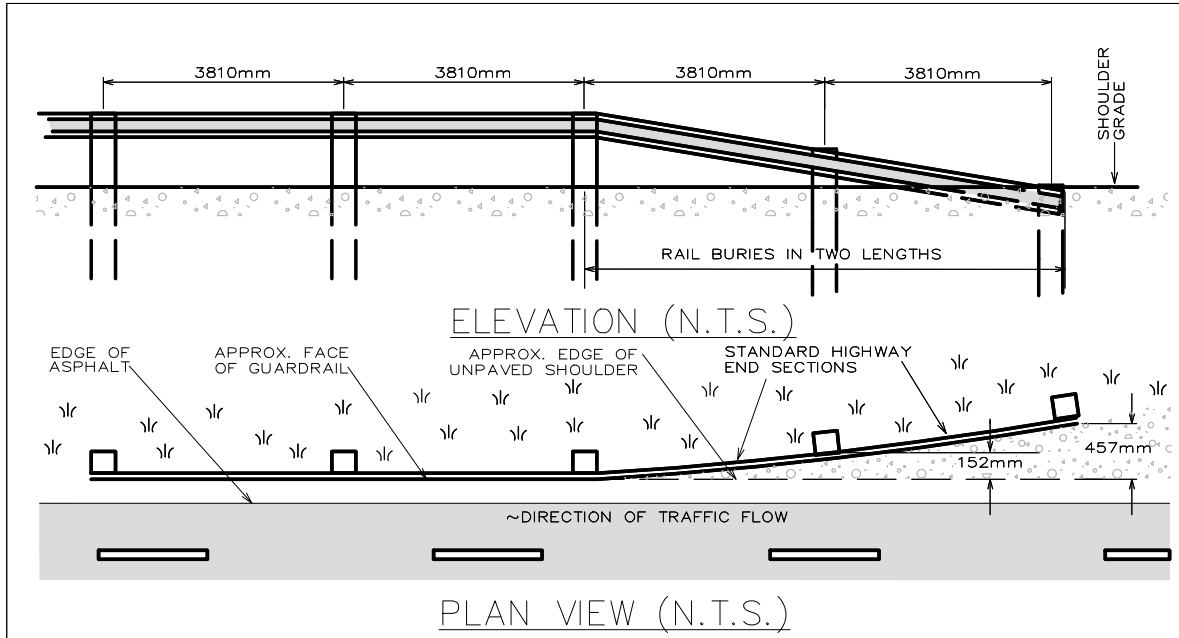


FIGURE 903-01 ERECTION OF FLEX BEAM GUIDERAIL
REVISED 2020

GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY CONSTRUCTION
DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

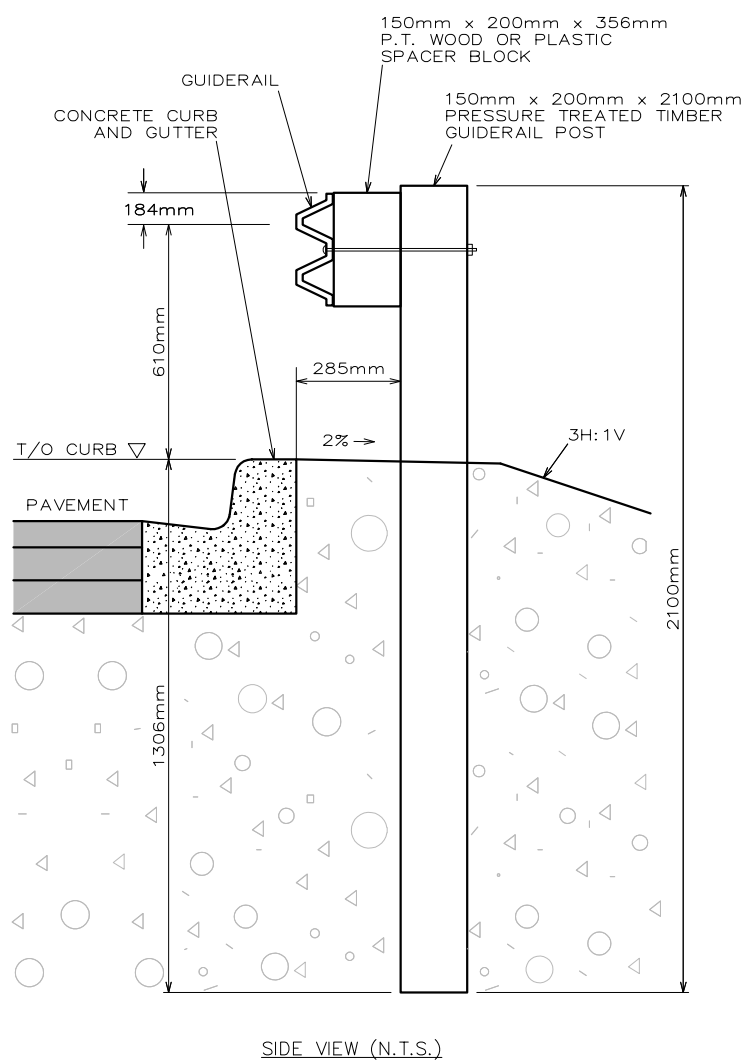
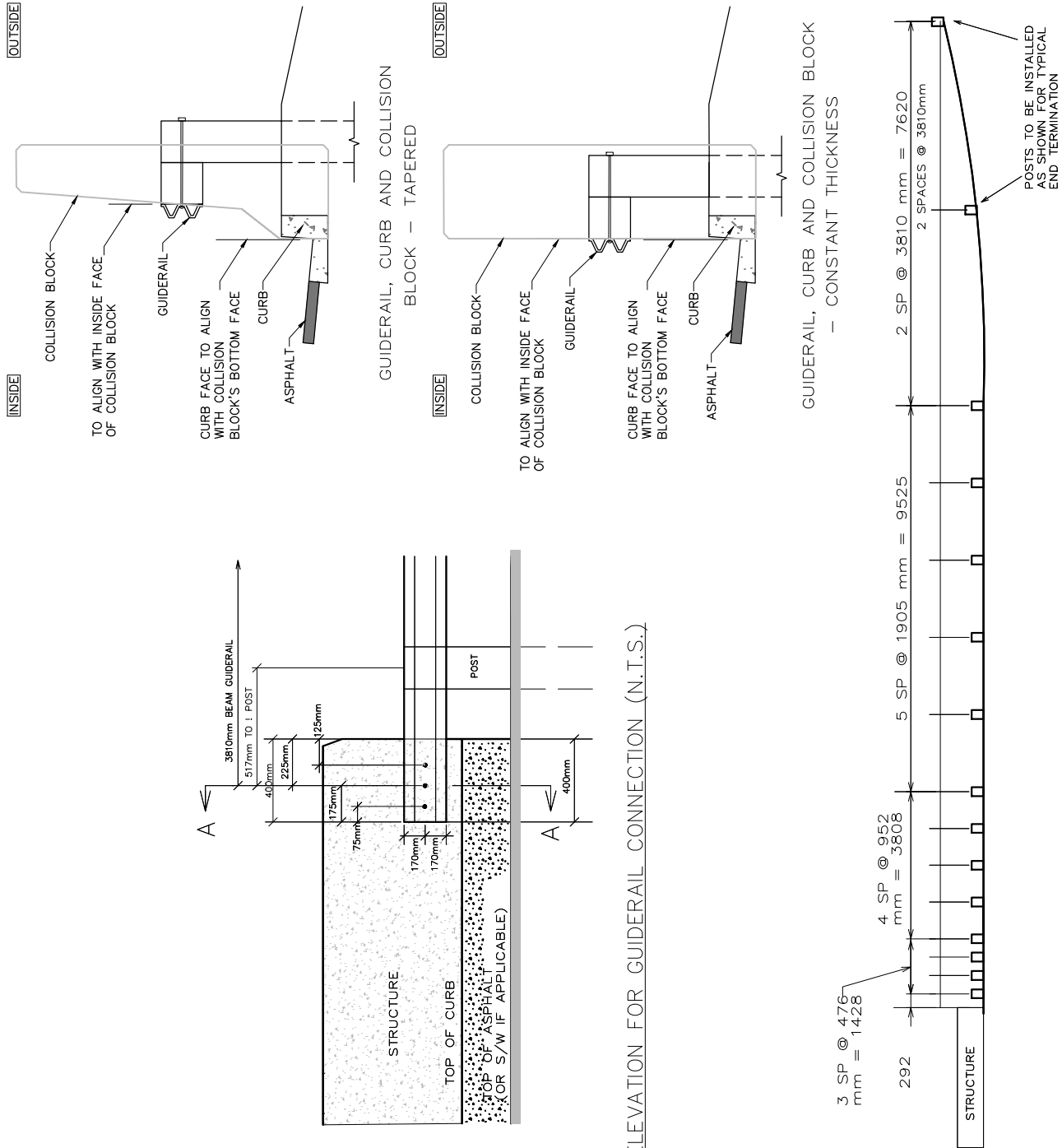


FIGURE 903-01B GUIDERAIL BEHIND CURB

ERECTION OF FLEX BEAM GUIDERAIL

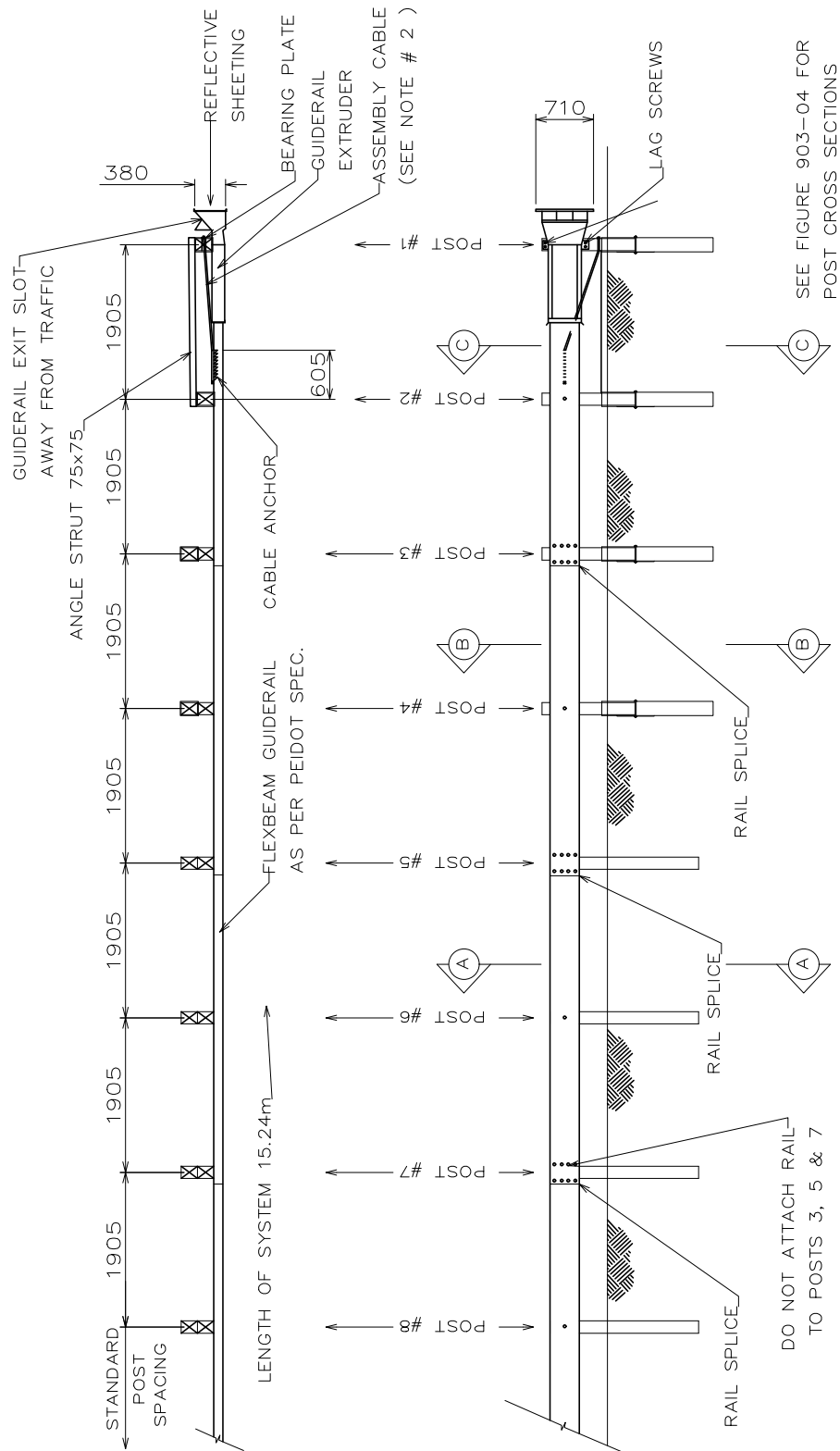
903



POST SPACING ON APPROACH TO A STRUCTURE (N.T.S.)

FIGURE 903-02 CONNECTION OF FLEX BEAM GUIDERAIL AT A STRUCTURE

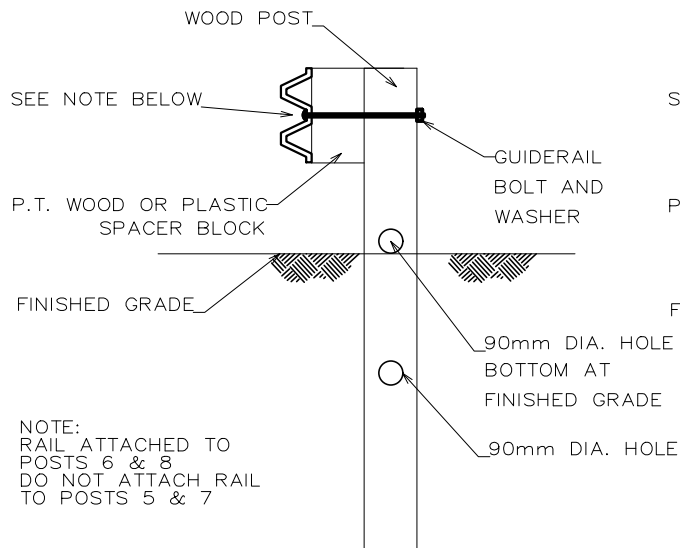
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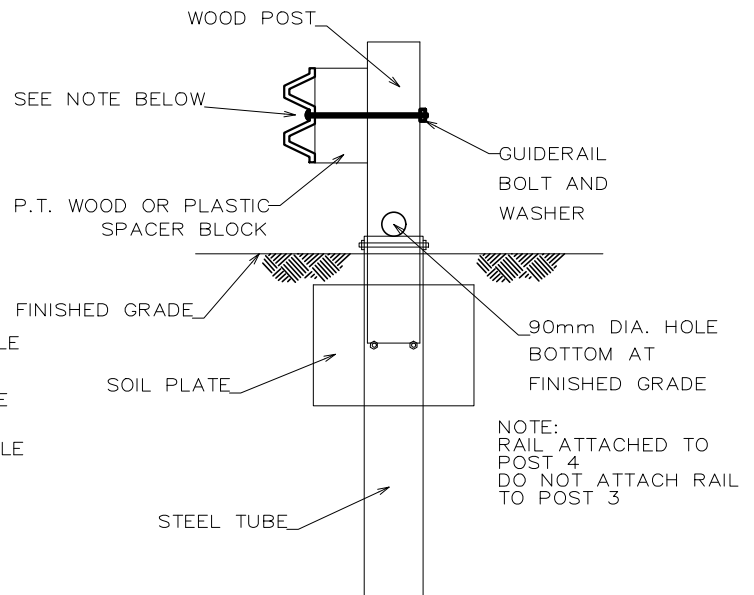
NOTES:

1. INSTALL RAIL PARALLEL TO ROADWAY EDGE LINE WHEN TAPER IS REQUIRED BY DESIGN ENGINEER, A 50:1 TAPER OVER THE LENGTH OF THE SYSTEM IS ALLOWABLE
2. AFTER FINAL ASSEMBLY RE-CHECK ASSEMBLY CABLE TO ENSURE IT IS TAUGHT AND HAS NOT RELAXED.
3. DO NOT ATTACH GUIDERAIL TO POST #1.
4. DO NOT ATTACH GUIDERAIL TO POST BLOCKS AT SPLICE LOCATIONS AT POSTS 3, 5 & 7.
5. A FLAT WASHER IS USED UNDER THE NUT BEHIND THE POST ONLY. NO WASHER IS USED ON THE FRONT OF THE RAIL FOR THE LENGTH OF THE SYSTEM.
6. PROVIDE REFLECTIVE SHEETING ON END OF GUIDERAIL EXTRUDER ASSEMBLY.

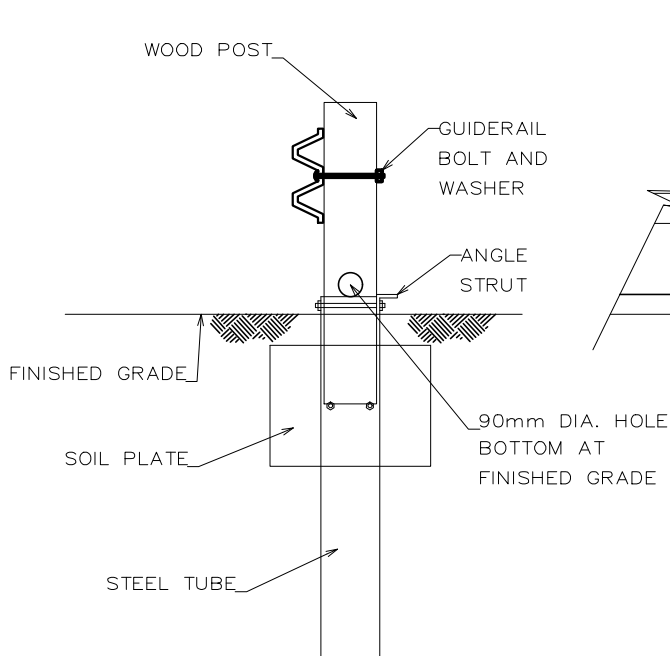
FIGURE 903-03 GUIDERAIL EXTRUDER
ASSEMBLY PLAN & ELEVATION
2005



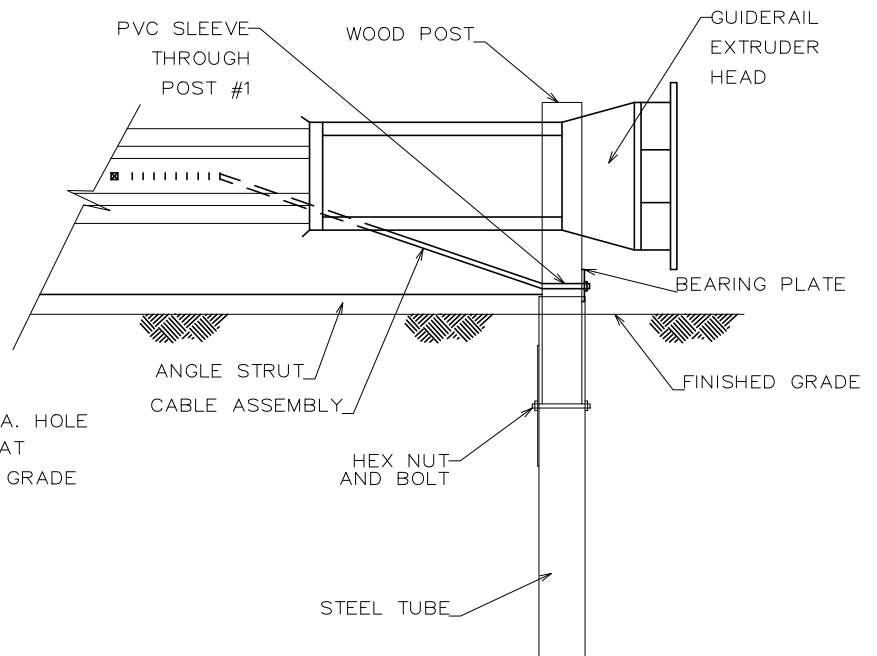
Section A-A Posts 5, 6, 7 & 8



Section B-B Posts 3 & 4



Section C-C Post 2



Elevation Post 1

FIGURE 903-04 GUIDERAIL EXTRUDER POST
SECTIONS & ELEVATION
REVISED 2010

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CONSTRUCTION ZONE EDGE DELINEATION

904

904.01 Description

The work under this Section consists of the supply, erection, maintenance and removal of delineators along the edge of the travelling surface within the construction zone.

904.02 Material

Construction zone edge delineation shall consist of signs having alternating black and high intensity reflective orange stripes of at least 120 mm in width. The minimum size of the delineator sign shall be 300 mm wide by 600 mm high. The delineator shall be in accordance with Figure 904-1.

904.03 Construction Method

Construction zone edge delineation shall be supplied, erected and maintained along all edges of the travelling surface within the construction zone. Delineators shall be placed as work progresses with no sections under construction left undelineated overnight. Delineators shall be maintained until immediately prior to placement of shoulder material when they shall be removed from the work site.

The delineators shall be erected 1 m from edge of pavement on the shoulder at a spacing of 100 m on highway sections, or as specified by the Engineer. The delineator shall be erected so that the bottom of the delineator sign is between 800 mm and 1200 mm above the top of the travelling surface.

904.04 Maintenance

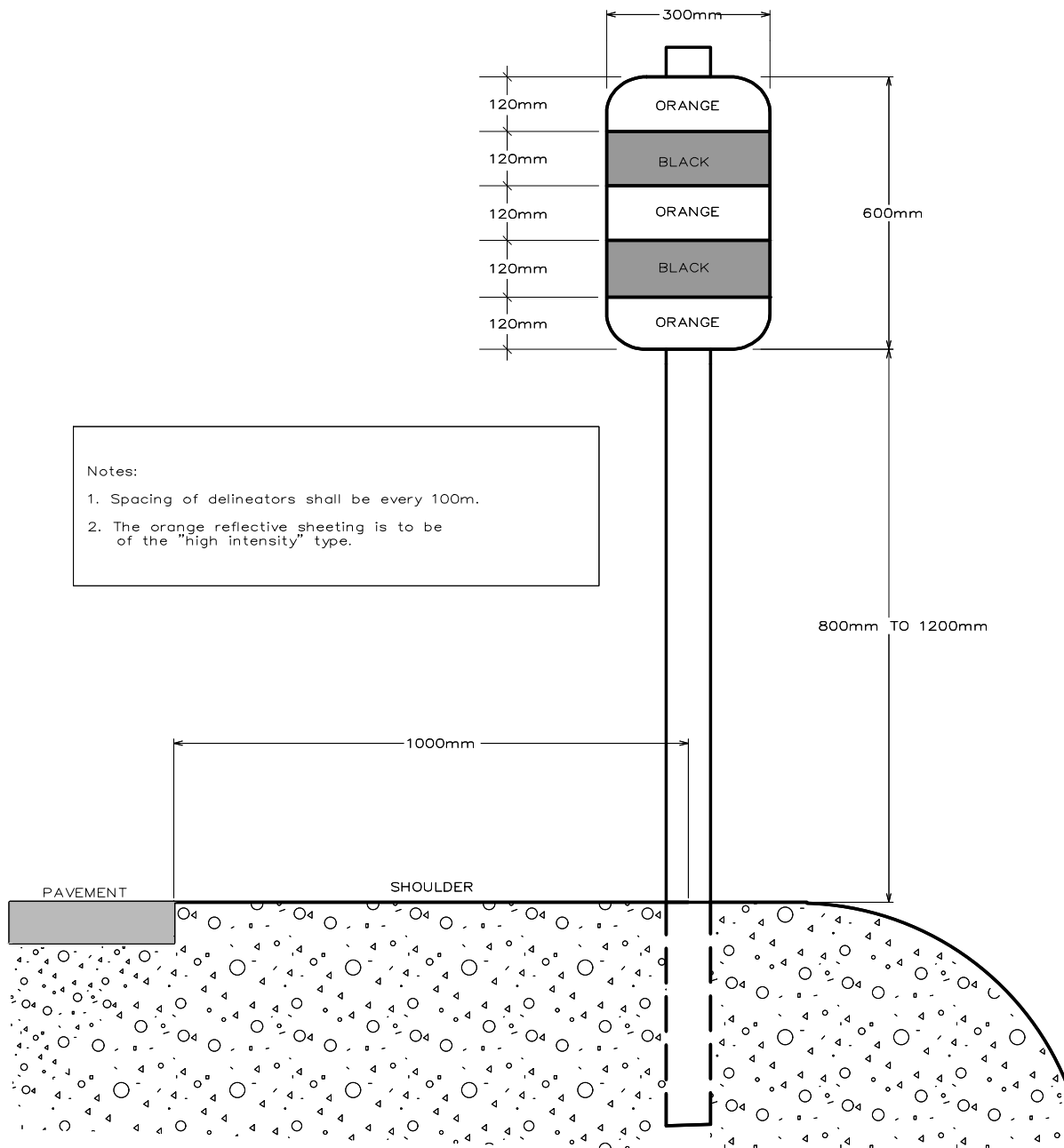
The delineators shall be maintained in proper position and must be clean and legible at all times. Maintenance shall include removal and reinstallation as required by the Engineer. Damaged or faded delineators shall be repaired or replaced as soon as possible.

904.05 Method of Measurement

Construction zone edge delineation shall be measured by the number of delineators erected and maintained. The number may be recorded at any time between the erection and removal of the delineators. Those delineators erected but not maintained will not be recorded.

904.06 Basis of Payment

Payment under this Section shall be at the unit bid price per Construction zone edge delineator.



ELEVATION (N.T.S.)

FIGURE 904-01 PAVEMENT EDGE DELINEATOR
REVISED 2001

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TEMPORARY MARKING

905

905.01 Description

Temporary marking tape or Temporary Overlay Markers (TOMS) shall be placed on all new asphaltic concrete base and seal courses, all surface treatments, all milled pavement surfaces and all tack coated asphaltic concrete base courses as work progresses with no new road surface left unmarked overnight.

905.02 Material

Temporary marking shall consist of reflective pavement marking tape or TOMS with adhesive backing. The adhesive shall adhere the tape or TOM to the roadway surface so that they are not removed, displaced, rolled or torn by traffic. Nails may be required to be used to ensure TOMS are not removed, displaced, rolled or torn by traffic. Temporary marking tape 100 mm in width, TOMS 100 mm in width by 50 mm in height (reflective on two sides), and nails shall be supplied by the Contractor.

905.03 Construction Method

Yellow tape or TOMS are to be used to separate lanes of traffic in opposing directions. White tape or TOMS (reflective one side) are to be used to separate lanes of traffic in the same direction.

The tape is to be placed in 500 mm lengths every 20 m and the TOMS are to be placed every 40 m or as specified by the Engineer.

905.04 Method of Measurement

Measurement for payment under this Section shall be the number of linear metres of tape applied or the number of TOMS placed.

905.05 Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre for tape and at the unit bid price per unit for TOMS. This price shall be full compensation for supply and application of temporary marking, tools, labour, equipment and incidentals necessary to carry out the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TRAFFIC CONTROL DEVICES

906

906.01 Scope

The requirement of this Section is that the Contractor have a supply of traffic control devices available on the work site before construction begins.

906.02 Material

The Contractors shall have the following traffic control devices on the work site before construction begins:

- 40 traffic cones
- 40 plastic traffic posts
- 2 construction zone signs
- 2 construction ahead signs
- 2 Work Zone signs
- 2 Construction Ends signs

In addition to the listed traffic control devices the Contractor must have the following at all arterial highway work sites:

- 40 traffic barrels
- 40 plastic traffic posts

As work progresses the Contractor must supply and maintain any additional traffic control devices as required by the Engineer.

Traffic barrels must be constructed of impact resistant, flexible low density polyethylene. Minimum wall thickness shall be 2.4 mm. The traffic barrel shall be 2 piece construction with a breakaway base that locks in place after ballast is placed in the barrel.

The height of the traffic barrel shall be not more than 1 m and not less than 910 mm. The outside diameter of the barrel shall be 585 mm and the barrel shall be tapered to an outside top diameter of 455 mm.

The colour of the traffic barrel shall be "safety orange" and shall have 5 reflective alternating bands of orange and white high intensity sheeting. At the request of the Engineer the contractor shall clean or replace any traffic control devices. The minimum width of each band of sheeting shall be 100 mm and shall be the same circumference of the traffic barrel.

906.03 Construction Method

The traffic control devices are to be placed on the work site as required in accordance with the Traffic Control Procedures for Road Work of Appendix 3 to indicate a safe roadway for traffic.

The above requirements do not alleviate the Contractor's responsibility of accommodating traffic in accordance with Provision 105.07.

906.04 Method of Measurement

There shall be no measurement for payment under this Section.

906.05 Basis of Payment

The provision of all signs, traffic cones and barrels are incidental to the work.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

VEHICLE CONFIGURATIONS AND RESTRICTIONS

907

907.01 Scope

This Section specifies the vehicle configuration which may be used to haul various materials to the work site and the type of traffic control that must be in place for each highway project depending on traffic control (i.e. approved detours) and traffic volumes (i.e. Summer Average Daily Traffic - SADT).

907.02 Vehicle Configurations on all Highway Projects

Truck: Single unit vehicle with end dump, 2 or 3 axles, no trailers.

Truck with Pup Trailer (TPT): Truck with 2 or 3 axle trailer connected to the truck by a drawbar.

Tractor Semi-Trailer (TST): 2 or 3 axle tractor with 2 or 3 axle end-dump semi-trailer connected through a 5th wheel and kingpin.

Tractor Belly Dump (TBD): 2 or 3 axle tractor with 2 or 3 axle belly dump semi-trailer connected through a 5th wheel and kingpin.

Train: 2 or 3 axle tractor with more than 1 trailer or semi-trailer.

Tractor with Flow-Boy Trailer (TFB): 2 or 3 axle tractor with 2 or 3 axle semi-trailer connected through a 5th wheel and a kingpin and the semitrailer is equipped with a conveyor in the floor to unload to the rear of the trailer.

Tractor Scissor Dump (TSD): 2 or 3 axle tractor with 2 axle quarter frame end dump semi-trailer connected through a 5th wheel and kingpin.

907.03 Vehicle Restrictions on Highway Projects with an Approved Detour

907.03.01 Materials Haul Restrictions

1. Only trucks and tractors with flow-boy trailers will be permitted to haul asphaltic concrete and RAP.
2. Only trucks, trucks with pup trailers, and tractors with flow-boy trailers will be permitted to haul shoulder material.
3. Unless restricted in other sections of this policy, trucks, trucks with pup trailers, tractor semi-trailers, tractor belly dumps and tractors with flow-boy trailers will be permitted to haul bulk materials on the work site.
4. Trains will not be permitted to haul any materials.

907.03.02 Traffic Restrictions

1. All vehicles may haul in any order.

907.03.03 Safety Requirements

1. Tractor semi-trailers will not be permitted to dump on roads where the super-elevation or cross-slope is greater than 3%.
2. Tractor semi-trailers will not be permitted to move ahead or in reverse with the dump body raised.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

VEHICLE CONFIGURATIONS AND RESTRICTIONS

907

907.03.04 Contractor Requirements

1. The Contractor must provide sufficient equipment for spreading the material after dumping.
2. The Contractor must prepare a levelled area where tractor semi-trailers are permitted to dump.

907.04 Vehicle Restrictions on Highway Projects with SADT < 1000

907.04.01 Material Haul Restrictions

1. Only trucks and tractors with flow-boy trailers will be permitted to haul asphaltic concrete and RAP.
2. Only trucks, trucks with pup trailers, and tractors with flow-boy trailers will be permitted to haul shoulder material.
3. Unless restricted in other sections of this policy, trucks, trucks with pup trailers, tractor semi-trailers, tractor belly dumps and tractors with flow-boy trailers will be permitted to haul bulk materials on the work site.
4. Trains will not be permitted to haul any materials.

907.04.02 Traffic Restrictions

1. All vehicles may haul in any order.
2. On gravel and sandstone hauls, all vehicles must turn in a designated turning area if one is provided by the Contractor.

907.04.03 Safety Requirements

1. Any designated turning area must have safe stopping sight distance at the entrance and exit.
2. Tractor semi-trailers will not be permitted to dump on roads where the super-elevation or cross-slope is greater than 3%.
3. Tractor semi-trailers will not be permitted to move ahead or in reverse with the dump body raised.
4. Traffic must be stopped from the time the tractor semi-trailer starts to raise the dump body until the empty dump body has been lowered to the level of the top of the tractor cab.
5. Signallers must control all areas where any vehicle is in the dumping queue. This requirement includes entering, waiting, dumping and leaving the queue.
6. No loaded vehicles will be permitted to turn on the travelled portion of the highway.
7. The dumping sequence for trucks must comply with the 3 stages of Figure 907-01 when the paving operation is proceeding toward the asphalt plant.
8. The dumping sequence for tractor semi-trailers must comply with the 4 stages of Figure 907-02.

907.04.04 Contractor Requirements

1. The Contractor must provide sufficient equipment for spreading the material after dumping.
2. The Contractor must prepare a level plane where tractor semi-trailers are permitted to dump.
3. The Contractor must provide 2 additional signallers, 1 located at each end of the tractor semi-trailer, at sites where tractor semi-trailers are permitted.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

VEHICLE CONFIGURATIONS AND RESTRICTIONS

907

907.05 Vehicle Restrictions on Highway Projects with SADT >1000 but <4000

907.05.01 Material Haul Restrictions

1. Only trucks and tractors with flow-boy trailers will be permitted to haul asphaltic concrete and RAP.
2. Only trucks, trucks with pup trailers, and tractors with flow-boy trailers will be permitted to haul shoulder material.
3. Unless restricted in other sections of this policy, trucks, trucks with pup trailers, tractor semi-trailers, tractor belly dumps and tractors with flow-boy trailers will be permitted to haul bulk materials on the work site.
4. Trains will not be permitted to haul any materials.

907.05.02 Traffic Restrictions

1. On gravel and sandstone hauls, all vehicles must turn in a designated turning area if one is provided by the Contractor.
2. Tractor semi-trailers may only haul on the ratio of 1 tractor semi-trailer to 3 other haul vehicles.

907.05.03 Safety Requirements

1. Any designated turning area must have safe stopping sight distance at the entrance and exit.
2. Tractor semi-trailers will not be permitted to dump on roads where the super-elevation or cross-slope is greater than 3%.
3. Tractor semi-trailers will not be permitted to move ahead or in reverse with the dump body raised.
4. Traffic must be stopped from the time the tractor semi-trailer starts to raise the dump body until the empty dump body has been lowered to the level of the top of the tractor cab.
5. Signallers must control all areas where any vehicle is in the dumping queue. This requirement includes entering, waiting, dumping and leaving the queue.
6. No loaded vehicles will be permitted to turn on the travelled portion of the highway.
7. The dumping sequence for trucks must comply with the 3 stages of Figure 907-01 when the paving operation is proceeding toward the asphalt plant.
8. The dumping sequence for tractor semi-trailers must comply with the 4 stages of Figure 907-02.

907.05.04 Contractor Requirements

1. The Contractor must provide sufficient equipment for spreading the material after dumping.
2. The Contractor must prepare a levelled area where tractor semi-trailers are permitted to dump.
3. The Contractor must provide 2 additional signallers, 1 located at each end of the tractor semi-trailer, at sites where tractor semi-trailers are permitted.

907.05.05 Truckers Association Requirements

The Prince Edward Island Truckers Association is responsible for enforcing the ratio of 1 tractor semi-trailers to 3 other haul vehicles prior to loading and weighing. This ratio is to be enforced prior to leaving the loading area.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

VEHICLE CONFIGURATIONS AND RESTRICTIONS

907

907.06 Vehicle Restrictions on Highway Projects with SADT > 4000

907.06.01 Material Haul Restrictions

1. Only trucks and tractors with flow-boy trailers will be permitted to haul asphaltic concrete and RAP.
2. Only trucks, trucks with pup trailers, and tractors with flow-boy trailers will be permitted to haul shoulder material.
3. Unless restricted in other sections of this policy, trucks, trucks with pup trailers, tractor belly dumps and tractors with flow-boy trailers will be permitted to haul bulk materials on the work site.
4. Tractor semi-trailers and trains will not be permitted to haul any materials.

907.06.02 Traffic Restrictions

1. On gravel and sandstone hauls, all vehicles must turn in a designated turning area if one is provided by the Contractor.

907.06.03 Safety Requirements

1. Any designated turning area must have safe stopping sight distance at the entrance and exit.
2. Signallers must control all areas where any vehicle is in the dumping queue. This requirement includes entering, waiting, dumping, and leaving the dumping queue.
3. No loaded vehicles will be permitted to turn on the travelled portion of the highway.
4. The dumping sequence for trucks must comply with the 3 stages of Figure 907-01 when the paving operation is proceeding toward the asphalt plant.

907.07 Method of Measurement

There shall be no measurement for payment under this Section.

907.08 Basis of Payment

Compliance with this Section shall be incidental to the work.

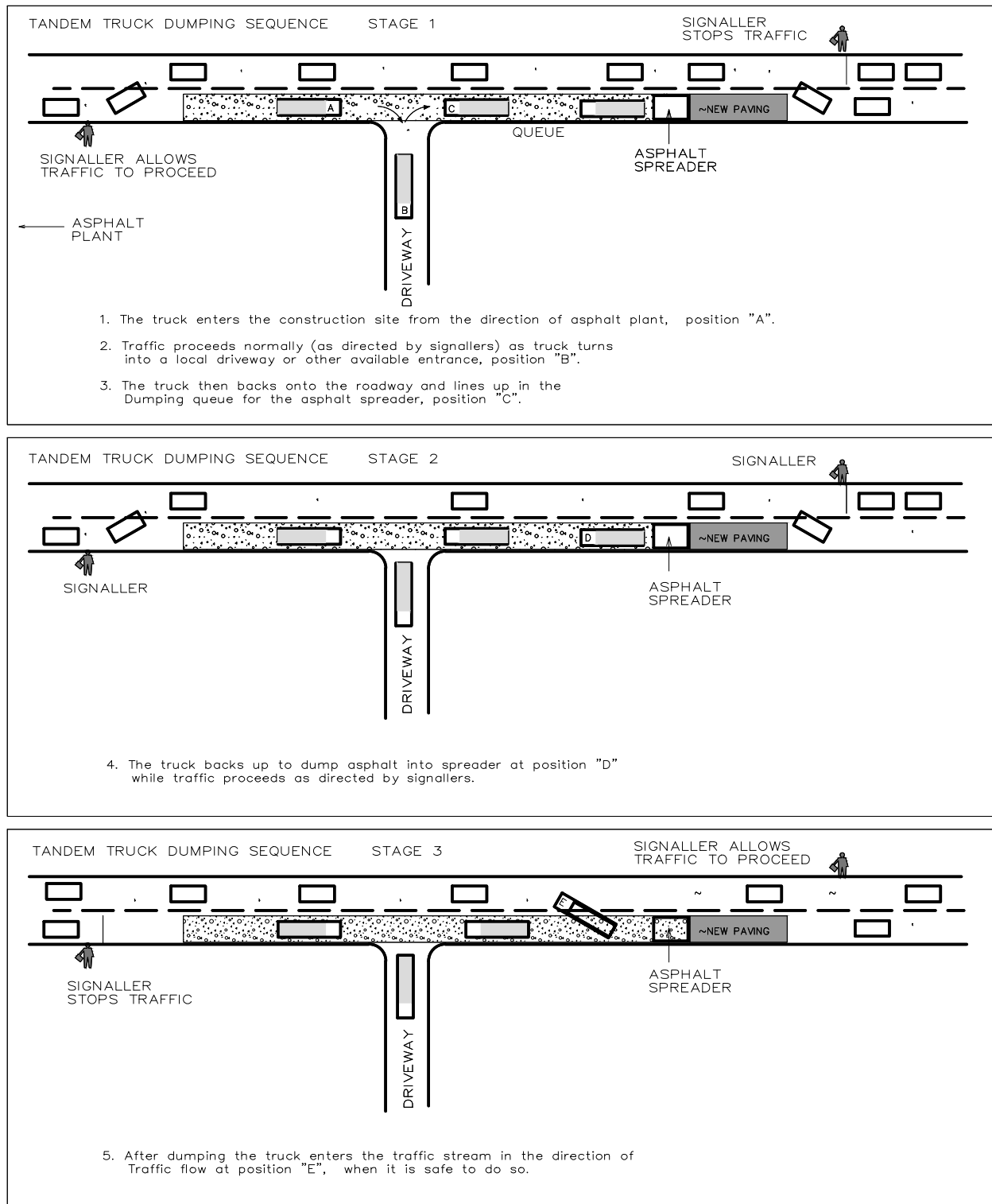


FIGURE 907-01 TANDEM TRUCK DUMPING SEQUENCE
REVISED 2001

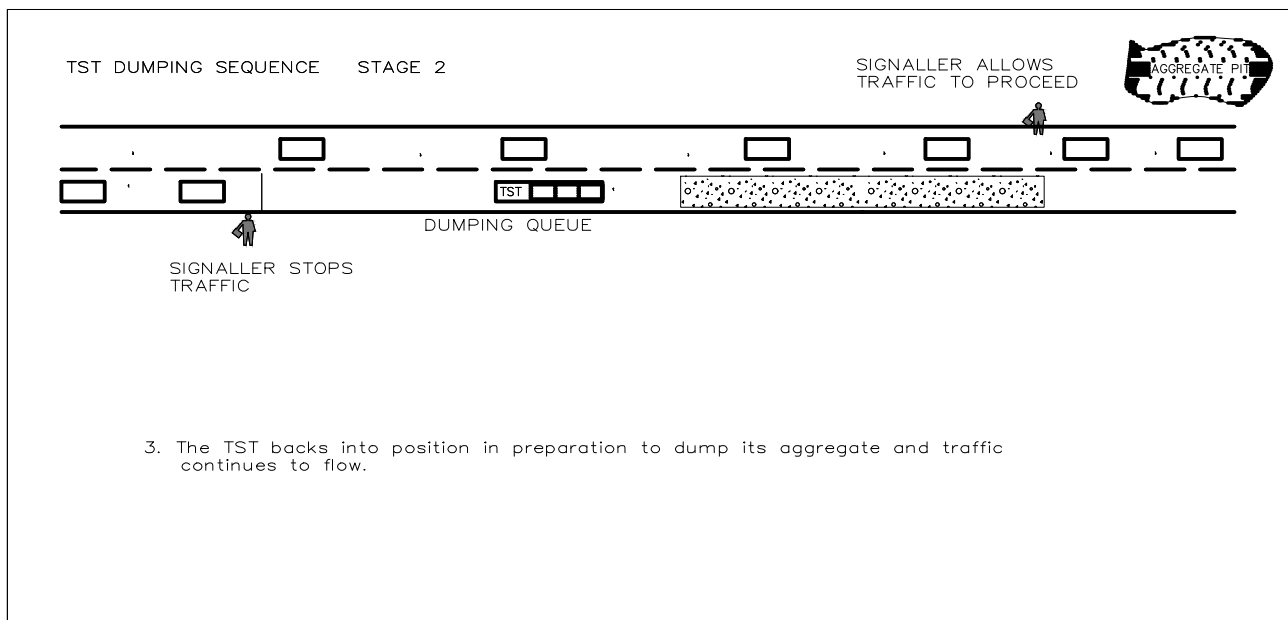
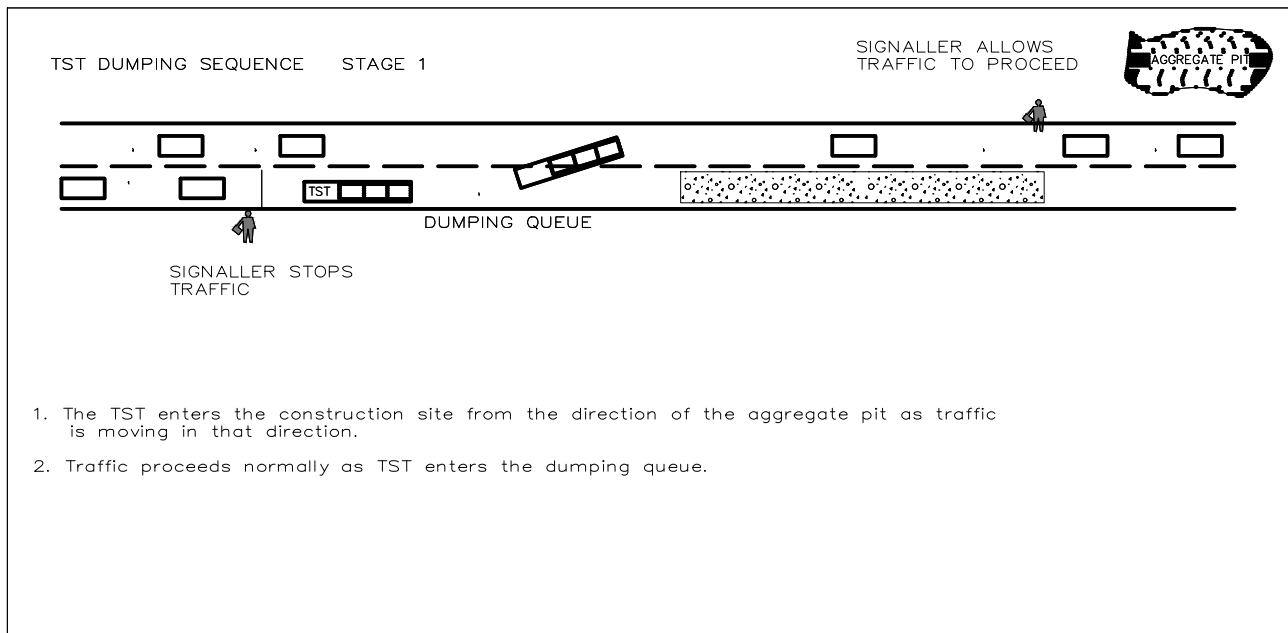


FIGURE 907-02 TRACTOR SEMI-TRAILER
DUMPING SEQUENCE (1 OF 2)
REVISED 2001

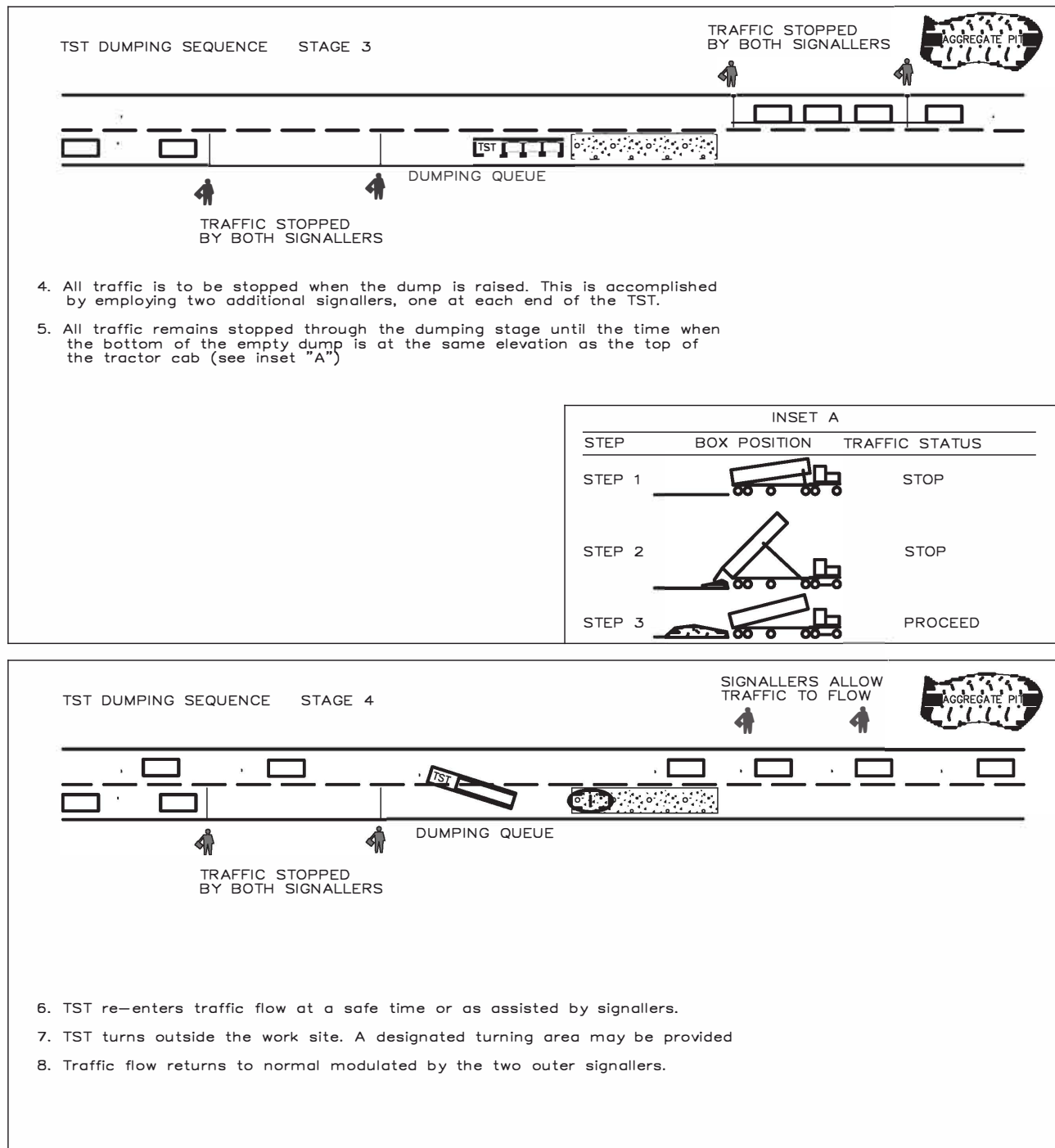


FIGURE 907-02 TRACTOR SEMI-TRAILER
DUMPING SEQUENCE (2 OF 2)
REVISED 2001

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TRAFFIC CONTROL PLAN

908

908.01 Description

This work shall consist of the preparation, implementation, maintenance and supervision associated with a Traffic Control Plan.

908.02 Preparation

The Contractor shall provide the Engineer with a Traffic Control Plan (TCP) at least five working days prior to the commencement of construction. The TCP will describe the temporary traffic controls to be used on the site at all times during the various phases of construction. The TCP will pay special attention to areas with more than 2 lanes, intersections, detours, accommodating pedestrians in urban areas, and any other areas requested by the Engineer. The TCP shall be implemented and monitored by the Contractor in accordance with the fundamental principles outlined in Section 5.0 of the 2016 Temporary Workplace Traffic Control Manual. The Contractor shall ensure that the necessary standard of care is followed and documented as outlined in Section 3.0 of the 2016 Temporary Workplace Traffic Control Manual is met.

908.03 Traffic Control Manager

The Contractor shall have a Traffic Control Manager (TCM) whose sole responsibility is to control traffic on the site at all times when work is underway. The Contractor will designate the Traffic Control Manager to the Engineer at least five working days prior to commencement of the work and provide a proof of certification showing that the person is accredited. The Traffic Control Manager shall be trained in Work Zone Traffic Control, and shall be responsible for the supervision of all signallers, compliance with the TCP, and the condition, placement, relocation, and removal of all traffic control devices. The Traffic Control Manager shall maintain daily records of the number, location and condition of all traffic control devices on the site. Copies of the daily records shall be provided to the Department. The TCM shall be available on site as required by the Engineer to address any traffic control issues as they arise.

908.04 Revisions

Revisions to the TCP may be made with the Engineers approval. Revisions must be requested at least 2 working days prior to implementation.

908.05 Equipment

Traffic Control Devices used in the TCP must comply with those in Appendix 3 or receive approval from the Engineer at least 2 working days prior to implementation.

908.06 Method of Measurement

Measurement for this section will be based on the provision of a Traffic Control Plan and a Traffic Control Manager providing active traffic control on the site.

908.07 Basis of Payment

Payment under this section shall be at the unit price per hour set by the Department and this price shall be full compensation for the following:

- providing a written Traffic Control Plan with drawings covering the placement of signs, signallers, detours and all other traffic control devices associated with the work site;

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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TRAFFIC CONTROL PLAN

908

- providing any revisions to the Traffic Control Plan and drawings;

- providing a Traffic Control Manager whose sole responsibility is to control traffic on the site at all times when work is underway, who supervises the signallers; installs, maintains and removes all traffic control devices and maintains daily records of the traffic control devices and signallers on the site.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

INSTALLATION OF GUIDERAIL END TREATMENT

909

909.01 Description

This work shall consist of the installation of guiderail end treatment at the end of a section of installed guiderail.

909.02 Material

EAGRTs shall meet the requirements of National Cooperative Highway Research Program(NCHRP) Report 350, Test Level 3. Only proprietary EAGRTs will be acceptable, including those made by the following:

Energy Absorption Systems Inc., Chicago, Illinois.

Road System Inc., Big Spring, Texas.

Trinity Industries Inc., Dallas, Texas.

Posts shall be a steel "breakaway" type designed for the EAGRT to be supplied on the Contract. A yellow and black hazard marker, minimum 300 mm x 600 mm and made from 3M Hi-Intensity reflective sheeting or equivalent, shall be supplied with each EAGRT

909.03 Requirements

The contractor shall submit, at least 14 days in advance of the work, the type of EAGRT system proposed for the work, the name of the manufacturer, and at least three copies of Shop Drawings stamped by a professional Engineer clearly showing in detail the components and installation of the system.

Prior to delivery of the EAGRT systems to the Work Site, the Contractor shall submit written certification that the EAGRT has been designed to meet the requirements of NCHRP Report 350 Test Level 3; have been fabricated of materials consistent with the design; and will function as designed.

909.04 Construction Method

The Contractor shall carry out the Work as indicated in the approved Shop Drawings or as directed by the Engineer.

The Contractor shall be prepared to arrange for a technical representative of the supplier/manufacturer of the EAGRT to be on site for the initial installation on the Contract to ensure that correct construction procedures are established.

The impact end of each EAGRT may be offset up to 300 mm away from the line of the guide rail installation if the line is not on a horizontal curve, as determined by the Engineer. The impact head of each EAGRT shall be cleaned thoroughly as recommended by the manufacturer of the reflective sheeting hazard marker.

Installation of any EAGRT system shall be performed within 2 Days of the guide rail installation to which it will be attached.

909.05 Method of Measurement

The quantity to be measured under this section shall be the number of guiderail end treatments installed.

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INSTALLATION OF GUIDERAIL END TREATMENT

909

909.06 Basis of Payment

Payment under this Section shall be at the unit bid price for guiderail end treatment supply and installation and this price shall be full compensation for the supply and installation of guiderail end treatment, tools, labour, equipment, and incidentals necessary to complete the work.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ELECTRICAL	1000

1001 Electrical General Provisions

1002 Telephone Duct Bank

1003 Basic Materials

1004 Traffic Signals

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ELECTRICAL GENERAL PROVISIONS	1001

1001.01 Scope

This Section details the requirements for traffic signal systems and ductwork as shown on the Drawings or as specified.

1001.02 Codes and Standards

Installation must be in accordance with CSA 22.1 except where otherwise specified.

Must comply with the CSA Electrical Bulletins in force at time of Tender submission; while not identified and specified by number in this Division, the Bulletins are to be considered as part of the related CSA Part II standard.

Abbreviations for electrical terms: to CSA Z85.

1001.03 Permits and Fees

Submit to the Electrical Inspection Division of the Department of Communities, Land and Environment the necessary number of drawings and specifications for examination and approval prior to commencement of work.

Must pay associated fees.

Engineer will provide Drawings at no cost.

1001.04 Care, Operation and Start-Up

Instruct operating personnel in the operation, care and maintenance of equipment.

Arrange and pay for the services of the manufacturer's factory service engineer to supervise start-up of the installation and to check, adjust, balance and calibrate the components.

Provide services for such period and for as many visits as necessary to put equipment in operation and to ensure that operating personnel are conversant with all aspects of the equipment's care and operation.

1001.05 Voltage Ratings

Operating voltages: to CSA C235.

Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by CSA C235 Equipment to operate in extreme operating conditions as established in above standard without damage.

1001.06 Inspection

Furnish a Certificate of Acceptance from the Chief Electrical Inspector of the Province of Prince Edward Island.

1001.07 Materials and Equipment

Equipment and material to be CSA certified and manufactured to standard quoted.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ELECTRICAL GENERAL PROVISIONS

1001

1001.08 Finishes

Shop finish metal enclosure surfaces by removing rust and scale, cleaning, applying rust resistant primer inside and outside and by applying a minimum of 2 coats of finish enamel.

Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

Clean, prime and paint exposed hangers, racks and fastenings to prevent rusting.

1001.09 Wiring Identification

Identify wiring, with permanent identifying numbers, on both ends of phase conductors of feeders and branch circuit wiring.

Maintain phase sequence and colour coding throughout. Colour code wiring to CSA C22.1.

Ensure that colour coded wires in traffic control cable are matched throughout the system.

Provide colour coding of the traffic signal wiring system as indicated on the Contract Drawings.

1001.10 Wiring Terminations

Lugs, terminals and screws used for termination of wiring must be suitable for either copper or aluminum conductors.

1001.11 Manufacturer's and CSA Labels

Manufacturer's nameplates and CSA labels are to be visible and legible after equipment is installed.

1001.12 Warning Signs

Provide warning signs, as specified or to meet requirements of the Chief Electrical Inspector of the Province of Prince Edward Island.

Use decal signs that are a minimum of (20 x 300 mm) in size.

1001.13 Protection

Protect exposed live equipment during construction for personnel safety.

Shield and mark all live parts, (i.e. "LIVE 120 VOLTS"), with appropriate voltage.

1001.14 Conduit and Cable Installation

Install conduit and sleeves prior to the pouring of concrete.

Install cables, conduits and fittings, that are to be embedded or plastered over, neatly and close to the structure so that furring is minimized.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ELECTRICAL GENERAL PROVISIONS

1001

1001.15 Tests

Conduct and pay for all tests for control, signal and traffic systems installed under this Contract.

Carry out tests in the presence of the Engineer.

Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

Submit test results.

Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

1001.16 Insulation Resistance Testing

Megger circuits, feeders and equipment up to 350 V with a 500 V instrument. Check resistance to ground before energizing.

1001.17 Coordination of Protective Devices

Ensure that circuit protective devices such as over current trips, relays and fuses, are installed to values and settings as specified.

1001.18 Cleaning

Do cleaning in accordance with Provision 103.09.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TELEPHONE DUCT BANK

1002

1002.01 Description

Work in this Section includes supply and installation of the concrete encased telephone duct bank as indicated on the Drawings and as specified.

1002.02 Material

PVC duct type EBII.

Marker tape: yellow plastic that is suitable for direct burial.

Pulling rope: 6 mm diameter nylon in each duct.

Concrete to be in accordance with Section 1101.

1002.03 Construction Method

Install underground duct banks as indicated.

Install ducts founded on undisturbed soil or on well compacted bedding material in accordance with Section 220.

Make transitions offsets and changes in direction using 50 bend sections.

Install marker tape and backfill with materials indicated on the Drawings.

The Contractor must prove that all ducts are clear of obstructions before the Engineer will accept the work. This will be accomplished by blowing a flight through each duct and pulling an approved plug or mandrel through each duct or by a similar approved process. Each duct will be strung using nylon pulling ropes.

Ducts are to be supported at 1.5 m intervals using interlocking type spacers with vertical and horizontal interlocks. Base and intermediate spacers are to be used and assembled according to manufacturer's instructions.

Ducts are to be joined using solvent weld couplings or suitable waterproof couplings. Ensure these junctions are smooth and free of any sharp protrusions which could damage cables being pulled into the ducts.

Stagger coupling of conduits to bell ends both vertically and horizontally a minimum of 150 mm.

1002.04 Inspection

Do not backfill until the Engineer has inspected the work.

1002.05 Method of Measurement

The quantity to be measured under this Section shall be the number of linear metres of duct banks measured horizontally along the centreline for each type of duct banks constructed terminating at the vertical faces of the structures.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TELEPHONE DUCT BANK

1002

1002.06

Basis of Payment

Payment under this Section shall be at the unit bid price per linear metre and this price shall be full compensation for constructing duct banks, trench excavation and backfilling, disposal of surplus materials, supply and placement of ducts, spacers, jointing, concrete, formwork, bedding, marker tape and incidentals necessary to complete the work and testing.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

BASIC MATERIALS	1003
1003.01	<u>Scope</u> This Section details basic materials. It should be noted that Drawings do not show all conduit and cable locations; those shown are in schematic form only.
1003.02	<u>Material</u> Copper conductors: to CSA C22.2 No. 38-M. Moulded case circuit breakers: to CSA C22.2 No. 5-M. Grounding equipment: to CSA C22.2 No. 41-M.
1003.03	<u>Conductors</u> Copper conductors for power supply and beacon light wiring: size as indicated with 600 V or 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90. Traffic control cables: 7 conductor, 14 AWG, soft drawn, 7 strand copper with PVC insulation (type TW minus 400 C) rated 600 V, type IMSA 19-1 or equal. Detector lead-in cable: 2 conductor, twisted and shielded, size 14-2, PVC jacketed, Belden #8720 - 600 V or approved equal. Detector loops: IMSA 51-5 cable within a PVC Jacket installed as detailed on the Drawings.
1003.04	<u>Connectors</u> Pressure type wire connectors: with current carrying parts of copper alloy sized to fit copper conductors as required. Bushing stud connectors: to EEMAC 1Y-2 to consist of: - Connector body and stud clamp for stranded copper conductors. - Stud clamp bolts. - Sized for conductors as indicated.
1003.05	<u>Conduits</u> Rigid PVC conduit: to CSA C22.2 No. 211.2, size as indicated on the Drawings.
1003.06	<u>Conduit Fastenings</u> One hole malleable iron straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
1003.07	<u>Conduit Fittings</u> Fittings manufactured for use with conduit specified. Factory "ells" where 900 bends are required for 25 mm and larger conduits.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

BASIC MATERIALS

1003

1003.08 Expansion Fittings for Rigid Conduit

Watertight expansion fittings suitable for linear expansion and 20 mm deflection in all directions. Locate expansion fittings where indicated on the Drawings.

1003.09 Fittings - General

Bushing and connectors with nylon insulated throats.

Knock-out fillers to prevent entry of foreign materials.

Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

1003.10 Service Fittings

Service entrance fitting made of 2 piece PVC, size as indicated on drawings.

1003.11 Grounding Equipment

Provide insulated ground conductor complete with connectors as indicated between ground lugs of controller equipment and ground rods, as indicated. Protect conductor with conduit as indicated.

1003.12 Traffic Loop Sealants

Medium hard asphaltic base compound that requires heating for installation. Acceptable product - Novoid C or approved equivalent.

1003.13 Disconnect Switch and Meter Base

Provide a 2 pole 60 A disconnect switch in EEMAC 4X stainless steel enclosure. Provide 40.A fuses of type recommended by controller manufacturer.

Provide utility meter base as required by Maritime Electric.

1003.14 Method of Construction

1003.14.01 Installation of Cables and Cable Supports

Do not use wire lashing or perforated straps to support or secure raceways or cables.

Do not use supports or equipment installed for other trades for conduit or cable support except with permission of the other trade and the approval of the Engineer.

Install fastenings and supports as required for each type of equipment, cables and conduits and in accordance with manufacturer's installation recommendations.

Conductors are shown on Drawings or in cable tables in approximate locations. Confirm locations of cable runs with Engineer before installation.

1003.14.02 Installation of Wire and Cable Connectors

Remove insulation carefully from ends of conductors and:

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FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

BASIC MATERIALS

1003

- Install mechanical pressure type connectors and tighten screws with appropriate tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65-M.
- Install crimp type connectors to manufacturer's recommendations.

1003.14.03 Installation of Conduit

Install conduits to cause minimum interference in spaces through which they pass. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

Install nylon fish cord in empty conduits.

Where conduits become blocked, remove and replace blocked section.

Dry conduits out before installing wire.

1003.14.04 Surface Conduits

Run parallel or perpendicular to structure lines.

1003.14.05 Conduit Poured in Concrete

Encase conduits completely in concrete as detailed on the Drawings.

1003.14.06 Installation of Ground

Install complete permanent, continuous, system in conduit to equipment and provide electrodes, conductors, connectors, accessories, as indicated on the drawings, to conform to requirements of the Engineer and the local authority having jurisdiction over installation.

Install connectors to manufacturer's instructions.

Protect exposed grounding conductors from mechanical injury.

Make buried connections, electrodes, using copper welding by thermite process.

Use mechanical connectors for grounding connections to equipment provided with lugs.

Soldered joints are not permitted.

Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

Bond single conductor, metallic armoured cables to cabinet at supply end and provide non-metallic entry plate at load end.

Install grounding connections to service equipment.

1003.14.07 Tests of Grounding System

Perform grounding tests as required by the Electrical Inspection Division of the Department of Communities, Land and Environment.

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BASIC MATERIALS

1003

1003.14.08 Traffic Loop Sealant

Prepare joint surfaces, mix compounds and place sealant in accordance with manufacturer's instructions.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TRAFFIC SIGNALS

1004

1004.01 Description

Provide all labour, tools, equipment and materials necessary to complete the traffic control system.

Install the following equipment supplied by the Department:

- Traffic signals, heads and lenses
- Poles, brackets and trusses
- Traffic controller and flasher unit
- Mounting hardware
- Precast concrete pole bases available for pickup at the storage yard located on Riverside Drive, north of Queen Elizabeth Hospital, or as directed by Engineer.

Supply and installation of the following:

- Concrete base for signal controller
- Conduits and junction boxes
- Vehicle detector loops
- System wiring including traffic signal cable, twisted and shielded lead-in cable, detector loop cable, beacon signal and power service wiring including fused disconnect switch

1004.02 Existing Underground Utilities

The intersection may contain underground telephone, street lighting, storm and sanitary sewer and water utilities. The location of these utilities as indicated on the Drawings shall be approximate only.

1004.03 Power Supply

Known utility pole locations are shown on the Drawings.

The Contractor shall co-ordinate the installation of traffic signal power supply with Maritime Electric.

1004.04 Material

Concrete and reinforcement shall be in accordance with Section 1101. Concrete mix for controller base and junction boxes to produce 32 MPa minimum compressive strength at 28 days.

Granular base material shall be in accordance with Section 401.

Anchor bolts shall be in accordance with Section 1101.

Conduit as shall be in accordance with Provision 1003.05.

1004.05 Construction Method

1004.05.01 Excavation and Backfill

The Contractor shall excavate and backfill in accordance with Section 217.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TRAFFIC SIGNALS

1004

1004.05.02 Bedding Material

The Contractor shall comply with the following procedure:

Place bedding material beneath signal bases and controller foundation to details indicated or as directed.

Shape bed true to grade to provide a uniform horizontal bearing surface for base structures.

Bedding material, in accordance with Section 220, shall be placed in 150 mm layers and compact 95% Standard Proctor Density in accordance with Section 209.

1004.05.03 Concrete

The Contractor shall comply with the following procedure:

Do concrete work in accordance with Section 1101.

Form vertical surfaces to full height using forming material that will not deform under loading by plastic concrete.

Accurately place reinforcing steel and anchor bolts in positions indicated and hold firmly during placing, compacting and setting of concrete.

Finish exposed surfaces to a smooth uniform finish, free of open texture and exposed aggregate.

Install precast concrete bases supplied by the Department where shown on the Drawings. Provide backfill in accordance with the respective specifications.

The grade on the top of the concrete base for poles shall be a minimum of 25 mm and a maximum of 50 mm above the top of the adjacent curb, or, if no curb exists, above the finished grade of the surrounding material. The grade on the top of the concrete base for controller cabinet shall be as shown on the drawings.

1004.05.04 Installation of Poles

The Contractor shall comply with the following procedure:

Prior to erection of the poles clean the under surfaces of all base plates and treat with a non-staining sealant.

Install poles with handhold facing away from the roadway.

Field drill apertures for installation of signal wiring from truss bracket. De-burr edges of holes and install rubber grommets.

Secure poles in a vertical position.

Tighten all nuts to a ½ turn beyond snug tight condition ensuring that all parts of the joint are brought into full contact with each other and that all bolts are in tension.

Grout the space between the underside of the pole base and the top of the concrete base with approved non-metallic, non-shrink grout.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TRAFFIC SIGNALS

1004

1004.05.05 Installation of Signal Brackets

The Contractor shall comply with the following procedure:

Install truss, side post and post top brackets in the positions shown on the Drawings.

Attach the brackets to the metal poles in the manner recommended by the manufacturer.

Slip-fit signal hangers onto the tenons of the truss brackets and secure in position.

1004.05.06 Installation of Signal Heads

The Contractor shall comply with the following procedure:

Orient signal heads as shown on the Drawings.

Secure signal heads in a horizontal or vertical alignment to the satisfaction of the Engineer.

Install signal lenses in signal head assembly.

1004.05.07 Installation of Conduit

The Contractor shall install conduit in the locations and to the details shown on the Drawings.

1004.05.08 Installation of Detector Loops

The Contractor shall comply with the following procedure:

Install loop wire continuous from curbside junction box around loop and back to junction box. Splices are not permitted.

Twist wires from loop to junction box. Use 18 turns per metre with equal lay on each wire.

Splice loop leads to detector lead-in cable using Scotchcast 85-10 3M splice kit or equivalent as approved by the Engineer.

Centre detector loop in the traffic lane to the dimensions shown on the Drawings.

Install detector loops in a slot formed in the pavement to the details indicated on the Drawings.

To complete the loop connection, extend one of the slots toward the curb. Twist the loop conductors where they enter the under-curb conduit sleeve and extend to the designated junction box as detailed on the Drawings.

Clean slots of loose material and moisture to the approval of the Engineer.

Exercise extreme care during installation to ensure that the loop turns are wound in 1 direction. Stack individual loop turns directly one above another. Prevent individual wires from twisting on themselves.

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TRAFFIC SIGNALS

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Install loops to following procedure:

- Apply 6 mm layer sealant to bottom of slot.
- Temperature control sealant to prevent burning of the wire insulation.
- After sealant has set sufficiently lay the first turn in the slot. Install wire slack to allow contraction.
- Apply additional sealant to fill slots on either side of the loop. Do not cover top of wire.
- Repeat preceding steps until all turns have been installed and sealant is applied to its final levels, 1.6 mm above finished road grade.
- Twist loop leads about one another - 18 twists per metre.
- Group and twist individual loop feeder pairs and extend through conduit sleeves under curb to junction box as indicated on the Drawing. Ensure conduit sleeve is packed with sealant before asphalt is laid. Connect each set of lane loops in series to the 2C twisted/shielded lead-in cable.
- Route copper lead-in cable via underground conduit to the traffic signal controller cabinet and connect to the detector harness as directed by the controller manufacturer.

Check the continuity, resistance to ground and insulation leakage at 500 V. Perform this check in the presence of the Engineer.

1004.05.09 Installation of Traffic Signal Controller Cabinet

The Contractor shall comply with the following procedure:

Secure controller cabinet to the concrete base by use of chuck-end type anchors complete with stainless steel machine bolts and lock washers. The number and location of bolts to be as per the cabinet manufacturer's instructions.

Assemble and secure control equipment components within the cabinet.

Install beacon flasher unit on cabinet as indicated.

Bring traffic signal and detector lead-in cables and power supply and ground wire conductors into the cabinet and make connections as shown on the Drawings and in accordance with the manufacturer's instructions.

All wiring and connections shall be in accordance with Sections 1001 and 1003.

1004.05.10 Installation of Power Supply

The Contractor shall comply with the following procedure:

Install conduit risers on power supply pole as shown on the Drawings.

Install supply conductors in the conduits in a continuous run between the service entrance fitting and the controller.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TRAFFIC SIGNALS

1004

Provide a minimum of 1.5 m of supply conductors coiled at the service entrance for final connection to the overhead supply by Maritime Electric.

All wiring to be in accordance with Sections 1001 and 1003.

1004.05.11 Installation of Traffic Signal Control Equipment

The Contractor shall comply with the following procedure:

Install controller only after all signal system and power feed wiring has been completed.

The signal system shall be energized and placed in the operating mode immediately after installation.

The control equipment is to be tested by operating the system for at least 1 hour in the presence of the Engineer prior to setting the system on "all flash" operation.

1004.06 Testing and Commissioning

The Contractor shall comply with the following procedure:

Test the continuity, resistance to ground and insulation leakage of the detector loop.

Ensure that all signal heads are securely covered during periods when the signal system is not in operation.

1004.07 Method of Measurement

Measurement for payment under this Section shall be a unit measurement based on the completion of the traffic control system specified.

1004.08 Basis of Payment

Payment under this Section shall be at the unit bid price as a lump sum and this price shall be full compensation for the following:

- Excavation and backfill, disposal of surplus material, supply, placement and compaction of bedding material, concrete, reinforcing, grout and anchor bolts.
- The acceptance, transportation, and installation items supplied by the Department including traffic signal poles, bases and signal heads complete with truss brackets, spring cushion hangers, appurtenances and wiring, and the signal controller and flasher unit installed on the concrete base constructed by the Contractor, including ducts, bolts, wiring, cabinet, all connections and system testing.
- The supply and installation of junction boxes complete with conduit stubs, ground rods, frames and covers, ducts including timber planks, signal wiring, and connections, detector loops including saw cutting asphalt, sealant, connection of loop wiring to lead wires in junction box; and power supply including conduit, main disconnect, utility metre base, miscellaneous appurtenances, conductors and connection to utility.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CONCRETE		1100
1101	Cast-In-Place Concrete	
1102	Curb and Gutter	
1103	Concrete Sidewalk and Flatwork	
1104	Precast Concrete Span (RESCINDED 2022)	

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CAST-IN-PLACE CONCRETE	1101
1101.01	<u>Description</u> This Section specifies requirements for constructing, supplying, transporting and placing cast- in-place concrete.
1101.02	<u>Reference Standards</u> Cast-in-place concrete work shall be in accordance with CAN3-A23.1-M and testing shall be in accordance with CAN-A23.2-M except where otherwise specified.
1101.03	<u>Samples</u> The Contractor shall inform the Engineer of proposed source of aggregates in advance of the work and shall provide access for sampling as requested.
1101.04	<u>Certificates</u> The Contractor shall provide the following certification to the Engineer: Prior to starting concrete work submit the manufacturer's test date and the certification by qualified independent inspection and testing laboratory that the materials will meet specified requirements. Provide certification that plant, equipment, and materials to be used in the cast-in-place concrete work comply with requirements of CAN3-A23.1M. Provide certification that mix proportions selected will produce concrete of specified quality and yield and that the strength will comply with CAN3-A23.1M.
1101.05	<u>Quality Control</u> The Contractor shall submit proposed quality control procedures for the Engineer's approval.
1101.06	<u>Material</u> The Contractor shall supply and use only materials meeting the following standards: Formwork lumber: plywood and wood formwork materials conforming to CAN3-A23.1-M. Form release agent: Chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps to prevent a film from setting on the forms. Reinforcement shall be billet steel conforming to CSA G40.12, Grade 400, unless otherwise specified. Chairs, bolsters, bar supports and spacers shall be of adequate strength to support reinforcing construction conditions. Portland cement: to CAN3-A5, Type General Use (GU), except high-early strength cement, if permitted, shall be Type 30. Water: to CAN3-A23.1. Aggregates: to CAN3-A23.1.M Course aggregates to be normal density.

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Air entraining admixture: to CAN3-A266.1-M.

Chemical Admixtures: to CAN3-A266.2-M. Owner to approve accelerating or set retarding admixtures during cold and hot weather placing.

Supplementary cementing materials and their use: to CAN3-A23.5-M.

Non-shrink grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 30 MPa at 28 days.

Curing compound: to CAN3-A23.1-M white.

Bolts and anchor bolts to ASTM A-307.

Pre-moulded joint filler: bituminous impregnated fibreboard to ASTM D-1751.

Granular base as specified in Section 401.

Bedding material as specified in Section 402.

1101.07

Reinforcing Fabrication

The Contractor shall comply with the following procedure:

Fabricate reinforcing to CAN3-A23.1-M.

Obtain Engineer's approval for locations of reinforcement splices.

Fabricate reinforcing steel within the following tolerances:

- Sheared length: plus or minus 25 mm.

Ship bundles of reinforcement bar, clearly identified in accordance with bar lists.

1101.08

Concrete Mixes

The Contractor shall comply with the following procedure:

Proportion normal density concrete in accordance with CAN3-A23.1, Alternative 1, for all concrete except for a suspended slab at a manhole chamber or a bridge deck, to give the following properties:

- Use Type General Use (GU) cement.
- Minimum compressive strength at 28 days: 32 MPa.
- Minimum cement content: to CAN3-A23.1-M.
- Class of exposure: C-2.
- Nominal size of coarse aggregate: 20 mm.
- Slump at time and point of discharge: 80 mm $\pm$ 30 mm.
- Air content: 5 to 8%.
- Maximum water-cement ratio 0.45.
- Chemical admixtures: to CAN3-A266.4M.

Proportion normal density concrete in accordance with CAN3-A23.1, Alternative 1, to give following properties for a suspended slab at a manhole chamber or a bridge deck:

- Use Type General Use Blended (GUb) cement.

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- Minimum compressive strength at 28 days: 35 MPA.
- Minimum cement content: to CAN3-A23.1M.
- Class of exposure: C-1.
- Nominal size of coarse aggregate: 20 mm.
- Slump at time and point of discharge: 80 mm ± 30 mm.
- Air content: 5 to 8%.
- Maximum water-cement ratio: 0.40.
- Chemical admixtures: to CAN3-A266.4M.

Do not change concrete mix without prior approval of the Engineer. Should a change in material source be proposed, a new mix design shall be provided for approval by the Engineer.

1101.09

Workmanship

The Contractor shall comply with the following procedure:

Obtain Engineer's approval and provide 24 hours notice prior to concrete placement. Pumping of concrete is permitted only after approval of equipment and mix.

Ensure reinforcement and inserts are not disturbed during concrete placement.

Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

Protect and cure concrete in extreme weather in accordance with CAN3-A23.1-M. Prior to concrete placement in adverse weather conditions obtain Engineer's approval of proposed method for protection of concrete during placing and curing.

Do not place concrete on frozen ground.

In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place dowels of deformed steel reinforcing bars as shown on the Drawings and pack solidly with non-shrink grout to positively position and anchor dowels.

Do not place load on new concrete until authorized by Engineer.

Control joints are to be a minimum of $\frac{1}{4}$ and a maximum of a of the section thickness.

Saw cutting may be allowed if done as soon as concrete has set sufficiently to resist raveling and before shrinkage cracks appear.

Fill control joints with backer rods and sealant in accordance with manufacturer's recommendations.

Install isolation joint filler around manholes and catch basins and along the length adjacent to concrete curbs, catch basins or permanent structures.

Horizontal and vertical alignment of the forms shall be within 6 mm of the design location.

1101.10

Erecting Forms

The Contractor shall comply with the following procedure:

Verify lines and levels before proceeding with formwork and ensure that the dimensions agree with the Drawings.

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Construct forms to produce finished concrete conforming to the shape, dimensions, locations and levels indicated within tolerances required by CAN3-A23.1-M.

Align form joints and make them watertight. Keep form joints to a minimum.

Leave formwork in place for a minimum of 6 days after placement during cold weather (5 °C) or 2 days during normal weather (16° C).

Adequately shore and brace members subjected to additional loads during construction.

Assume full responsibility for any damage to the structure due to premature removal of forms.

1101.11 Placing Reinforcement

The placement and positioning of reinforcing steel shall conform with CAN3-A23.3.

All reinforcing shall be clean, free from mill scale, oil, grease or other matter before and after erection and shall be kept in a condition approved by the Engineer.

All reinforcing steel shall be secured rigidly in position by annealed iron wire or suitable clips at intersections and well supported on reinforcing chairs.

The Contractor shall ensure that the positions of the bars do not alter during concrete placement and that the cover as shown on the Contract drawings is maintained at all times.

The Contractor shall obtain the Engineer's approval of reinforcing steel quantities and placement before placing concrete.

1101.12 Inserts

The Contractor shall comply with the following procedure:

Set anchor bolts to templates under supervision of the appropriate trade prior to placing concrete.

With Engineer's approval, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes are to be at least 100 mm in diameter. Drilled holes are to be a minimum of 25 mm larger in diameter than the bolts to be used.

Protect anchor bolt holes from water accumulations.
Set bolts and fill holes with non-shrink grout.

Set inserts and openings as indicated. Openings greater than (100 x 100 mm) not indicated on the Drawings must be approved by Engineer.

Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain Engineer's approval for modifications before placing concrete.

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CAST-IN-PLACE CONCRETE	1101

1101.13 Finishing

The Contractor shall comply with the following procedure:

Finish concrete in accordance with CAN3-A23.1-M.

Finish exposed surfaces to a smooth uniform finish, free of open texture and exposed aggregate. Do not work more mortar to surface than required. Do not use neat cement as a dryer to facilitate finishing.

Trowel smooth the top surfaces of concrete foundations and bases.

Round edges, including edges of joints, with a 6 mm radius edging tool.

Finish surfaces to within 6 mm in 3 m, from lines, level or grade as measured with a straight edge placed on surface.

Apply curing compound to finished surfaces at a rate recommended by manufacturer.

Finish the perimeter of all slabs with an edger.

1101.14 Defective Work

Concrete shall be deemed defective when it contains excessive honeycombing, embedded debris or when the 28-day strength in any defined area is less than 95% of the specified strength.

1101.15 Method of Measurement

There shall be no measurement for payment under this section.

1101.16 Basis of Payment

No payment shall apply to this section. Cast-in-place concrete shall be supplied and paid for according to the various specifications for curb and gutter, sidewalk/flatwork, or other bid items as specified.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CURB AND GUTTER

1102

1102.01 Description

This Section specifies requirements for constructing concrete curb and curb and gutter on granular base to lines, grades, dimensions and typical cross-sections indicated or directed.

1102.02 Materials

The Contractor shall supply and use only materials meeting the following standards:

Cast-in-place concrete and reinforcing shall be in accordance with Section 1101.

Concrete mix for cast-in-place concrete shall be designed to produce 32 MPa minimum compressive strength at 28 days and containing 20 mm maximum size, coarse aggregate. Water cement ratio by weight shall not exceed 0.45. The concrete shall have an air content of 5% to 8%. Class of exposure C-2.

Isolation joint filler: to ASTM D1751, 12 mm preformed, not-extruding, resilient, bituminous type.

Curing compound: to ASTM C309, "Ritecure" as manufactured by Sternsons or MB-429 as manufactured by Master Builders.

Chemical grout: epoxy acrylate resin. Acceptable product: Hilti C-100.

Granular base under curb and gutter: Granular Class 'A' as specified in Section 401.

1102.03 Construction Methods

The Contractor shall comply with the following procedure:

Construction of curb or curb and gutter shall be in accordance with Figures 1102.1, 1102.2, 1102.3 and 1102.4.

Do not place concrete until finished granular base is inspected and approved. Place granular base material to lines, widths and depths indicated.

Compact granular base to a minimum 98% Standard Proctor Density.

Concrete for curbs and curb and gutter to be shaped by forms of either wood or metal construction or by use of a slip form paver. Extruding equipment and mule configuration to be approved before construction begins.

Form vertical surfaces to full depth using forming material that will not deform under loading by plastic concrete.

Securely position forms to required lines and grades.

Horizontal and vertical alignment of the forms prior to placing concrete shall not vary more than 6 mm from the correct alignment and grade.

Coat forms with approved form release agent.

Obtain acceptance of forms before placing concrete.

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CURB AND GUTTER

1102

Do concrete and reinforcing work in accordance with Section 1101 and as specified herein.

Finish exposed surfaces to a smooth uniform finish, free of open texturing and exposed aggregate. Do not work more mortar to surface than required. Do not use neat cement as a drier to facilitate finishing.

Round edges, including edges of joints, with 6 mm radius edging tool.

Finish surfaces to within 6 mm in 3 metres from line, level or grade as measured with a straight edge placed on surface.

Apply curing compound to finished surfaces at a rate recommended by manufacturer.

Control joints to be a minimum of $\frac{1}{4}$ to a maximum of a of the section thickness.

Space control joints every 3 metres for curbs unless otherwise indicated.

Provide control joints within 150 mm of change in cross-section of curbs and gutters.

Finish perimeter of all slabs with an edger.

Saw cutting may be allowed if done as soon as concrete has set sufficiently to resist ravelling and before shrinkage cracks appear.

When new curb is adjacent to sidewalks make joints of curb and sidewalk coincide.

Install isolation joint filler around manholes and catch basins and along length adjacent to concrete curbs, catch basins, or permanent structures.

1102.04 Method of Measurement

The quantity of curb and curb and gutter for which payment will be made shall be measured in linear metres constructed. Modified curb sections across driveways are to be included in the measurement.

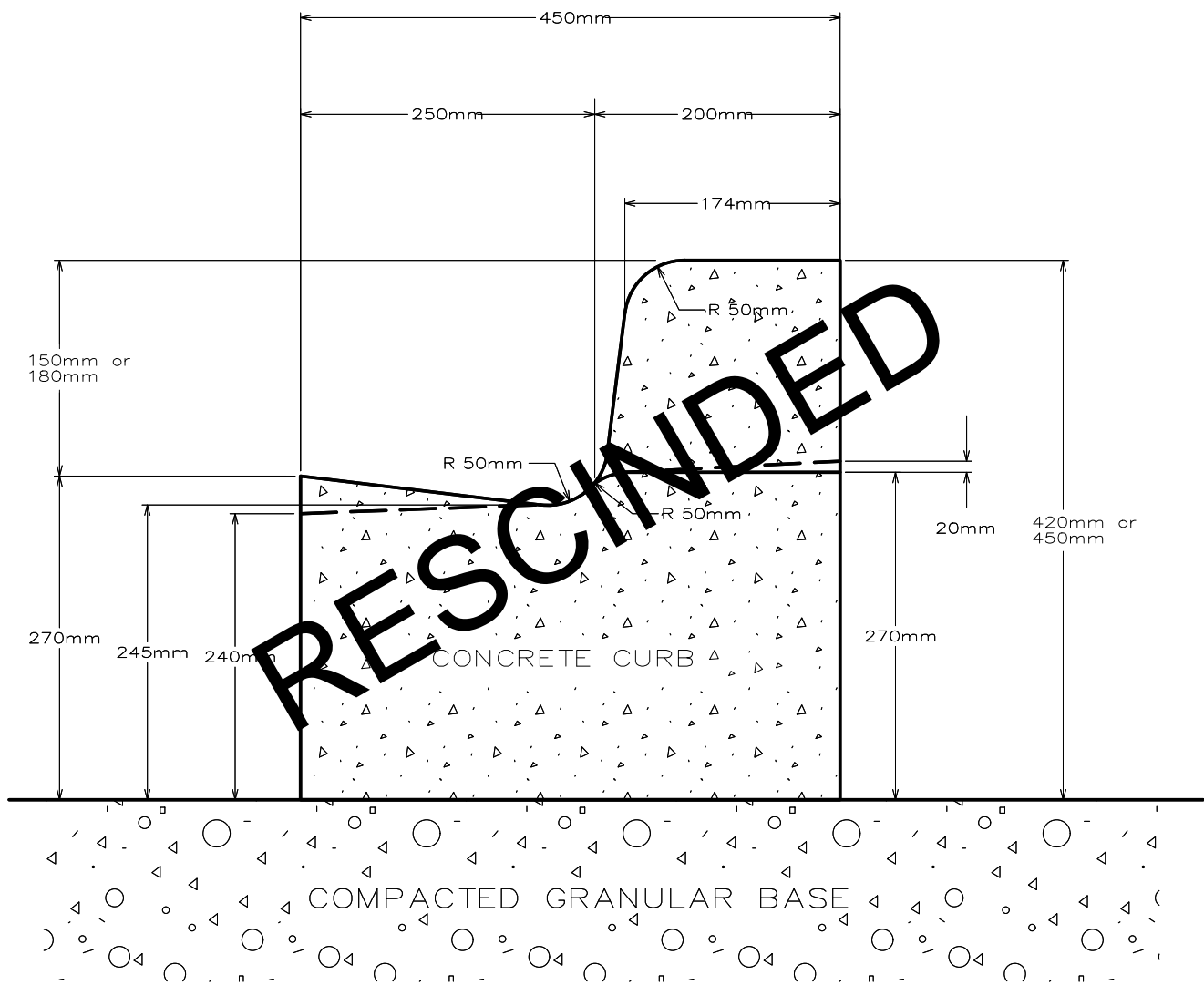
1102.04 Basis of Payment

The unit bid price for each of these items shall be for the number of linear metres as measured by the method of measurement.

Such payment shall be full compensation for excavation and foundation preparation; supply, transporting and placing concrete, reinforcing and dowels, excavation and compaction of granular base, formwork, finishing, jointing and curing; and for all labour and other materials necessary to complete the work.

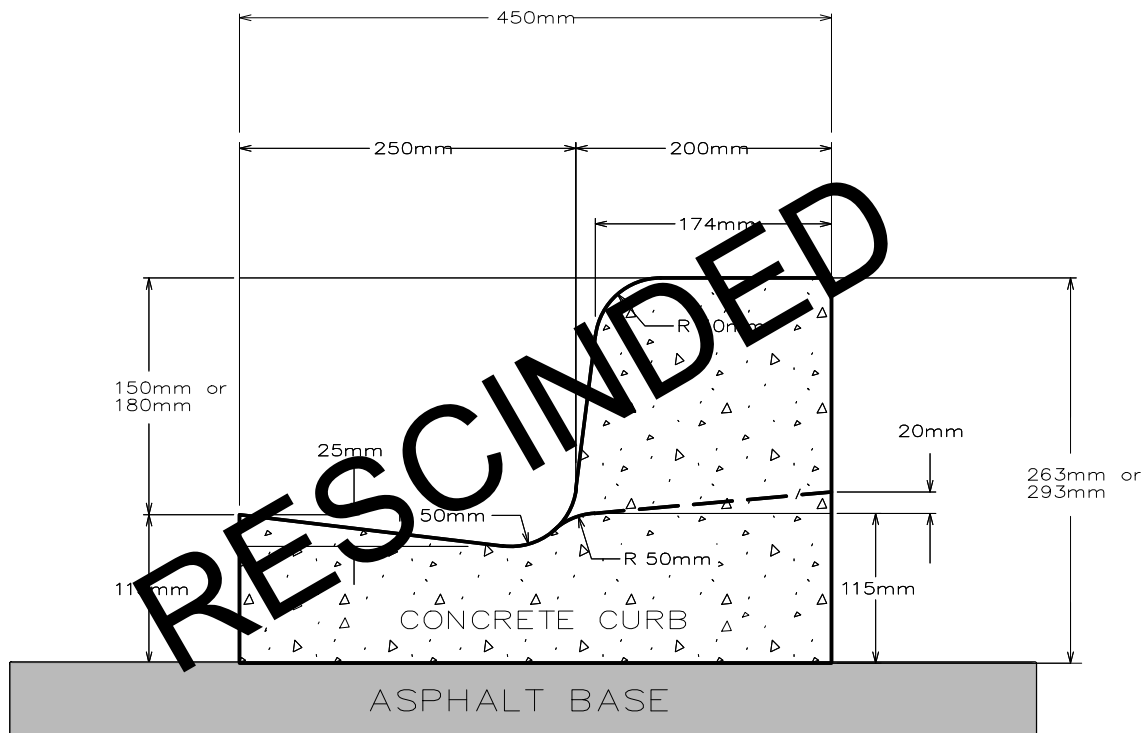
Backfill behind curbs shall be paid for in accordance with the section for the type of material supplied.

Granular base under curb and gutter shall be paid for under Section 207.



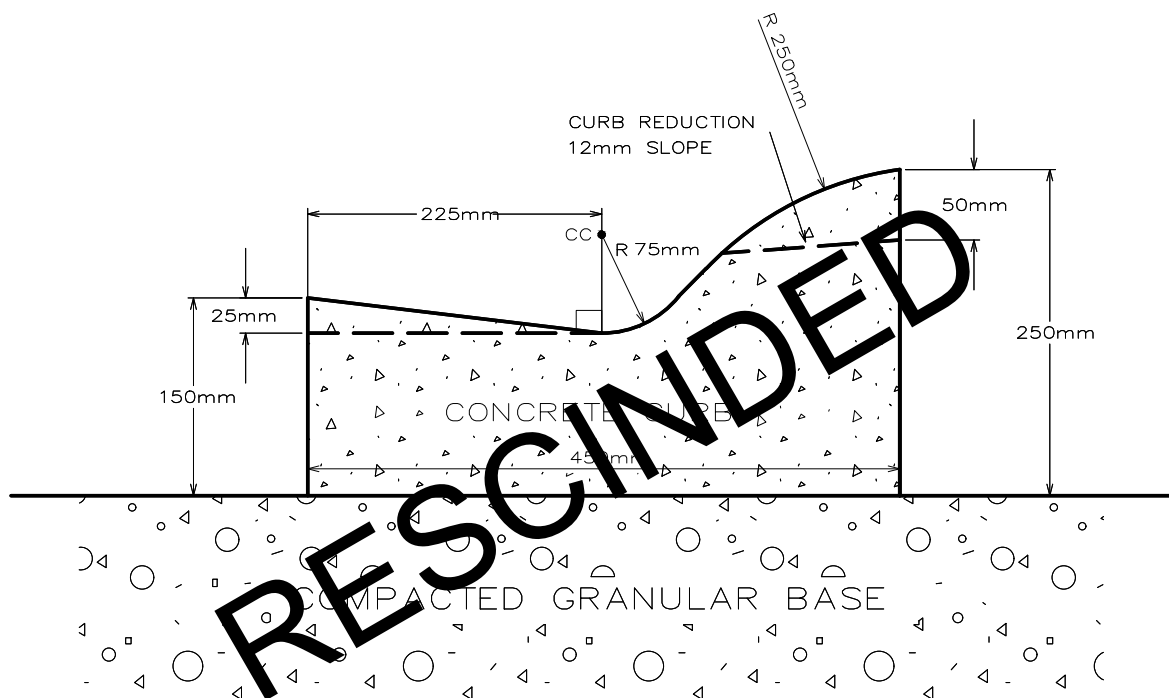
CROSS-SECTION (N.T.S.)

FIGURE 1102-01 CONCRETE CURB AND GUTTER ON GRANULAR BASE
REVISED 2002



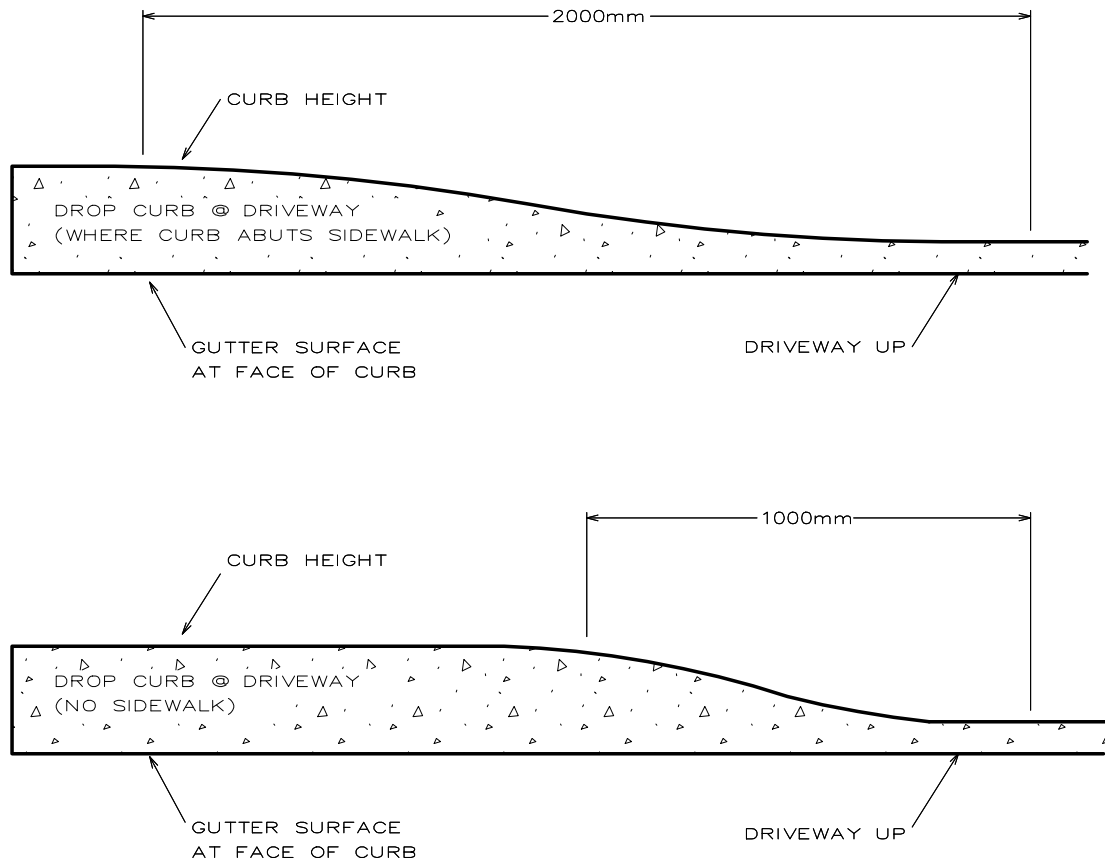
CROSS-SECTION (N.T.S.)

FIGURE 1102-02 CONCRETE CURB AND GUTTER
ON ASPHALT BASE
REVISED 2002



CROSS-SECTION (N.T.S.)

FIGURE 1102-03 SEMI-MOUNTABLE CURB AND GUTTER
REVISED 2002



ELEVATIONS (N.T.S.)

FIGURE 1102-04 TYPICAL CURB PROFILE DETAILS
REVISED 2002

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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CONCRETE SIDEWALK AND FLATWORK

1103

1103.01 Description

This Section specifies requirements for constructing concrete sidewalk and flatwork on granular base to lines, grades, dimensions and typical cross-sections indicated or directed.

1103.02 Material

The Contractor shall supply and use only materials meeting the following standards: Cast-in-place concrete shall be in accordance with Section 1101.

Concrete mix for cast-in-place concrete shall be designed to produce 32 MPa minimum compressive strength at 28 days and containing 20 mm maximum size, coarse aggregate. Water cement ration by weight shall not exceed 0.45. The concrete shall have an air content of 5% to 8%. Class of exposure C-2.

Isolation joint filler: to ASTM D1751 or ASTM D2549: 12 mm preformed, non-extruding, resilient, bituminous, polyethylene foam, cross linked polyethylene foam, or polyurethane.

Curing compound: to ASTM C309, , "Ritecure" or equivalent.

Granular base under sidewalk/flatwork: Class `A` as specified in Section 401.

Wire mesh Reinforcement: 150x150 MW18.7xMW18.7 welded wire fabric which meets the requirements of CSA G30.5-M.

1103.03 Construction Methods

1103.03.01 Preparation and Inspection

Construction of sidewalk/flatwork shall be in accordance with Figures 1103.1 and 1103.2. Do not place concrete until finished granular base is inspected and approved.

1103.03.02 Forming

The Contractor shall comply with the following procedure:

Concrete for sidewalk/flatwork to be shaped by wood or metal forms.

Form vertical surfaces to full depth using forming material that will not deform under loading by plastic concrete.

Securely position forms to required lines and grades.

Horizontal and vertical alignment of the forms prior to placing concrete shall not vary more than 6 mm from the correct alignment and grade.

Coat forms with approved form release agent.

Obtain acceptance of forms before placing concrete.

Slip-form paving machines may be used for placing concrete sidewalk/flatwork but only in areas approved by the Engineer. The machine shall have automatic grade and line

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CONCRETE SIDEWALK AND FLATWORK

1103

1103.03.03 control and be able to spread, vibrate, shape and finish the concrete in a single pass while producing a dense and homogenous concrete section.
Concrete

The Contractor shall comply with the following procedure:

Do concrete and reinforcing work in accordance with Section 1101.

Finish exposed surfaces to a smooth uniform finish, free of open texturing and exposed aggregate. Do not work more mortar to surface than required. Do not use neat cement as a drier to facilitate finishing. Broom finish sidewalk/flatwork, transverse to the direction of traffic, to provide a non-skid, uniform texture.

Finish perimeter of all slabs with an edger.

Round edges, including edges of joints, with 6 mm radius edging tool.

Finish surfaces to within 6 mm in 3 metres from line, level or grade as measured with a straight edge placed on surface.

Apply curing compound to finished surfaces at a rate recommended by manufacturer.

1103.03.04 Jointing

The Contractor shall comply with the following procedure:

Control joints to be a minimum of one-quarter to a maximum of one-third of the section thickness.

Provide control joints within 150 mm of change in cross-section of curbs and gutters.

Saw cutting may be allowed if done as soon as concrete has set sufficiently to resist ravelling and before shrinkage cracks appear.

Install joints at intervals of:

- 7.5 metres for isolation joints
- 1.5 metres for transverse control joints

or as directed by the Project Engineer.

Isolation joints shall be installed around manholes and catch basins and along length adjacent to concrete curbs, catch basins, and permanent structures.

1103.04 Measure of Measurement

The quantity of sidewalk/flatwork for which payment will be made shall be measured in square metres.

1103.05 Basis of Payment

The unit bid price for these items shall be for the number of square metres of sidewalk/flatwork as measured by the method of measurement.

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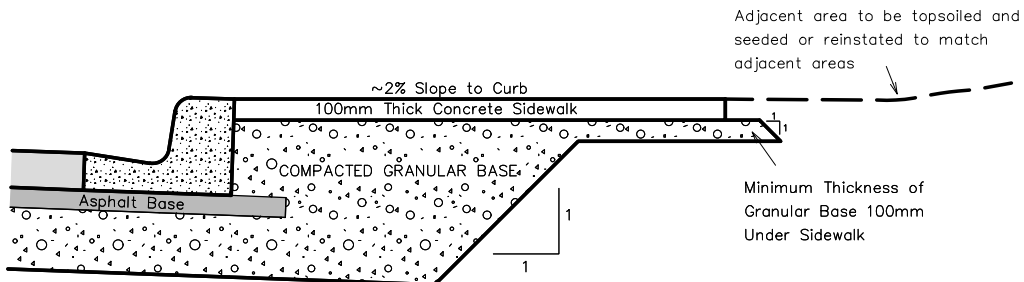
CONCRETE SIDEWALK AND FLATWORK

1103

Such payment shall be full compensation for excavation and foundation preparation; supplying, transporting and placing concrete, formwork, wire mesh reinforcement, finishing, jointing and curing; surface reinstatement (unless otherwise specified); cutting concrete curb for wheel chair ramps and for all labour and materials necessary to complete the work.

Backfill behind sidewalk shall be paid for in accordance with the section for the type of material supplied.

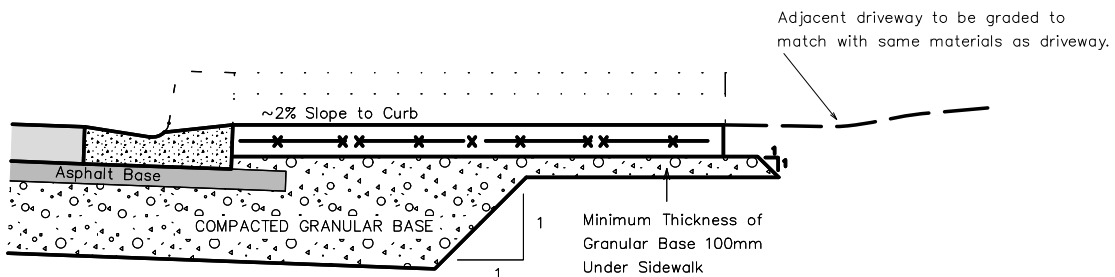
Granular base under sidewalk/flatwork shall be paid under Section 220.



TYPICAL SIDEWALK ADJACENT TO CURB (N.T.S.)

Notes:

1. Where there is a space between the sidewalk and the curb this space shall be topsoiled and seeded.

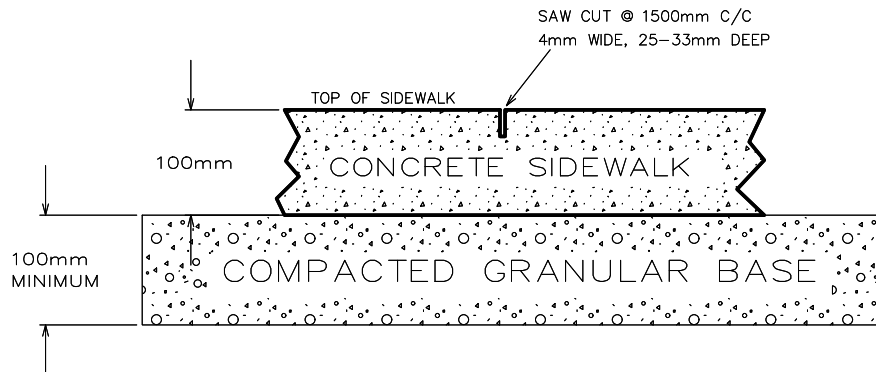


Note:

1. Dropped sidewalk shall be minimum 150mm thick concrete slab
c/w 150x150 MW18.7xMW18.7 welded wire fabric provided in flatsheets.

DROPPED SIDEWALK SECTION AT DRIVEWAY (N.T.S.)

FIGURE 1103-01 SIDEWALK SECTIONS
REVISED 2005



DETAIL — TYPICAL CONTROL
JOINT IN SIDEWALK
(N.T.S.)

FIGURE 1103-02 TYPICAL CONTROL JOINT IN SIDEWALK
REVISED 2001

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

PRECAST CONCRETE SPAN

1104

1104.01 Description

This section specifies requirements for the design, manufacture, delivery and installation of precast concrete spans.

1104.02 Material

Concrete shall be in compliance with CSA CAN3-A23.1 and shall have a compressive strength of 35 MPa at 28 days.

Reinforcing steel shall either be wire fabric in compliance with CAN/CSA G30.5 - Grade 450 or be high strength deformed round bars in compliance with CSA G30.12 - Grade 400.

Joint water proofing and recommended primer shall be Rub'r Nek joint waterproofing or an equivalent approved by the Engineer.

1104.03 Construction Methods

1104.03.01 Design and Manufacturing

The manufacture of precast concrete spans shall not commence until the shop drawings have been approved by the department and have been stamped by a Professional Engineer licensed to practice in Prince Edward Island. Approval of shop drawings by the department will not relieve the manufacturer of the responsibility for correctness of dimensions, size of components and details of fabrication in accordance with the latest editions of AASHTO Standard Specifications for Highway Bridges, CSA CANS-A23.3 Design of Concrete Structures and CAN/CSA-S6 Design of Highway Bridges.

Curing shall conform to CSA A23.1-94. All sections should be covered for a minimum period of three consecutive days or spread with a curing agent.

The manufacturer will be responsible for all labour laws, patents and licensing fees, duties and handling charges, transportation and all other charges.

The manufacturer will ensure that each section will have a quality assurance document as specified in CSA A251. Mill certificates, concrete mix design and other Quality Assurance documents shall be prepared in binder format and delivered to the department on completion of the contract.

1104.03.02 Inspection

The department shall have the right to inspect the manufacture of the precast concrete span and the authority to order production to stop if the work does not conform to plans, shop drawings or specifications. The manufacturer shall notify the department five calendar days in advance of the commencement of any phase of manufacturing.

To ensure proper jointing of sections to a maximum of 10 mm gap when installed at the job site, the manufacturer shall fit a random number of three sections at the factory.

Each span and footing section shall have the lot number, date of manufacture, name of manufacturer and specification designation marked on them by indentation or waterproof paint.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

PRECAST CONCRETE SPAN

1104**1104.03.03 Delivery to Site**

It is the responsibility of the contractor to deliver the concrete span to the site safely and by the time specified in the contract.

1104.03.04 Placement

It is the responsibility of the contractor to properly place the concrete span and footings to the design criteria indicated by the project engineer.

1104.04 Method of Measurement

Measurement for payment under this Section shall be the number of linear metres of precast concrete span installed.

1104.05 Basis of Payment

Payment under this section shall be at the unit bid price per linear metre of precast concrete span and is to include all applicable taxes. This price shall be full compensation for all the work including, the supply and placement of footings, the supply and placement of the concrete span, transportation, equipment, tools, labour, curing, grouting, waterproofing, joint- filling, reinforcing steel and incidentals necessary to complete the work.

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MISCELLANEOUS

1200

1201 Chain Link Fence and Gates

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CHAIN LINK FENCE AND GATES	1201

1201.01 Description

This work includes the supply, transportation and erection of chain link fences and gates.

1201.02 Reference Standards

CAN/CSA-23.1 Concrete Materials and Methods of Concrete Construction
CAN/CGSB-138.1 Fence, Chain Link, Fabric
CAN/CGSB-138.2 Fence, Chain Link, Framework, Zinc-Coated Steel
CAN/CGSB-138.3 Fence, Chain Link, Installation
CAN/CGSB-138.4 Fence, Chain Link, Gates
CAN/CGSB-1-GP-181M Organic Zinc Rich Coating

1201.03 Shop Drawings

Shop Drawings are to show details of the work and are to indicate dimensions, materials, finish, fittings and hardware, installation requirements and other pertinent information.

Check all shop drawings prior to submission. Determine and verify all field measurements, field construction criteria, materials and similar data and check and coordinate each shop drawing with the requirements of the work. Sign and date each shop drawing to confirm compliance with Provision 1201.02.

Submit 6 copies of the shop drawings to the Engineer for review.

Engineer will not review shop drawings if it is evident that they are not in accordance with Provision 1201.02.

After review, the Engineer will return 4 copies of shop drawings. The Contractor shall make all corrections as noted and resubmit.

Do not proceed with work involving relevant products until completion of shop drawings.

1201.04 Material

1201.04.01 Concrete mixes and materials: to CAN/CSA-23.1. Nominal coarse aggregate size to be 20 mm. Compressive strength: 20 MPa minimum at 28 days.

1201.04.02 Chain link fence fabric: to CAN/CGSB-138.1. 9 Gauge, Type 1, Class A, heavy style. Height of Fabric: 2.4m or as indicated on the drawings.

1201.04.03 Posts, braces and rails to: CAN/CGSB-138.2, galvanized steel pipe, dimensions as follows:

Line Posts: 60mm diameter schedule 40 hot dipped galvanized tubular steel pipe.

Terminal Posts: 90mm diameter schedule 40 hot dipped galvanized tubular steel pipe, with stretching bands and bars for attaching fabric to the post. Terminal posts at double gate openings greater than 6m in width shall be 114mm diameter.

Top Rails: 43mm diameter schedule 40 hot dipped galvanized tubular steel pipe.

Braces: Gate, corner, straining and end posts shall be braced by a centre rail of the same material as the top rail, between the gate, corner or end post and the next post.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CHAIN LINK FENCE AND GATES	1201
1201.04.04	Bottom tension wire: single strand, galvanized steel wire, 5 mm diameter.
1201.04.05	Tie wire fasteners: single strand, aluminum coated or galvanized steel wire conforming to requirements of fence fabric, 5 mm diameter.
1201.04.06	Tension bars: Min. (5 X 20 mm) galvanized steel.
1201.04.07	Tension bar bands: Min. (3 X 20 mm) galvanized steel or Min. (5 X 20 mm) aluminum.
1201.04.08	Gate frames: to ASTM A-53, galvanized steel pipe, standard weight 42.9 mm outside diameter pipe for outside frame, 33.3 mm outside diameter pipe for interior bracing.
	Fabricate gates as indicated with electrically welded joints and hot dipped galvanized after welding or paint gates with minimum 2 coats of zinc rich coating after welding.
	Fasten fence fabric to gate with twisted selvage at top.
	Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for a padlock which can be attached and operated from either side of installed gate.
	Furnish double gates with chain hook to hold gates open, and a centre rest with a drop bolt to hold gates closed.
1201.04.09	Fittings and hardware: cast aluminum alloy, galvanized steel or malleable or ductile cast iron. Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail. Extension arms to provide waterproof fit, to hold top rails and an outward or inward projection, as directed and to hold barbed wire overhang. Provide projection with clips or recesses to hold 3 strands of barbed wire spaced 100 mm apart. Projection length of approximately 300 mm long to project from fence at 45° above horizontal. Turnbuckles to be drop forged.
1201.04.10	Organic zinc rich coating: to CGSB 1-GP-181M.
1201.04.11	Barbed wire: 2 mm diameter galvanized steel wire to ASTM A-121, 4 point barbs, 125 mm spacing.
1201.05	<u>Finishes</u> Galvanizing for chain link fabric: to CAN/CGSB-138.1 Grade 2. Galvanizing for pipe: 550 g/m² minimum to ASTM A-90. Galvanizing for barbed wire: to ASTM A-121, Class 2. Galvanizing for other fittings: to CSA G164.
1201.06	<u>Construction Method</u>
1201.06.01	<u>Grading</u> Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts. Provide a clearance between bottom of fence and ground surface no more than 75 mm.

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

CHAIN LINK FENCE AND GATES

1201

1201.06.02 Erection of Fence

Erect fence along lines as directed by Engineer and in accordance with CAN/CGSB-138.3

Excavate post holes to 1500 mm depth x 300mm diameter or to dimensions as indicated by methods approved by Engineer.

Space line posts 2.4m apart as measured parallel to the ground surface or to spacing as indicated.

Space straining posts at equal intervals not exceeding 150 m if distance between end or corner posts on straight continuous lengths of fence, over reasonably smooth grade, is greater than 150 m.

Install additional straining posts at sharp changes in grade and where directed by Engineer.

Install corner post where change in alignment exceeds 10°.

Install end posts at end of fence and at buildings. Install gate posts on both sides of gate openings.

Place concrete in post holes then embed posts in concrete to depths as indicated on the Drawings. Extend concrete 50 mm above ground level and slope it to drain away from the posts. Brace to hold posts in plumb position, true to alignment and elevation until concrete has set.

Do not install fence fabric until concrete has cured a minimum of 5 days.

Install brace between end and gate posts and nearest line post, place in centre of panel and parallel to ground surface. Install braces on both sides of corner and straining posts in similar manner as required.

Install overhang tops and caps.

Install top rail between posts and fasten securely to terminal posts and secure waterproof caps and overhang tops.

Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with the tension bar secured to post and with tension bar bands spaced at 300 mm intervals. Knuckled selvedge at bottom. Twisted selvedge at top.

Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals. Give tie wires two twists.

Install barbed wire strands and clip securely to lugs of each bracket.

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CHAIN LINK FENCE AND GATES

1201

1201.06.03 Installation of Gates

Install gates in locations where directed by Engineer.
Level contours between gate posts and set gate bottom approximately 40 mm above ground surface.

Determine position of centre gate rest for double gate. Cast gate rest in concrete as directed. Dome concrete above ground level to shed water.

Install gate stops where directed.

1201.06.04 Touch-up

Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply 2 coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

1201.06.05 Cleaning

Clean and trim areas disturbed by operations. Dispose of surplus material and reinstate disturbed surfaces as directed by Engineer.

1201.07 Method of Measurement

Measurement for payment under this Section shall be the number of linear metres of chain link fence including gates installed.

1201.08 Basis of Payment

Payment shall be at the unit bid price per linear metre and this price shall be full compensation for supply, transportation, handling, storage and all labour, tools and materials necessary to complete the work.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

HIGHWAY STRUCTURES

ITEM: 1300

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

PORTLAND CEMENT CONCRETE

ITEM: 1301**1301.1** DESCRIPTION

- .1 This Item consists of the proportioning, supply and placement of Portland cement concrete.

1301.2 REFERENCES**1301.2 .1** American Society for Testing and Materials International (ASTM)

- .1 ASTM C260 – 10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C309-19, Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM C494/C494M-19e1, Standard Specifications for Chemical Admixtures for Concrete.
- .4 ASTM C1017/C1017M-13e1, Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.
- .5 ASTM C1064-17, Standard Specifications for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
- .6 ASTM D412-16(2021), Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- .7 ASTM D624-00(2020), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .8 ASTM D1751-18, Standard Specifications for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .9 ASTM D1752-18, Standard Specifications for Preformed Sponge Rubber Cork and Recycled PVS Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .10 ASTM D5249-10(2021), Standard Specifications for Backer Material for use with Cold and Hot Applied Sealants in Portland Cement Concrete and Asphalt Joints

1301.2 .2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .2 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1301.2 .3 Canadian Standards Association (CSA International)

- .1 CSA A3000-18, Cementitious Material Compendium.
- .2 CSA A23,1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Tests and Standard Practices for Concrete.
- .3 CSA A283:19, Qualification Code for Testing Laboratories.
- .4 CSA S269.1-16 (R2021), Concrete Formwork.

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PORTLAND CEMENT CONCRETE

ITEM: 1301**1301.3 MATERIALS****1301.3 .1 General**

- .1 All materials shall be supplied by the Contractor.
- .2 Material properties shall conform to CSA A23.1, if not otherwise specified herein.

1301.3 .2 Cements and Supplementary Cementing Materials

- .1 The following words, phrases and acronyms, wherever used in this Item, shall have the meaning ascribed to them in CSA A3001 and such materials shall conform to CSA A3000:
 - .1 Hydraulic Cement or Blended Hydraulic Cement (XXb- where b denotes blended);
 - .1 Type GU or GUb: General use cement.
 - .2 Type MS or MSb: Moderate sulphate-resistant cement.
 - .3 Type MH or MHb: Moderate heat-of-hydration cement.
 - .4 Type HE or HEb: High early-strength cement.
 - .5 Type LH or LHb: Low heat-of-hydration cement.
 - .6 Type HS or HSb: High sulphate-resistant cement.
 - .2 SCM: Supplementary Cementing Materials;
 - .3 GGBFS: Ground, granulated blast- furnace slag;
 - .4 Fly Ash.
 - .1 Type F – with CaO content less than 8%.
 - .2 Type CI – with CaO content ranging from 8% to 20%.
 - .3 Type CH – with CaO content greater than 20%.
 - .5 Portland Limestone Cement (XXL – where L denotes Limestone) or Blended Portland Limestone Cement (XXLb - where b denotes blended);
 - .1 Type GUL or GULb: General use cement.
 - .2 Type MSL or MSLb: Moderate sulphate-resistant cement.
 - .3 Type MHL or MHLb: Moderate heat-of-hydration cement.
 - .4 Type HEL or HELb: High early-strength cement.
 - .5 Type LHL or LHLb: Low heat-of-hydration cement.
 - .6 Type HSL or HSLb: High sulphate-resistant cement.

1301.3 .3 Aggregates

- .1 Aggregates used in concrete shall meet the material properties specified in accordance with 1302.2.

1301.3 .4 Other Admixtures Not Covered By ASTM

- .1 A written statement shall be provided to the Engineer from the manufacturer stating that the admixture contains no purposely added calcium chloride.

1301 .4 SUBMITTALS

- .1 The Contractor shall have the source of supply of Portland cement concrete approved by the Engineer in advance of the supply of the concrete to the Work, and this approval shall consist of but not be limited to:

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ITEM: 1301

- .1 The Contractor shall provide the Engineer with the name of the proposed cement supplier.
- .2 The Contractor shall submit certification that the concrete supplier is certified in accordance with Atlantic Provinces Ready Mix Concrete Association, Plant Certification Program or equivalent.
 - .1 The concrete supplier shall submit proof of certification in the appropriate categories in accordance with CSA A23.1.
 - .2 Only concrete supplied from such certified plants shall be acceptable to the Owner and plant certification shall be maintained for the duration of the fabrication and erection until the warranty period expires.
- .3 The proposed mix proportions (design), certified by the Contractor or his/her agent, shall be submitted at least 5 Days before concrete production is due to start.

1301.5 CONSTRUCTION**1301.5 .1 General**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 Concrete shall meet the requirements of CSA A23.1, if not otherwise specified herein.
- .3 No loads shall be applied to new concrete including vibration until the concrete has attained a minimum compressive strength of 20 MPa.

1301.5 .2 Care and Storage of Materials

- .1 All concrete materials shall be handled and protected in such a way as to prevent segregation, damage and contamination.
- .2 All cement, aggregate and other concrete construction materials shall be stored in accordance with the requirements of CSA A3001, and CSA A23.1.

1301.5 .3 Proportioning and Composition of Concrete

- .1 The Contractor shall be responsible for providing concrete mix designs for each Exposure Class of concrete specified and proposed for use.
- .2 If, during the progress of the Work, it is determined that the concrete has inadequate workability, or does not meet the requirements of the Specification(s), the Contractor shall submit a new mix design to the Engineer, in accordance with Section 1302.
- .3 All concrete shall be proportioned in accordance with the submitted mix designs.

1301.5 .4 Concrete Production

- .1 Portland cement concrete shall be produced in accordance with the requirements of CSA A23.1.

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PORTLAND CEMENT CONCRETE

ITEM: 1301**1301.5 .5 Delivery**

- .1 Delivery of concrete shall be in accordance with CSA A23.1 and shall be regulated so as to enable continuous deposition until the placement of each concrete section is completed.
- .2 The batch delivery ticket meeting the requirements of CSA A23.1 shall accompany each batch of concrete delivered to site.
 - .1 The batch ticket shall include quantities of materials batched.

1301.5. .6 Addition of Water

- .1 Water shall not be added after batching for any purpose without the approval of the Engineer.
 - .1 Slump adjustment of superplasticized concrete shall be with admixture only.

1301.5 .7 Placement

- .1 The Contractor shall be responsible for all formwork design and construction in accordance with CSA A23.1.
- .2 All concrete placement shall be in accordance with CSA A23.1, unless otherwise noted.
- .3 Floats shall be aluminum or magnesium. Steel floats shall not be permitted.

1301.6 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of cubic metres of Portland cement concrete proportioned, supplied and placed in accordance with Section 1302.

1301.7 BASIS FOR PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each class of concrete, as identified under the Contract.

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CONCRETE IN STRUCTURES

ITEM: 1302

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CONCRETE IN STRUCTURES

ITEM: 1302

1302.1 DESCRIPTION

- .1 This Item consists of the supply, placement and finishing of concrete in Structures.
- .2 This Item is subdivided into, but not limited to, the following types:
 - .1 Concrete in Structures "A":
 - .1 Concrete for use in cast-in-place above grade Bridge components, including; but not limited to: abutment caps, seats, wingwalls, curtain walls, ballast walls, bridge decks, haunches, curb, sidewalk, collision blocks, traffic barriers, concrete end dams, at-grade approach slabs, piers, pier caps, and all other above grade cast-in-place components
 - .2 Concrete in Structures "B":
 - .1 Concrete for use in buried components, including; but, not limited to: buried approach slabs and footings or any other cast-in-place concrete bridge component that is completely buried.
 - .3 Concrete in Structures "C":
 - .1 Concrete for use as tremie concrete in footings or inside pipe piles.
 - .4 Concrete in Structures "D":
 - .1 Concrete for use as Mud or "working" slabs and levelling pads.
- .3 A continuous structure is defined as the complete deck slab between the expansion joints.

1302.1 .4 Definitions

- .1 The following words and phrases, wherever used in this Item, shall have the meaning ascribed to them in CSA A3001:
 - .1 Blended Hydraulic Cement;
 - .2 Blended Portland Limestone Cement
 - .3 Supplementary Cementing Materials;
 - .4 Blast- furnace slag;
 - .5 Blended Supplementary Cementing Materials; and
 - .6 Fly Ash.

1302.2 REFERENCES

1302.2 .1 American Concrete Institute (ACI)

- .1 ACI-117.1-14, Guide for Tolerance Compatibility in Concrete Construction.

.2 American Society for Testing and Materials International (ASTM)

- .1 ASTM D412-16, Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

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- .2 ASTM D624-00(2020), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .3 ASTM D1751-23, Standard Specifications for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .4 ASTM D1752-18(2023), Standard Specifications for Preformed Sponge Rubber Cork and Recycled PVS Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .5 ASTM D5249-10(2021), Standard Specifications for Backer Material for use with Cold and Hot Applied Sealants in Portland Cement Concrete and Asphalt Joints
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA A3000-18, Cementitious Material Compendium.
 - .2 CSA A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Tests and Standard Practices for Concrete.
 - .3 CSA S269.1-16 (R2021), Concrete Formwork.
 - .4 CSA S6-19, Canadian Highway Bridge Design Code.

1302.3 MATERIALS

1302.3 .1 General

- .1 All materials shall be supplied by the Contractor.
- .2 Material properties shall conform to CSA A23.1, if not otherwise specified herein.

1302.3 .2 Material Properties

.1 Aggregates

- .1 The coarse aggregate and fine aggregate shall each be stockpiled separately.
- .2 Stockpiles shall be placed on a level well drained base and constructed in such a manner that segregation and contamination does not occur.

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- .1 Stockpiles shall be checked during the normal course of the Work, for conformance to the grading limits specified.
- .2 Segregated or contaminated stockpiles shall not be incorporated into the Work.
- .3 Stockpiles shall be maintained so that there is a sufficient supply of aggregates for the production of concrete to be placed in the following 14 Days.
- .3 Fine and coarse aggregates shall only be combined in the specified proportions at the time of batching.
- .4 Petrographic examination of the aggregates shall be made on an annual basis in accordance with CSA A23.2-15A and as described below.
 - .1 A Petrographic examination of the aggregates shall be initiated where there is an observed change in the material at the pit or quarry.
 - .2 When the size of the crushing operation or the usage of material from that operation is such that more than two years supply is stockpiled, the Contractor may submit a request for an extension to the time requirement for the petrographic test. The request for extension shall include details of inventory management and time period requested as a minimum.
 - .3 The petrographic examination shall detect the presence of deleterious shale, mica, coated grains, soft flaky particles, chert, and all deleterious substances which are known to cause harmful reactions in Portland cement concrete mixtures. The maximum PN for coarse aggregate shall be reported.
 - .4 The aggregate petrographer shall be responsible to describe each rock type present in an aggregate sample and to comment on the unfavourable effects of any material which is known to be deleterious.
 - .5 When the sample has been found to possess properties or constituents that are known to have specific unfavourable effects on concrete, those properties or constituents shall be described qualitatively and, to the extent practicable, quantitatively.
 - .1 Additional testing shall be necessary to prove the aggregate shall have no deleterious effect on concrete.
- .5 Blending of aggregates shall only be permitted to meet the grading requirements.
 - .1 The blending materials shall individually meet the requirements of this Item with the exception of the grading requirements.

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1302.3.2 .2 Fine Aggregate

- .1 Fine aggregate shall consist of uncoated natural sand, manufactured sand or an approved combination thereof, sourced from a reputable quarry or manufacturer. Locally mined sand shall not be permitted.
- .2 The amounts of deleterious substances in fine aggregate, each determined on independent samples complying with the grading requirements indicated in CSA A23.1, shall not exceed the limits specified in Table 1302-1.

**Table 1302-1
Limits for Deleterious Substances and Physical Properties of Fine Aggregate**

Deleterious Substances and Physical Properties	Test Procedures	Test Limits (%)
Coal and Lignite	Note ¹	0.25
Micro Deval	CSA A23.2-23A	16.0
Alkali Aggregate Reaction ²	CSA A23.2-14A Modified ³	0.035 @ 2 years
NOTES: 1) The sample shall first be tested for low density material in accordance with CSA A23.2-4A. The material retained on the liquid with a specific gravity of 2.0 shall be dried and the portion which is coal or lignite shall be determined by petrographic examination. 2) Test runs for a period of two years. There shall be no testing on the third year. Following the year of no testing the cycle shall begin again. New results required within 3 years of previous results. 3) Testing period shall be 2 years. Job mix aggregate combination shall contain 430 kg/m ³ cement content.		

1302.3.2 .3 Coarse Aggregate

- .1 The amount of deleterious substances in coarse aggregate, determined on independent samples complying with the grading requirements in CSA A23.1, shall not exceed the limits prescribed in Table 1302-2.

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**Table 1302-2
Limits for Deleterious Substances and Physical Properties of Coarse Aggregates**

Deleterious Substances	Test Procedures	Test Limits (%)
Coal and Lignite	Note ¹	0.5
Micro Deval	CSA A23.2-29A	14.0
Particle Shape	CSA A23.2-13A	15
Unconfined Freeze Thaw	CSA A23.2-24A	6
Alkali Aggregate Reaction ²	CSA A23.2-14A Modified ³	0.035 @ 2 years
NOTES: 1) The sample shall first be tested for low density material in accordance with CSA A23.2-4A. The material retained on the liquid with a specific gravity of 2.0 shall be dried and the portion which is coal or lignite shall be determined by petrographic examination. 2) Test runs for a period of two years. There shall be no testing on the third year. Following the year of no testing the cycle shall begin again. New results required within 3 years of previous results. 3) Testing period shall be 2 years. Job mix aggregate combination shall contain 430 kg/m ³ cement content.		

1302.3.2 .4 Water

- .1 Water shall be potable in accordance with A23.1. The source of supply shall be the responsibility of the Contractor. Use of sea water shall not be permitted.
- .2 Water-to-cementing materials ratio shall be computed using the weight of cementing materials that is equal to the total weight of cement plus fly ash, silica fume, and slag.

1302.3.2 .5 Admixtures

- .1 A written statement from the manufacturer stating that the admixture contains no purposefully added calcium chloride shall be provided to the Engineer.
- .2 Any admixtures which increase the water-to-cementing materials ratio by 0.01 or greater shall be accounted for in the mix design to meet the specified water-to-cementing ratios.

1302.3.2 .6 Curing Materials

- .1 Burlap, absorptive mat, or non-woven geotextile shall be used for curing horizontal surfaces.
- .2 Curing materials shall, at any time of use, be in good condition free from holes, dirt, clay or other substances which would have a deleterious effect upon concrete.

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- .3 Burlap shall be of a quality which will absorb water readily when dipped or sprayed and shall have a mass of not less than 237 g/m² when clean and dry.
- .4 Curing water shall be free of chlorides, oils, dirt and other deleterious materials.
- .5 Curing compounds shall not be permitted.

1302.3.2 .7 Cement and Supplementary Cementing Materials

- .1 Unless otherwise specified, Portland Cement shall be by type GU or GUL as defined in Section 1301. Blended Hydraulic Cement shall be type GULb or GULb as defined in Section 1301.
- .2 Fly ash, slag, and silica fume may be used:
 - .1 On flatwork concrete exposed to chlorides and freezing and thawing, the proportions shall be limited to 20%, 35%, and 8% respectively. Total replacement shall not exceed 35%.
 - .2 On formwork concrete exposed to chlorides and freezing and thawing, the proportions shall be limited to 30%, 50%, and 8% respectively. Total replacement shall not exceed 50%.
 - .3 Higher replacement proportions may be permitted at the discretion of the Engineer.

1302.3.3 Composition of Concrete Mix

.1 General

- .1 It shall be the responsibility of the Contractor to ensure that the mixture proportions submitted to the Engineer are properly batched, mixed, placed and cured such that the concrete conforms to the Specification.
- .2 Concrete type "A" shall be exposure Class C-XL with a 28-day compressive strength minimum 45MPa. Concrete type "B" shall be exposure Class C-1 with a 28-day compressive strength minimum 35MPa. Concrete types "C" and "D" shall be exposure class F-1 with a 28-day compressive strength minimum 20 MPa.
- .3 A calcium nitrite corrosion inhibitor shall be added to all type "A" concrete.
 - .1 The dosage rate shall be 15 L/m³.
 - .2 The corrosion inhibiting calcium nitrite admixture shall contain between 30% to 36% calcium nitrite by weight of solution.
 - .3 The calcium nitrite shall be added at the concrete ready-mix plant and verification shall be provided to the Engineer for the quantity of the calcium nitrite added to each batch of concrete.

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- .1 Acceptable verification shall include, but is not necessarily limited to, printouts from computerized batch plants or printouts from computerized admixture dispensing units.
- .2 Verification shall be provided on the delivery slip.

1302.3 .4 Associated Materials

- .1 The Contractor shall supply any associated materials necessary for construction, as shown in the Contract Documents.
- .2 Materials shall be stored at least 100 mm off the ground.

1302.4 SUBMITTALS

- .1 The Contractor shall submit the source of supply of Portland cement concrete to the Engineer 14 Days in advance of the supply of the concrete to the Work, and this submittal shall consist of but not be limited to:
 - .1 Certification that the concrete supplier is certified in accordance with Atlantic Provinces Ready Mix Concrete Association (APRMCA), Plant Certification Program or the equivalent as follows:
 - .1 The concrete supplier shall submit proof of conformance to the requirements for the production of the concrete in accordance with CSA A23.1.
 - .2 Only concrete supplied from such certified plants shall be acceptable to the Owner and plant certification shall be maintained for the duration of the Work.
 - .2 Proposed sources of aggregates and test results shall be submitted to the Engineer, in writing, a minimum of 14 Days prior to the proposed use of such materials. This notification period shall be increased to a minimum of 35 Days if the aggregates proposed for use have not been previously approved for use in the Owner's projects.
 - .3 The proposed design mix proportions, certified by the Contractor or his/her agent, and stamped and signed by a Professional Engineer registered with Engineers PEI and shall include:
 - .1 Specified hardened properties and age of testing for strength, air, and permeability.
- .2 Other submittals are required for this Item and are contained within the sections applicable to the specific phase of the Work being undertaken.
- .3 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

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1302.5 CONSTRUCTION

1302.5 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 Concrete materials and methods of concrete construction and methods of test for concrete shall conform to CSA A23.1 and CSA A23.2, if not otherwise specified herein.
- .3 The Contractor shall notify the Engineer at least two Days in advance of the commencement of each concrete placement.
- .4 When detailed in the Contract Documents the Contractor shall install the associated materials described in 1302.2.4 in accordance with the Contract Documents.

1302.5 .2 Equipment and Production

.1 Batching

- .1 The Contractor has the responsibility to ensure that the concrete mix proportions are being accurately and consistently batched to produce the specified mix and concrete properties.
 - .1 The moisture content for aggregates shall be determined and adjustments made prior to the batching of concrete.

.2 Mixing

- .1 Mixers and agitators used for transporting concrete shall deliver their load to the Work Site and discharge shall be completed within 1½ hours of completion of batching unless a longer time is specifically authorized in writing by the Engineer.
 - .1 Under conditions contributing to rapid stiffening of concrete the Engineer may specify a time of less than 1½ hours.

.3 Delivery

- .1 The batch delivery ticket meeting the requirements of CSA A23.1 shall accompany each batch of concrete delivered to site.
 - .1 The batch ticket shall include quantities of materials batched.
 - .2 Addition of Water
 - .1 Water shall not be added after batching for any purpose without the approval of the Engineer.
 - .1 Slump adjustment of superplasticized concrete shall be with admixture only.

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1302.5 .3 Falsework and Formwork

- .1 The Contractor shall be responsible for all falsework design and construction in accordance with Item 1385.
- .2 The Contractor shall be responsible for all formwork design and construction in accordance with Item 1384.
- .3 All submissions with respect to falsework and formwork shall be in accordance with Item 1383.

1302.5 .4 Placement**.1 General**

- .1 All concrete shall be placed in a space free of standing water, unless otherwise specified in the Contract Documents.
- .2 New concrete shall be defined as concrete that has not attained its minimum specified compressive strength.
 - .1 All loads to be applied on new concrete shall be subject to the approval of the Engineer.
- .3 Bonding of new concrete on hardened concrete shall be carried out as follows:
 - .1 Before depositing new concrete on concrete that has set, the forms shall be retightened, and the surface of the hardened concrete shall have all foreign matter and laitance removed.
 - .2 Hardened concrete surfaces shall be thoroughly saturated with water, without ponding, in advance of placing concrete.
 - .3 Methods of obtaining an adequate bond between the hardened and fresh concrete shall be subject to the approval of the Engineer.
- .4 The Contractor shall determine required delivery temperature of concrete to satisfy the selected construction method and temperature control, but concrete temperatures from the time of batching until final placing shall be maintained between 10°C and 25°C, unless otherwise authorized in writing.
- .5 Concrete shall be placed while still plastic and workable.
 - .1 Concrete at the advancing face of the concrete placement must be plastic and cold joints within a concrete placing operation shall not be permitted.
 - .2 Re-tempering any partially hardened concrete with additional water shall not be permitted.

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- .6 Concrete placement advancement shall be up-grade unless otherwise noted in the Contract Documents and/or authorized by the Engineer.
- .7 If the concrete details are such that a feather edge or thin section might be created by the sequence of placing, a bulkhead shall be introduced to maintain an edge thickness of at least 100 mm.
- .8 Any lubrication material used to prime the concrete pump line shall not be permitted to be placed within nor left as part of the permanent structure. All lubrication material shall be disposed of in coordination with the Department's Environment Management Section (EMS) and 1302.5.8.

.2 Footings and Working Slabs

- .1 Where Over-excavation is required due to soil conditions and a working or "mud" slab is required, concrete shall be placed in accordance with Standard Drawing 1302-1 and shall be in accordance with type "D".
- .2 For stepped footings and similar stepped formwork details, where concrete has to be placed in two or more stages and where the monolithic nature has to be maintained, the upper portion shall be placed as soon as stiffening of the concrete in the lower portion shall permit.
 - .1 The concrete in the lower portion shall be designed so as to minimize bleeding; any free water or laitance shall be removed before the next layer of concrete is placed.

.3 Columns

- .1 Concrete in columns shall be placed in one continuous operation unless otherwise noted in the Contract Documents and/or as directed by the Engineer.
- .2 Prior to the placement of walls or column formwork all concrete in footings must have attained a minimum compressive strength of 20 MPa and the footing curing and protection requirements must be satisfied in accordance with 1302.5.8.
- .3 Concrete in columns shall be allowed to cure a minimum of 36 hours and to a minimum compressive strength of 20 MPa before adjacent formwork is placed.
- .4 Falsework supported by brackets on columns shall not be placed until concrete has attained 60% of its minimum specified compressive strength.
- .5 Unless specifically permitted by the Engineer, in writing, concrete shall not be placed in the Superstructure until column forms have been stripped sufficiently to determine the character of concrete in the columns.

.4 T Beam Spans

- .1 Concrete in girder webs shall be deposited uniformly in horizontal layers.

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.2 Concrete in a T Beam span shall be placed in one continuous operation.

.5 Box Girders

.1 Concrete in box girders shall be placed in two or three separate operations.

.1 The bottom slab shall be placed first with a construction joint between the bottom slab and the webs.

.6 Decks and Diaphragms

.1 All diaphragm concrete, with the exception of continuous pier diaphragms for Bridges with prestressed girders that are made continuous for live load and integral abutment diaphragms, must have attained 60% of its minimum specified compressive strength, prior to placing the concrete for the deck slab or any other superimposed dead loads.

.1 Pier diaphragms in prestressed concrete girder Bridges that are made continuous for live load shall be placed concurrently with the portion of the deck over the same pier, as shown on the concrete placement diagram in the Contract Documents.

.2 Deck concrete shall be placed uniformly and symmetrically with respect to the width of the Structure.

.3 The deck slab concrete must have attained 80% of its minimum specified compressive strength prior to the placement of curb, barrier walls or sidewalk concrete or any other superimposed dead load on the deck slab.

.1 Bulkheads for the deck slab placement shall remain in place for at least 36 hours and until the deck slab concrete reaches a minimum compressive strength of 20 MPa following the initial set of the deck slab concrete.

.1 No disturbance of the embedded reinforcing shall occur until a minimum compressive strength of 20 MPa is achieved.

.4 The deck slab concrete and continuous pier diaphragms must have attained 80% of its minimum specified compressive strength prior to the placement of any vehicles on the deck slab.

.7 Superstructure Reactions on Bents, Piers, or Abutments

.1 The load of the Superstructure shall not be allowed to come upon the bents, piers or abutments until concrete in the bents piers or abutments has reached the minimum specified compressive strength.

.8 Profile of Bridge Superstructure Components

.1 Longitudinal girders, transverse floor beams and stringers shall be profiled by the Engineer.

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- .1 The Contractor shall notify the Engineer of the availability of his/her safety support system a minimum of 7 Days in advance of the placement of any falsework, formwork or other additional loads on the Superstructure to allow for the profiling.
- .2 Where excessive camber of precast pre-stressed beams occurs, the Contractor shall carry out grade adjustments, as directed by the Engineer.
- .9 Bridge Decks
 - .1 The deck slab concrete for a simple span shall be placed in one continuous operation, starting at one end of a span and proceeding to the other end, unless otherwise noted in the Contract Documents.
 - .2 Concrete in continuous slab and slab-on-girder Bridges shall be placed as shown in the Contract Documents.
 - .1 Placing of concrete in deck slabs shall be continuous between construction joints.
 - .2 Vehicles or any superimposed dead load shall not be allowed on any portion of a continuous structure until all concrete has attained 80% of its minimum specified compressive strength.
 - .3 Deck slab, safety curb, parapet, barrier wall and Sidewalk concrete shall not be placed between November 1st and May 1st, unless authorized by the Engineer, in writing.
 - .4 During the concreting of the deck slab and barrier walls the Contractor shall ensure, at no cost to the Owner, that cement paste or other leakage from the forms is removed from the exposed portions of a steel superstructure employing an Engineer approved pressurized water spray.
- .10 Multi-span Steel Girder Bridges
 - .1 Before deck slab concrete is placed on steel spans, the falsework supporting Bridge girders shall be removed.
 - .2 The placement of deck concrete for any single placement on a continuous Structure shall not proceed until the minimum specified compressive strength has been attained for the preceding concrete deck placement(s) as detailed in the Contract Documents.

1302.5.5 Tremie Concrete

- .1 The Contractor, in conjunction with the concrete supplier, shall plan all aspects of underwater concrete placement including mix design, contingencies, anti-washout admixtures, monitoring and test placements, in accordance with ACI 308, CSA A23.1, and the following minimum requirements:
 - .1 Tremie pipes shall be kept filled with concrete while depositing and shall have a maximum spacing of 3.0 m.

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- .2 During placing, the upper surface of the concrete must be kept as level as possible and particular care must be taken to ensure that the tremie concrete has a reasonably smooth and level upper surface +200 mm or - 100 mm of the elevation designated in the Contract Documents.
 - .1 Concrete in excess of 300 mm of the upper designated surface shall be removed.
- .3 Prior to any placing of the tremie concrete, vertical shaft reinforcing bars in the tremie area shall be securely held in proper alignment by steel templates.
 - .1 The lower template shall be located a maximum of 1 m above the top of the tremie.
 - .2 The upper template is to be positioned near the top of the cofferdam.
- .4 During placing of the structural tremie, the Contractor must satisfy, as a minimum, the following conditions:
 - .1 The Contractor shall only begin the tremie placement, for the footings of any pier, once the Contractor warrants the capability of supplying and placing the concrete at a rate of not less than 40 cubic metres per hour throughout the entire placement.
 - .2 The concrete must contain enough set retarder to ensure a minimum depth of 1 m of fluid concrete at any time during the placement in order to maintain a proper seal.
 - .3 A maximum centre to centre spacing of tremie pipes shall be 3 m in any footing concrete placement and the outside rows of tremie pipes shall be spaced a maximum of 1.5 m from the inside face of the sheet piling cofferdam walls.
- .2 In the area of pier shafts, at the top of the structural tremie footing, the laitance shall be removed and the top of the footing shall be chipped down to sound concrete.
 - .1 All laitance and concrete residue shall become the property of the Contractor and shall be disposed of outside the Work Area.
- .3 The Owner shall arrange to have one or more cores drilled from the structural tremie concrete of each pier for the purpose of checking the quality and strength of the concrete placement.
 - .1 The Contractor shall, as part of the Work, provide access, platforms and any other assistance that may be necessary to enable the drilling to be carried out efficiently.
 - .2 The Contractor shall suspend all of her/his construction operations on the pier during the tremie coring operation.

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- .3 Should such cores identify defects or fail to meet the Specifications, the Contractor shall at his/her own expense, carry out corrective measures, subject to the approval of the Engineer, to remedy the deficiencies identified in the structural tremie concrete.
- .1 The Contractor shall be responsible, at her/his own expense, for the cost of any additional coring to determine the full extent of the defects and to develop a remediation plan satisfactory to the Engineer.

1302.5.6 Construction Joints

.1 Limitation in Use of Construction Joints

- .1 Construction joints shall not be permitted except those shown in the Contract Documents or as approved in writing by the Engineer, unless occasioned by the breakdown of the Equipment, or other unforeseen reasons, in which case the Contractor shall provide bulkheads parallel to the principal lines of stress.
- .2 Vertical construction joints in deck slabs shall not be allowed parallel to the centreline of the Roadway.
- .3 Cast-in place concrete traffic barrier shall have formed 'V' grooves which are to be sawcut and filled with an approved sealant within 24 hours of stripping formwork.

.2 Use of Keys

- .1 Suitable keys shall be formed at the top of the upper layer of each day's Work and at other levels where Work is interrupted.
- .2 Keys or construction joints shall be of the type and detail as shown in the Contract Documents, unless otherwise permitted by the Engineer.

1302.5.7 Placing and Finishing Plastic Concrete

.1 Tolerances

- .1 Unless otherwise required in the Contract Documents, the maximum deviations from line, grade and dimension shall be as shown in Table 1302-3.

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**Table 1302-3
Placing and Finishing Tolerance Limits**

Position in Structure	Tolerance
Finished Bridge Deck Grades Surface variation Cracks	± 8 mm 8 mm over 3 m < 0.4 mm
Approach Slab directly overlaid with asphalt concrete Grades Surface variation Cracks	± 8 mm 8 mm over 3 m < 0.4 mm
Approach Slab buried below grade Grades Surface variation	± 8 mm 12 mm over 3 m
Concrete Bridge Bearing Block or Seat Grades Surface variation from level	+1 to -5 mm $\pm 0.1^\circ$
Footing Grades	-10 mm/+50 mm
Columns, Walls, Cap Beams and High-Quality Surface Areas and exposed Wingwalls Surface variation from true line	≤ 5 mm
Misplacement or eccentricity in Pier, Cap Beam & Bridge Seat	± 10 mm
Columns, Piers, Walls, Beams and High-Quality Surface Areas and exposed Wingwalls Cross sectional dimensions	- 5 mm/+ 10 mm
Footings Plan dimensions width/length	- 10 mm
Misplacement or eccentricity	$\pm 1\%$ of footing dimension in direction of misplacement but < 50 mm
Variation in sizes and location of Slab and Wall openings	± 10 mm

.2 Upper Horizontal Surfaces

.1 The concrete shall be placed in the forms in such a way that the final elevation of the upper horizontal surfaces shall be as indicated in the Contract Documents and/or as directed by the Engineer.

.1 Use of mortar topping shall not be permitted.

.2 Steel floats shall not be permitted.

.2 Upper horizontal surfaces include tops of collision blocks, traffic barriers, end posts, etc..

.3 Bearing Surfaces

.1 Where bearing pads (other than steel) are shown in the Contract Documents, concrete surfaces on which pads are to be placed shall be wood or magnesium floated to a level plane.

.1 If bearing block surfaces are ground to meet tolerances, the surface shall be artificially roughened as required to produce a surface texture similar to coarse sandpaper.

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.4 Bridge Curbs and Sidewalks

- .1 Sidewalks and curbs shall be constructed by placing concrete continuously to the elevations shown in the Contract Documents.
- .2 The concrete shall be worked with a magnesium float to give a uniform surface.
- .3 Floating shall be kept to a minimum consistent with the desired finish.
- .4 Before this finish has set, the surface shall be lightly roughened, perpendicular to the centre line of the Roadway, with a fine dry broom.

.5 Bridge Decks

- .1 Concrete Bridge decks shall be finished by power machine method as specified in the following sections.
- .2 Continuous access to the Bridge deck surface during finishing operations shall be provided by the Contractor.
 - .1 Access shall be provided by means of suitable transverse Bridges.
 - .2 The access Bridges shall be positioned as required by the Engineer.
 - .3 Placing of concrete in Bridge decks shall not be permitted until the Engineer is satisfied that:
 - .1 The rate of production and placing of concrete shall be sufficient to complete finishing operations within the scheduled time.
 - .2 The necessary tools and Equipment are at the site and in satisfactory condition for use.
 - .4 The finishing operations for silica fume modified concrete shall be limited to screeding and/or bull-floating.
 - .5 Falsework and wedges shall be checked immediately prior to placing Bridge deck concrete, and the Contractor shall make necessary adjustments.
 - .1 Care shall be exercised to ensure that settlement and deflection due to the added weight of the Bridge deck concrete is minimal.
 - .2 Suitable means shall be provided by the Contractor to permit immediate measurement by the Engineer of settlement and deflection.
- .3 Screed bars or pipes shall be set to the correct elevation, to form the surface of the Bridge deck to the line and grade as shown in the Contract

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Documents, with allowances, as required, for any anticipated settlement and/or cambered deflection of the Structure.

.1 Screed bars and pipes shall be of such type and be installed so that they shall not deflect appreciably under the applied loads.

.2 Screed pipes or bars for deck pours shall be firmly secured prior to placing concrete.

.3 Supports for screed pipes or bars shall not be carried upon reinforcing steel.

.1 If the supports for the rails are located in the concrete, the supports shall be the type which can be removed without disturbing the concrete, or partially removed so that no part remains less than 70 mm below the finished concrete surface.

.1 The supports shall be removed and the resulting holes entirely filled with deck concrete before the deck concrete has hardened.

.4 The Contractor shall be responsible for the design of deck hangers and form brackets to support the additional loads imposed by the power-driven screed machine.

.6 Deck Surface Repairs to Meet Tolerances

.1 Areas outside of tolerances identified in Table 1302-3 shall be repaired as directed by the Engineer.

.1 It shall not be acceptable to achieve this repair by placing grout or concrete over deck concrete that has hardened.

.7 Approach Slabs

.1 The concrete shall be placed in the forms in such a way that the final elevation of the approach slab surfaces shall be as indicated in the Contract Documents and/or as directed by the Engineer. The following shall be considered incidental to the works:

.1 The supply and installation of asphalt impregnated fibre board and approved caulking material for all edges of approach slabs that butt against hardened concrete collision or barrier walls;

.2 The supply and installation of high-density styrofoam sheets and/or ethafoam backer rod between the leading edge of the approach slab and breastwall;

.3 Polyethylene sheets shall be placed on top of compacted granular base.

.2 Finish shall be smooth trowel finish. Steel trowels shall not be permitted.

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.8 Screed Machines

- .1 Screeding of Bridge decks shall be accomplished by power-driven Bridge deck screed machines, approved by the Engineer.
- .2 Prior to beginning concrete placing operations, the screed machine shall be operated over the full length of the Bridge segment to be placed.
 - .1 This test run shall be made with the screed in its finishing position.
 - .2 While operating the screed machine in this test, the screed rails shall be checked for deflection and proper adjustment, the cover on slab reinforcement measured and the controlling dimensions of slab reinforcement and forms checked.
 - .3 Necessary corrections shall be made before starting the placement of concrete.
- .3 After the concrete has been placed, spread, and consolidated to provide a uniformly dense slab, the surface shall be struck off immediately by the passage of the screed machine.
 - .1 The screed machine shall carry sufficient concrete in front of the screed to fill low porous places.
 - .2 The Contractor shall verify the top cover on the reinforcing steel and the thickness of the deck slab across the deck within 3 m of the screeding operation at a maximum of 2 m intervals.
 - .1 If the top cover or the thickness of deck slab does not meet tolerances the screeding operation shall be repeated.
 - .3 The screeding operation shall be repeated as may be necessary to produce a uniformly consolidated, dense, and smooth surface true to the lines and grade.
 - .4 The final deck finish shall be obtained by methods approved by the Engineer.
- .4 For skewed bridge decks, the panel joints within the screed equipment shall be held rigid so as not to develop raised ridges in the top of the deck at the screed's panel joint locations.

.9 Curing and Protection

- .1 The Contractor shall submit to the Engineer for approval, 3 Days prior to the concrete placement, the proposed method and sequence to be employed in the Work for the curing and protection of the concrete.
- .2 Concrete shall be protected against plastic or dry shrinkage cracking by strict adherence to ACI 302 and ACI 308.

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- .3 All exposed concrete surfaces, mortar and grout shall be continuously wet cured.
 - .1 The curing period for concrete decks and approach slabs shall be for a minimum of 7 Days from the completion of concrete placement and until 70% of the specified strength is attained.
 - .1 Wet curing shall be carried out by means of absorptive mat, or fabric kept continuously wet. The deck shall be wet-to-touch at all times during curing.
 - .2 A burlap, absorptive mat, or non-woven geotextile fabric shall be applied immediately after finishing of the concrete surface.
 - .3 A fog mist system shall be applied continuously to bridge decks from the time of screeding until concrete is covered with burlap or non-woven geotextile fabric, in such a way as to maintain high relative humidity above the concrete and prevent drying of the concrete surface.
 - .1 Water shall not be allowed to drip, flow or puddle on the concrete surface during fog misting, when placing the burlap or non-woven fabric or at any time before the concrete has achieved final set.
 - .2 The curing period for sub-structures, mortar or grout shall be 3 Days from the completion of mortar or grout placement or as recommended by the manufacturer, whichever is most stringent.
- .4 Equipment and materials necessary for curing and protection of concrete shall be available on the Worksite and ready for use before placement of concrete commences.
- .5 Freshly finished concrete shall be protected from the elements and from defacement due to construction operations.
 - .1 The Contractor shall repair or replace, subject to the approval of the Engineer, any concrete damaged by the elements or defacement.
- .6 It shall be the responsibility of the Contractor to ensure that the system of curing and protection is properly constructed and maintained for the period of time required.
- .7 Material or Equipment, other than that required for actual curing operations, shall not be placed on either the concrete deck being cured or portions of decks on adjacent spans of continuous structures, without the approval of the Engineer.
- .8 Bridge decks shall be barricaded from traffic until completely cured

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.9 Formwork shall not be removed within the curing period without the approval of the Engineer.

.1 When formwork is removed prior to the completion of curing, the newly exposed concrete surfaces shall be kept wet until the curing period is completed.

.2 For vertical surfaces, curing shall be carried out by securing wet burlap against the vertical surface, supplying a continuous source of moisture to the burlap, and sealing with plastic.

.10 Cold Weather Requirements

.1 General

.1 For the purpose of this specification cold weather shall be considered to be when ambient temperature is at or below 5°C, or in the Engineer's opinion, is likely to fall below 5°C within the next 24 hours.

.2 The Contractor shall ensure that all boilers used for heating, materials, and housing, shall meet the inspection requirements and operating conditions of all applicable Provincial Acts and Regulations.

.2 Materials

.1 The temperature of material charged in the mixer shall be such that the temperature of the mixed concrete, at the time of placement does not exceed 25°C nor shall it be less than 10°C.

.1 The Contractor may heat water, or water and aggregate, to ensure that these temperature limits shall be met.

.2 Frozen lumps of aggregate shall be excluded from the mix.

.3 Water over 35°C shall not be brought in direct contact with the cement.

.3 Placing

.1 Concrete shall not be placed against frozen surfaces.

.2 Formwork, existing concrete at a construction joint, and reinforcing steel shall be free of ice and snow and shall be preheated to and maintained at a temperature of not less than 5°C for a minimum period of 24 hours prior to placement.

.4 Enclosed Protective Housing

.1 Protective housing shall be wind and weather tight, constructed of suitable materials on a substantial framework.

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- .1 Housing shall be of adequate size so proper placing and finishing procedures can proceed unhampered.
- .2 Use of "roll back" sheeting or tarpaulins supported from screed rails, or other means, is permitted on horizontal surfaces, provided:
 - .1 their use does not preclude the attaining of the required surface finish;
 - .2 the concrete is covered progressively as placed; and
 - .3 the resulting housing satisfies all the specified provisions of this Item.
- .5 Heating Within a Housing
 - .1 Housing shall be constructed so that it is clear of concrete and formwork by a minimum of 300 mm at all points.
 - .1 This minimum shall include the underside of bridge beams, slabs, cap beams, columns and walls unless the Engineer has authorized the protection of these areas by insulated formwork.
 - .2 The heating system shall provide at all times, an air temperature throughout the housing of not less than 10°C nor more than 32°C.
 - .3 These conditions shall be maintained for a minimum of seven continuous days and until the minimum specified compressive strength is obtained.
 - .4 Unvented heaters shall be removed from the placement area prior to the placement of concrete.
 - .1 All concrete surfaces shall be checked prior to acceptance into the Work with phenolphthalein (carbonation indicator) to ensure that surfaces are not damaged by combustion products.
 - .5 At the time of placing and during curing, concrete surfaces shall be protected by formwork or an impermeable membrane from direct exposure to combustion gases or drying from heaters.
 - .1 When dry heat is used the products of combustion shall be vented to the outside air and concrete surfaces shall be kept continuously wet.
 - .6 The housing shall be complete, and the heating system shall be in operation for a sufficient period prior to placing concrete to prove the adequacy of the Equipment to establish and maintain the specified curing conditions during the placing and throughout the specified curing period.

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.6 Insulation

- .1 Insulation may be used to protect concrete providing weather conditions and insulation procedures are such that the temperature of the surface of the concrete is maintained at a minimum of 10°C and a maximum of 50°C for a period of 7 continuous Days and until the minimum specified compressive strength is obtained.
- .2 When the ambient temperatures are anticipated to be -15°C, or lower, then insulation providing an *R* value of not less than 20 may be used to protect concrete, providing weather conditions and insulation procedures are such that the temperature of the surface of the concrete is maintained at a minimum of 10°C and a maximum of 50°C for a period of 7 continuous Days and until the minimum specified compressive strength is obtained.
- .3 The proposed method of insulation shall be submitted to the Engineer for approval at least two weeks in advance of use.
- .4 Insulating materials shall be kept dry.

.7 Withdrawal of Protection

- .1 After completion of the specified curing period the temperature of the concrete shall be gradually reduced, at a rate not to exceed 5 °C per hour, to that of the surrounding air. The temperature differential between ambient air temperature and the concrete shall not exceed 20°C.

.11 Hot Weather Requirements

- .1 For the purpose of this Specification hot weather shall be considered to be when the ambient temperature is at or above 25°C, or in the opinion of the Engineer is likely to rise above 25°C within the next 24 hours.
- .2 Hot weather placing of concrete shall not proceed without the approval of the Engineer.
- .3 The Contractor must demonstrate that he can provide adequate hot weather protection and agree to provide this protection before any approval can be given to start placing concrete.
- .4 When the drying conditions meet moderate drying conditions or severe drying conditions as defined by CAN/CSA - A23.1, the drying protection must meet with the approval of the Engineer.
- .5 The temperature of the formwork, reinforcing steel, and material against which new concrete is to be placed, shall not exceed 30°C.
- .6 The mixing water and/or aggregates shall be cooled when the temperature of the mix exceeds 25 °C.

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- .7 Exposed surfaces of concrete shall be shaded from the direct rays of the sun and sheltered from direct wind.

.12 Finishing Hardened Concrete

.1 General

- .1 The following concrete surfaces shall receive a "High Quality Surface Finish":

- .1 Abutment end posts, interior and exterior barrier walls, interior and exterior traffic barriers, interior and exterior of collision blocks, and vertical full height exposed exterior deck fascia.

- .2 All other concrete surfaces shall receive an "Ordinary Surface Finish" unless otherwise directed by the Engineer.

- .3 The Contractor shall cast, for a barrier wall, a site reference panel 3 m in length.

- .1 The reference panel shall be cast separate from the Structure.

- .1 With the approval of the Engineer this 3m reference panel may be cast in place on the Structure. No further barrier walls shall be placed until this is accepted. If this reference panel is not accepted, it shall be removed and replaced at the Contractor's own expense.

- .2 The panel shall be cast in the same orientation, with the same formwork material and reinforcing that shall be incorporated into the Work.

- .3 The panel shall be cast with the same concrete mix and method of placement, curing and protection that shall be applied for the barrier walls.

- .1 The surface finish shall be reviewed for approval by the Engineer.

- .4 Once the reference panel is accepted, it shall remain on-site for the purpose of comparison in assessing compliance of the high-quality finish for the barrier walls.

- .5 The Contractor shall be responsible for the removal and disposal of the site reference panel, outside of the Work Site.

- .4 For components other than barrier walls, the Contractor and the Engineer shall jointly select an area of the component, and the Contractor shall finish the area such that the area is acceptable to the Engineer.

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- .1 The selected finished area shall be used for comparison purposes in assessing compliance with the finish required for the component.
- .5 All costs associated with defect repair shall be at no additional cost to the Contract.
- .2 Defects Formed Surfaces
 - .1 Immediately after the removal of forms any part of the Work which displays defects (for example: honeycombing, spalls, cracking, cold joints, etc., etc.) shall be clearly marked and the Contractor shall notify the Engineer of the location and extent of the defect for her/his review.
 - .1 The Contractor shall submit a repair procedure for approval.
 - .1 Cement washes of any kind shall not be used.
 - .2 All defects shall be finished smooth, uniformly colour matched and flush with the adjacent surface.
- .3 Defects Bridge Deck
 - .1 Isolated local depressions less than 5 mm deep shall be removed by grinding the adjacent area, provided the specified cover is maintained.
 - .1 If removal of the depression by means of grinding cannot be carried out while maintaining specified cover then the affected area shall be repaired per 1302.5.7.12.3.2.
 - .2 Isolated local depressions more than 5 mm deep shall be removed and replaced as follows:
 - .1 If the depression has an area less than 0.03 m² then the affected area shall be saw cut, chipped, and patched with an Engineer approved repair material.
 - .2 If the depression has an area greater than 0.03 m² then the affected concrete shall be removed and replaced per Item 1372.4.2 as directed by the Engineer.
 - .3 Isolated local defects less than 25 mm in diameter and less than 5 mm deep may be filled with an Engineer approved product compatible with the waterproofing system.
- .4 Ordinary Surface Finish
 - .1 All surface voids larger than 12 mm in diameter and cavities or holes visible upon the removal of the formwork, shall be filled to their entire depth, with an approved cement grout mix of cement and fine sand from the same source as used in the concrete and incorporate a latex bonding agent.

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- .2 All objectionable fins, projections, offsets, streaks or other surface imperfections shall be totally removed to the Engineer's satisfaction.
- .3 If the concrete surface does not adequately fulfill the requirements for Ordinary Surface Finish, the Contractor shall, as directed by the Engineer, entirely remove certain designated portions, or all the concrete, and replace with new concrete.
- .5 High Quality Surface Finish
 - .1 A High-Quality Surface Finish shall be accomplished by using a form liner approved by the Owner.
 - .1 Supply, installation, fit and removal of form liner on the entire surface areas requiring High Quality Surface Finish shall be considered incidental to the work.
 - .2 Small surface voids due to entrapped air shall be cleaned to remove surface laitance and filled, to their entire depth, with an approved cement grout mix of cement and fine sand from the same source as used in the concrete and incorporating a latex bonding agent.
 - .3 The entire surface shall be finished to produce a smooth dense surface of uniform colour without pits or irregularities.
- .6 Bridge Deck Surface Preparation
 - .1 The entire deck shall be shot blasted, and/or using equivalent means, achieve an anchor profile which is clean of all foreign materials, such as asphalt, oil, grease, and is free of any sharp protrusions and of laitance.
 - .2 The final concrete surface profile shall range between a CSP 1 and a CSP 5 as defined by the International Concrete Repair Institute (ICRI) Technical Guideline No. 03732.
 - .1 Surface profile shall not interfere with the adhesion of the waterproofing membrane to the concrete deck.
 - .1 Contractor shall submit a repair procedure to the Engineer for approval of areas that are noncompliant.
 - .3 Areas where rapid setting patching materials have been approved for use by the Engineer shall be cured for minimum of 72 hours, or longer when recommended by the product manufacturer's written specifications, prior to applying primer or installing membrane.
 - .4 The entire surface shall then be swept and cleaned by pressure washing and oil-free compressed air, to the satisfaction of the Engineer.
 - .5 Deck surface shall be allowed to dry for a minimum of 7 Days after cessation of curing and in accordance with the waterproofing manufacturer's written specifications, prior to applying membrane.

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1302.5.7.13 Quality Testing

.1 General

- 1 The Contractor shall provide and maintain adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the initial curing period.
- .2 Facilities shall be provided by the Contractor, for the Engineer to inspect all ingredients and processes used in the manufacture and delivery of concrete.
- .3 The Department shall carry out Quality Control sampling/testing during the concrete placement, including air, temperature, and slump testing.
 - .1 Results of Quality Control tests shall be recorded and made available to the Contractor upon request.
 - .2 Tests shall be conducted by personnel certified under ACI Concrete Field-Testing Technician Grade 1, or CSA A283.
- .4 Test specimens shall be sampled in accordance with CSA A23.2-1C and made and cured to meet the requirements of CSA A23.2-3C.
 - .1 Samples shall be obtained at final point of discharge unless otherwise specified by the Engineer.

.2 Air & Slump Testing of Plastic Concrete

- .1 The air content of each load, or batch, of concrete shall be tested until consistent and acceptable air content is established, at which point testing frequency may be reduced, at the discretion of the Engineer. Should a test fail to meet the requirements, the frequency of testing shall return to one test per load, or batch, until acceptable air content consistency is re-established.
- .2 The Owner shall carry out Quality Assurance testing
 - .1 If the measured slump or air content falls outside the limits specified, a check test shall be made immediately on another portion of the same sample.
 - .1 This concrete load, in the event of a second failure, shall be considered to have failed to meet the requirements of this specification, and shall be rejected.
- .3 Density and Yield tests shall be carried out, as required by the Engineer, to meet the requirements of CSA A23.2-6C.

.3 Age of Compressive Strength Testing

- .1 The Engineer shall determine the age of test and shall be indicated on the submitted concrete mix design.

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- .1 In the absence of a Contractor initiated request, the age requirements stipulated in CSA A23.1 for the specified exposure class shall apply.
- .2 Strength tests shall be performed at 7 days and 28 days.
 - .1 Additional tests may be requested by the Contractor or Owner as required.
- .4 Frequency of Compressive Strength Testing
 - .1 Frequency of compressive strength testing shall conform to the schedule indicated in Table 1302-4 and per 1302.5.7.13.3.
 - .2 For each age of compressive strength test two tests, as defined in 1302.5.7.13.3.1, shall be required, unless indicated on submittal.
 - .1 A test, as defined in 1302.5.7.13.3.1 to be broken at the specified age submitted with the mix design.

Table 1302-4
Frequency of Compressive Strength Testing (Concrete)

Number of Cubic Metres in Placing Operation	Minimum No. of Trucks to be Tested
up to 50	2
51 - 100	3
101 - 200	4
over 200	See Note 1
NOTE: An additional test shall be taken for each additional 100 cubic metres of concrete placed.	

- .5 Hardened Air Void Testing Frequency
 - .1 Hardened air void testing shall be carried out by the Owner on an as-required basis.
- .6 Permeability Testing Frequency
 - .1 A minimum of two cylinders shall be taken for permeability testing from each placement and cured for a minimum of 56 Days.
 - .2 The permeability testing shall be carried out by the Owner.
- .7 Compressive Strength Testing
 - .1 Strength tests shall mean the average strength of two comparisons of 150 mm by 300 mm or three comparisons of 100 mm by 200 mm test cylinder specimens taken from the same batch and tested at the same age.

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- .2 Test specimens shall be tested at the age of test submitted with concrete mix design, unless otherwise approved by the Engineer, and shall meet the requirements of CSA A23.2-9C.
- .3 To meet the strength requirements of this item, the average of all the tests shall exceed the specified strength.
 - .1 When three or more tests of the same type of concrete are available, the average of any three consecutive tests shall be equal to or greater than the specified strength and no individual test shall be less than 90% of the specified strength.
 - .2 Concrete that does not meet specified strength shall be subject to Payment Adjustment per 1302.6.9.
- .4 If tests indicate that concrete in a placement does not meet the specified strength, the concrete in that placement shall be deemed noncompliant.
 - .1 Depending upon the severity of the noncompliant concrete, the Engineer may require complete removal, or:
 - .1 The Contractor may submit a proposal for repair of the noncompliant concrete to the Engineer for consideration.
 - .2 Any additional testing requested by the Contractor shall be subject to approval by the Engineer.
 - .1 Additional testing shall be conducted at the Contractors own expense.
 - .3 If the remedial measures are accepted by the Owner and the noncompliant concrete is allowed to remain, the concrete in the placement shall be paid according to Table 1302-5.
 - .2 If the noncompliant concrete is removed and replaced, the concrete incorporated into the placement shall be paid according to 1302.7.5.
- .5 Additional tests of cylinders, cured entirely under field conditions, may be required to check the adequacy of curing or cold weather protection.
 - .1 Test cylinders shall be stored as near as possible to the point in the Structure that the test cylinders represent and shall be afforded the same temperature protection and moisture environment as the Structure.
 - .2 At the end of the curing period the test cylinders shall be left in place, exposed to the weather in the same manner as the Structure.
 - .3 All test cylinders shall be removed from the field storage and stored in lime water at $23 \pm 2^{\circ}\text{C}$ for $24 \pm 8\text{h}$ immediately before time of testing to ensure uniform moisture conditions from cylinder to cylinder.

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1302.5.8 Environmental Controls

1302.5.8 .1 Concrete Wash-Out Pits

- .1 The Contractor shall be responsible for excavating, constructing, supplying, and installing environmental controls complete with their continued maintenance, clean out and disposal of waste material, decommissioning, removal of environmental controls, filling in, levelling out, and full reinstatement of concrete wash-out pits to be used for cleaning the concrete trucks' chutes.
- .2 The Contractor shall account for the quantity of pits required based on the location of concrete truck delivery relative to the site. The location of pit(s) shall be coordinated with a Department representative. The Contractor shall arrange, obtain permission, and pay for any pits which may have to be located on adjacent privately owned land.

1302.6 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the specified volume, measured in cubic metres, of concrete supplied, placed and finished in accordance with this Item.
 - .1 The volume shall be the lesser of the computed volume of concrete as determined from the design dimensions presented in the Contract Documents or the actual volume of concrete placed.
- .2 For beam supported concrete deck slabs the computed volume of concrete in structures "A" shall include the concrete calculated based on the actual beam camber profile.
- .3 On partial depth concrete removal and replacement under Item 1372, the volume shall be the actual quantity of concrete placed.
- .4 For approach slab concrete, the supply and installation of polyethylene sheets, asphalt impregnated fibre board, rigid foam insulation, caulking sealant, or any other peripheral materials shall be considered incidental to the works.
- .5 For working slab concrete where over excavation is required, measurement shall be by the volume of actual concrete placed for the working slab.
- .6 Concrete wash-out pits for environmental controls shall be considered incidental to the works and shall not be measured for payment.
- .7 The specified volume of tremie concrete for which payment shall be made shall be the volume contained within cofferdams assuming the theoretical horizontal dimensions as shown in the Contract Documents and the base and upper surface elevations as measured in the field and in accordance with 1302.5.5.1.2.
- .8 Measurement of concrete in Structures, calculated on the dimensions shown in the Contract Documents, shall not be affected by the formwork tolerances listed in Item 1384.

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- .9 The Price Adjustment for Control of Strength shall be paid in accordance with Table 1302-5.

**Table 1302-5
Price adjustment for Control of Strength**

For Concrete in Structures A, B, and C				
Strength	100%+ Strength	90 – 99% Strength	80 to 89% Strength	Less than 80% Strength - To be reviewed by Engineer
Payment per cubic metre component	100%	95%	90%	Removal or 75% (per 1302.5.12.7.4)

- .10 The price adjustment for Resistance to Chloride Ion Penetration shall be paid in accordance with Table 1302- 6.

**Table 1302-6
Price Adjustment for Resistance to Chloride Ion Penetration**

For Exposure Class C-XL in CSA A23.1					
Coulombs (ASTM C1202)	0-500	500-1000	1000-1300	1300-1500	1500-2500
Payment per cubic metre for component (% of Unit Price)	110%	105%	100%	95%	75%

1302.7 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of concrete, as identified under the Contract.
- .2 The Owner may make partial payment in accordance with 1382.7 for associated materials identified in 1302.2.4.1.
- .3 In the case that the Engineer initiates further testing in accordance with the requirements in 1302.5.7.13.4 to determine if the specified strength has been attained, the following shall apply:
- .1 If the test results indicate that the specified strength has been attained, then the testing costs incurred by the Owner shall be borne by the Owner.
- .2 If the test results verify that the specified strength has not been attained, then the testing costs incurred by the Owner shall be charged to the Contractor.
- .1 The cost of any retesting to resolve the specified strength shall be borne by the Contractor.
- .4 The Contractor shall be subjected to a penalty of \$1000.00 per occurrence if proper wet curing is not carried out. For the purposes of this item, an occurrence shall be

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when an inspection reveals that wet curing of concrete is not being carried out in accordance with 1302.5.7.9.3.1.1.

.1 This shall apply to each placement which is still being cured.

.5 Where noncompliant concrete is removed and replaced in accordance with 1302.5.7.13.7.4.2, the concrete incorporated into the component shall be paid at 100% of the Unit Price

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CONCRETE SEALERS

ITEM: 1303

1303.1 DESCRIPTION

- .1 This Item consists of the supply and application of concrete sealer to concrete surfaces, as identified under the Contract.

1303.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .1 The concrete sealer shall be a clear, breathable, high performance, sealer for protecting new and existing concrete surfaces from the delaminating effects of water, moisture saturation, chloride penetration, acids, alkali-silica reactions (ASR) and freeze thaw cycles.
- .1 Concrete sealer shall be as indicated in the Special Provisions of the contract documents.

1303.3 SUBMITTALS

- .1 The Contractor shall submit to the Engineer, 7 Days in advance of the commencement of the Work, the proposed type of concrete sealer including the following:
- .1 The manufacturer's recommended procedures for installation, storage procedures, and instructions for handling the concrete sealer and its components.
- 2 The Contractor shall select a product appropriate for the application and field conditions in accordance with the manufacturer's specifications.

1303.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 Protect plant life and surfaces to remain uncoated during application. Use drop cloth or masking as required.
- .3 The Contractor shall prepare the area and install the concrete sealer in accordance with the manufacturer's installation specifications and instructions.
- .4 Do not apply sealer if standing water is visible on surface to be treated.
- .5 Apply sealer to all exposed concrete surfaces except for the following:
- .1 Wingwalls, curtain walls, abutment footing/pile caps and pier caps.
- .6 Apply sealer with flowing action. Eliminate ponding.
- .7 Apply even distribution of sealer.
- .8 Protect sealer from damage during construction.
- .9 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

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1303.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of square metres of concrete sealer supplied and installed in accordance with this Item.

1303.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of concrete sealer, as identified under the Contract.

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REINFORCING STEEL

ITEM: 1304

1304.1 DESCRIPTION

- .1 This Item consists of supplying and placing of reinforcing steel.

1304.2 REFERENCES1304.2 .1 American Concrete Institute (ACI)

- .1 MNL-66(20), ACI Detailing Manual
- .1 ACI PRC-315-18, Guide to Presenting Reinforcing Steel Design Details

1304.2 .2 Canadian Standards Association (CSA International)

- .1 CSA A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Tests and Standard Practices for Concrete.
- .2 CSA A23.3 – 19, Design of Concrete Structures
- .3 CSA G30.3 M1983(R1998), Cold Drawn Steel Wire for Concrete Reinforcement.
- .4 CSA G30.5 M1983(R1998), Welded Steel Wire Fabric for Concrete Reinforcement.
- .5 CSA G30.14 M1983(R1998), Deformed Steel Wire for Concrete Reinforcement.
- .6 CSA G30.15 M1983(R1998), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- .7 CSA G30.18:21, Carbon Steel Bars for Concrete Reinforcement.
- .8 CSA S6-19, Canadian Highway Bridge Design Code.
- .9 CSA W186:21, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1304.2 .3 Reinforcing Steel Institute of Canada (RSIC)

- 1 RSIC – 2020, Manual of Standard Practice.

1304.3 MATERIALS

- .1 All material shall be supplied by the Contractor.
- .2 Reinforcing steel shall be designated as Reinforcing Steel “A” for non-coated reinforcing steel.
- .3 All reinforcing steel shall be new billet steel conforming to current CAN/CSA G30.18, "Billet Steel Bars for Concrete Reinforcement", Grade 400W, with the following additional requirements:
- .1 The minimum elongation at rupture in a 200 mm gauge length shall be 12% for 25M bars and smaller, and 10% for 30M bars and larger.

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- .2 The pin diameter for the 180° bend tests shall be 4 bar diameters for 25M bars and smaller, 6 bar diameters for 30M and 35M bars, and 8 bar diameters for 45M and 55M bars.
- .3 Reinforcing steel shall be in the form of deformed round bars unless otherwise noted in the Contract Documents.
- .4 Reinforcing steel shall be free of physical defects.
- .4 Reinforcing steel shall be bent to proper shape in a plant having suitable devices for bending reinforcing steel as recommended in The Reinforcing Steel Institute of Canada, (RSIC), Manual of Standard Practice, unless otherwise noted in Contract Documents.
 - 1 Heating shall not be used as an aid in bending steel, unless specifically authorized by the Engineer.
- .5 Welding or splicing shorter bars as a substitute for supplying bars of the specified lengths shall not be permitted.
- .6 Bars are subject to rejection if their actual weight varies from their theoretical weight, as specified in CAN/CSA G30.18, Grade 400, by more than 5%.
- .7 All Structures are designed using Metric (SI) reinforcing steel bar sizes and the Contractor shall supply accordingly.
- .8 Bar splice couplers (if permitted) shall be supplied in accordance with the Contract Plans.

1304.4

SUBMITTALS

- .1 The Contractor shall submit the manufacturer's mill certification that the materials supplied meet the specified requirements, at least 14 Days in advance of the commencement of the Work, in accordance with 1383.3.
 - .1 Steel with boron content exceeding 0.0008% shall not be permitted.
- .2 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.
 - .1 All welders shall be certified by the CWB in accordance with CSA W186, and/or to a certification level of Qualified Welder as issued by the Province of Prince Edward Island.
- .3 Submittals are required in accordance with any cross-referenced Item forming part of this Item.
- .4 The Contractor shall submit placement drawings for all internal reinforcement to the Department at least three weeks prior to the commencement of fabrication. These shall include; but not be limited to:

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- .1 Plan and section views, concrete element dimensions, material grade, piece marks, associated bar size and spacing, and lap locations and associated lengths.
- .2 Directly on the placement drawings (not on a separate document) a detailed bar list indicating a piece mark for all bar types (including straight bars), a descriptive location for each bar mark (EG. collision block horizontals, abutment wingwall verticals, etc.); quantity of bars for each mark, bend type, bend dimensions, total length for each mark, total mass for each mark, and grand total mass for the project.
- .5 Contractor responsible to review content of placement drawings for correctness prior to submitting to the Department. Refer to attached Schedule 'F' and drawings.

1304.5 CONSTRUCTION**1304.5 .1 General**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Work shall be in accordance with CSA A23.1, and the Reinforcing Steel Institute of Canada (RSIC), Placing Reinforcing Steel Recommended Practices.
- .3 The Contractor shall handle and store the reinforcing steel in a manner that ensures it is not damaged or contaminated with dirt or other materials.
- .4 Prior to delivery of reinforcing steel, bars or groups of bars shall be tagged in a durable fashion.
 - .1 Tags shall indicate designation letters and number assigned to bars on the Plans.
- .5 Reinforcing steel shall be stored on skids at least 150 mm above ground.

1304.5 .2 Placing and Fastening

- .1 Immediately before placing, reinforcing steel shall be free of oil, dirt, mill scale, loose or excessive rust or other coatings that would reduce bond to concrete.
 - .1 Reinforcing steel shall be maintained in this clean condition until embedded in concrete and reinforcing steel about to be embedded in concrete shall be free of loose hardened concrete.
 - .2 Bar supports shall be made of plastic or stainless steel.
- .2 Reinforcement shall be accurately positioned, secured and supported, using bar supports and side form spacers, to ensure proper concrete cover and spacing within allowable tolerances before and during placement of concrete.
- .3 Bars shall be fastened together at all intersections, except where the spacing is less than 300 mm in each direction in which case fastening at alternate intersections of each bar with other bars shall be permitted provided the Contractor

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can demonstrate to the Engineer that this shall hold all the bars securely in position.

- .4 The Contractor shall ensure flexing of the reinforcing steel partially embedded in the Work shall not occur until the concrete has attained a minimum compressive strength of 20 MPa.
- .5 Work on partially embedded reinforcing steel shall continue only when the previously placed concrete has attained a minimum compressive strength of 20 MPa.
- .6 Prior to the deposition of concrete the positioning and securing of the reinforcing steel shall be inspected and approved by the Engineer.

1304.5 .3 Support of Reinforcement

1304.5.3.1 Bar Supports

- .1 Bar supports shall have sufficient strength and stiffness to carry the loads from the reinforcement, construction crew and concrete pressures without failure, displacement or significant deformation.
- .2 Bar supports shall be spaced such that any sagging between supports shall not reduce the specified concrete cover.
- .3 Bar supports shall be made of plastic.
 - .1 Commercially available precast concrete bar supports, or Engineer approved equivalent, shall be used for bar supports that are in contact with soil.
 - 1 Precast concrete bar supports shall be made of concrete with a quality at least equal to that specified for the member into which the bar supports are integrated.
 - .1 Geometry of bar support or embedded tie wires shall keep rebar securely fastened.
 - .2 Stacking of bar supports shall not be permitted.
- .4 Bar supports shall be nonconductive and have a geometry and bond characteristics that deter the movement of moisture from the surface to the reinforcement,
- .5 Bar supports in contact with the soil shall have a base area of less than 10,000 mm².

1304.5.3 .2 Side Form Spacers

- .1 Side form spacers shall have provisions to enable them to be firmly secured to the reinforcement.
- .2 Side form spacers shall meet the requirements of 1304.5.3.1, Bar Supports.

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1304.5.3 .3 Internal Spacers

- .1 Spacers for maintaining the specified distance between layers of reinforcement shall be made from reinforcing bars or steel rods.
- .1 Spacers shall be positioned and securely fixed between the layers of reinforcement and shall not protrude in the cover concrete.

1304.5 .4 Welding

- .1 The welding of reinforcement, including tack welding, is prohibited unless otherwise indicated in the Contract Documents.

1304.5 .5 Testing

- .1 Additional reinforcing steel, required to replace that altered by testing, shall be provided by the Owner under the terms of this Item, unless the reinforcing steel is shown, by testing, to be in non-conformance with the Specifications, then the reinforcing steel shall be provided by the Contractor.

1304.5 .6 Tolerances

- .1 Unless otherwise specified in the Contract Documents, reinforcing steel shall be constructed within tolerances listed in Table 1304-1.
- .2 The tolerances listed in Table 1304-1 and those presented in Table 1384-1 for formwork are not cumulative.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

REINFORCING STEEL

ITEM: 1304

Table 1304-1

Reinforcing Steel Tolerances

Fabrication Tolerances	Cutting to length		(+) 10 mm, (-) 25 mm	
	Hooked bars	out-to-out of hooks	for 5M bars or smaller	± 10 mm
			for bars larger than 5M	+10 mm/ - 40 mm
	Spirals or circular ties	out-to-out dimension	± 5 mm	
	Column ties or stirrups	out-to-out dimension	± 5 mm	

Placing Tolerances	Reinforcing steel shall be placed in specified positions within the following tolerances unless otherwise noted in the Contract Documents:	
	Where the depth (d) of a flexural member, the thickness of a wall or slab or the smallest dimension of a column is:	
	200 mm or less	± 3 mm
	200 mm to 750 mm	± 6 mm
	more than 750 mm	± 10 mm
	Longitudinal locations of bends and ends of bars	± 25 mm *
	*Note: Cover may not be reduced by more than 10 mm or increased by more than 20 mm at the end of a member.	

Spacing Tolerances	Reinforcing steel shall be spaced at the specified spacing within the following tolerances unless otherwise noted in the Contract Documents			
	Footings		± 10 mm	
	Columns	notwithstanding the stated tolerance, all column bars must be in contact with spirals in round columns, and must be in contact with stirrups and in corners of stirrups for rectangular columns	± 10 mm	
	Deck bars and walls		± 10 mm	
	Tee beams	notwithstanding the stated tolerance, all bars must be in contact with stirrups and in the corners and hooks	± 10 mm	

Bar Cover Tolerances		± 10 mm

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REINFORCING STEEL

ITEM: 1304

1304.6 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of kilograms of reinforcing steel supplied and placed in accordance with this Item.
- .2 The quantity of spacer bars or frame-up bars shall be included in the number of kilograms of bars supplied and installed.

1304.7 BASIS OF PAYMENT

- 1 Payment for Work under this Item shall include a separate Unit Price for each type of reinforcing steel, as identified under the Contract.
- .2 The Owner may make partial payment for reinforcing steel in accordance with 1382.7.
- .3 The cost of the provision of materials, labour and Equipment to test the reinforcing steel to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the material does not meet the Specifications, otherwise the Owner shall bear the cost of the test.
 - .1 The cost of any retesting to resolve the supply of the specified reinforcing steel shall be borne by the Contractor.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

TENSION SPLICES

ITEM: 1305

1305.1 DESCRIPTION

- .1 This Item consists of the splicing of reinforcing steel bars.

1305.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 Tension reinforcing bar connections shall be able to develop a minimum of 125% of the yield stress of the bars being spliced.
- .3 Materials shall be stored in a weatherproof enclosure.

1305.3 SUBMITTALS

- .1 The Contractor shall submit the name of the supplier and the manufacturer/supplier's technical data information, including yield stress, at least 14 Days in advance of the Work.
- .2 The Contractor shall submit the manufacturer's instructions and recommended procedures for installation.

1305.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The preparation and installation of the splice shall be in accordance with the manufacturer's instructions.
- .1 The Contractor, upon request, shall make available, at the site, a representative of the supplier to ensure that preparations and installation procedures are as recommended by the manufacturer.
- .3 The Engineer reserves the right to test any or all splices.

1305.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of tension splices constructed in accordance with this Item.

1305.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price.
- .2 The Owner may make partial payment for tension splices in accordance with 1382.7.
- .3 The cost of the provision of materials, labour and Equipment to test the tension splices to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the splice does not meet the Specifications, otherwise the Owner shall bear the cost of the test.

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TENSION SPLICES

ITEM: 1305

- 1 The cost of any retesting to resolve the adequacy of the tension splice shall be borne by the Contractor.

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GFRP REINFORCING BARS

ITEM: 1306

1306.1 DESCRIPTION

- .1 This Item consists of supplying and placing of GFRP reinforcing bars.

1306.2 REFERENCES

1306.2 .1 American Concrete Institute (ACI)

- .1 ACI PRC-440.1-15, Guide for the Design and Construction of Structural Concrete Reinforced with GFRP Bars
- .2 ACI PRC-440-07, Report on Fiber-Reinforced Polymer Reinforcement for Concrete Structures.
- .3 MNL-66(20) ACI Detailing Manual 2004
- .1 ACI PRC-315-18, Guide to Presenting Reinforcing Steel Design Details
- .4 ACI SPEC-440.5-22, Construction with Glass Fiber-Reinforced Polymer Reinforcing Bars - Specification

1306.2 .2 Canadian Standards Association (CSA International)

- .1 CSA A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Tests and Standard Practices for Concrete.
- .2 CSA S6-19, Canadian Highway Bridge Design Code.
- .3 CSA S806-12 (R2021), Design and Construction of Building Structures with Fibre Reinforced Polymers
- .4 CSA S807-19, Specifications for Fibre Reinforced Polymers.

1306.2 .3 Reinforcing Steel Institute of Canada (RSIC)

- .1 RSIC – 2020, Manual of Standard Practice.

1306.3 MATERIALS

- .1 All material shall be supplied by the Contractor.
- .2 Coated ties, stainless steel ties or nylon ties for GFRP reinforcing bars.
- .3 Chairs, bolsters, bar supports, spacers: to CSA A23.1.
- .4 All glass fibre reinforced polymer (GFRP) reinforcing bars shall be new conforming to current CSA S807, "Specifications for Fibre Reinforced Polymers", with the following additional requirements:
- .1 For straight GFRP bars, the minimum guaranteed tensile strength shall be 1100 MPa for bars 25 mm and lesser in diameter and 900 MPa for bars 32 mm and greater in diameter.
- .2 The Nominal Modulus of Elasticity for straight GFRP bars shall be 60 GPa.

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- .3 Bent/shaped GFRP bars shall have a guaranteed tensile strength equal to 450 MPa with a Nominal Modulus of Elasticity of 50 GPa, in accordance with ACI 440.1 R-B.12.
- .4 Headed GFRP bars shall have a pull-out strength of 148 kN for 15mm diameter bars and 182 kN for 20mm diameter bars and larger.
- .5 All GFRP bars must be supplied by the same manufacturer.
- .5 GFRP bars shall be bent to proper shape in a plant having suitable devices for fabricating GFRP bars in accordance with S807.
- .6 Splicing shorter bars as a substitute for supplying bars of the specified lengths shall not be permitted. Substituting bars shall not be permitted.
- .7 All Structures are designed using Metric (SI) GFRP reinforcing bar sizes and the Contractor shall supply accordingly.
- .8 Bar splice couplers shall not be permitted

1306.4

SUBMITTALS

- .1 The Contractor shall submit the manufacturer's Quality Control Certification for all materials delivered to the site prior to placement of GFRP reinforcing bars. The report shall include production information, including:
 - .1 Supplier
 - .2 Lot number of GFRP Bars
 - .3 Batch number of resin
 - .4 The start and end date of production for each production lot of material
 - .5 The total lineal metres produced of each lot for straight bars or the total number of bars in each lot for bent bars and headed anchor bars.
- .2 The Contractor shall provide testing reports documenting the following:
 - .1 Number of samples tested in each lot
 - .2 Mean, standard deviation and minimum values for the following properties:
 - .1 tensile strength
 - .2 tensile elongation
 - .3 transverse shear strength and
 - .4 shear strength
 - .3 Supply test reports at no additional cost to the contract.
- .3 Submit shop drawings in accordance with section 1383.
 - .4 Indicate bars size, location, bend dimensions and bend fabrication process for all GFRP bars.
 - 5 Include bar schedule containing quantity, bar size, length and bend dimensions.

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ITEM: 1306

- 6 Indicate minimum guaranteed tensile strength and nominal modulus of elasticity for all bar sizes and types on the shop drawings.
- .7 Detail lap lengths and bar development lengths in accordance with CSA S6 and ACI 440.1.

1306.5 CONSTRUCTION**1306.5 .1 General**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Work shall be in accordance with CSA A23.1, and Canadian Reinforcing Steel Institute (CRSI), Placing Reinforcing Steel Recommended Practices.
- .3 The Contractor shall handle and store the GFRP reinforcing bars in a manner that ensures it is not damaged or contaminated with dirt or other materials.
- .4 Prior to delivery of GFRP reinforcing bars, bars or groups of bars shall be tagged in a durable fashion.
 - .1 Tags shall indicate designation letters and number assigned to bars on the Plans.
- .5 GFRP reinforcing bars shall be stored on skids at least 150 mm above ground and adequately covered.

1306.5 .2 Placing and Fastening

- .1 Immediately before placing, GFRP reinforcing bars shall be free of oil, dirt or other coatings that would reduce bond to concrete.
 - .1 GFRP reinforcing bars shall be maintained in this clean condition until embedded in concrete and GFRP reinforcing bars about to be embedded in concrete shall be free of loose hardened concrete.
 - .2 Bar supports shall be made of plastic.
- .2 GFRP reinforcing bars shall be accurately positioned, secured and supported, using bar supports and side form spacers, to ensure proper concrete cover and spacing within allowable tolerances before and during placement of concrete, as indicated in the placement drawings and in accordance with ACI 440.1 R-15 and ACI 440 R-07.
- .3 Bars shall be fastened together at all intersections, except where the spacing is less than 300 mm in each direction in which case fastening at alternate intersections of each bar with other bars shall be permitted provided the Contractor can demonstrate to the Engineer that this shall hold all the bars securely in position.
- .4 The Contractor shall ensure flexing of the GFRP reinforcing bars partially embedded in the Work shall not occur until the concrete has attained a minimum compressive strength of 20 MPa.

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- .5 Work on partially embedded GFRP reinforcing bars shall continue only when the previously placed concrete has attained a minimum compressive strength of 20 MPa.
- .6 Prior to the deposition of concrete the positioning and securing of the GFRP reinforcing bars shall be inspected and approved by the Engineer.

1306.5. 3 Support of Reinforcement

.1 Bar Supports

- .1 Bar supports shall have sufficient strength and stiffness to carry the loads from the reinforcement, construction crew and concrete pressures without failure, displacement or significant deformation.
- .2 Bar supports shall be spaced such that any sagging between supports shall not reduce the specified concrete cover.
- .3 Bar supports shall be made of plastic.
 - .1 Commercially available precast concrete bar supports, or Engineer approved equivalent, shall be used for bar supports that are in contact with soil.

- .1 Precast concrete bar supports shall be made of concrete with a quality at least equal to that specified for the member into which the bar supports are integrated.

- .1 Geometry of bar support or embedded tie wires shall keep rebar securely fastened.

- .2 Stacking of bar supports shall not be permitted.

- .4 Bar supports shall be nonconductive and have a geometry and bond characteristics that deter the movement of moisture from the surface to the reinforcement,

- .5 Bar supports in contact with the soil shall have a base area of less than 10,000 mm².

.2 Side Form Spacers

- .1 Side form spacers shall have provisions to enable them to be firmly secured to the reinforcement.
- .2 Side form spacers shall meet the requirements of 1306.5.3.1, Bar Supports.

.3 Internal Spacers

- .1 Spacers for maintaining the specified distance between layers of reinforcement shall be made from reinforcing bars or steel rods.
 - .1 Spacers shall be positioned and securely fixed between the layers of reinforcement and shall not protrude in the cover concrete.

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.4 Cutting and Bending

- .1 Shearing of GFRP bars shall not be permitted. Bars may be cut using high speed cutter or diamond blade.
- .2 Bending of GFRP bars on site is not permitted.

.5 Protection

- .1 GFRP bars that are to be exposed after concrete pouring shall be protected from concrete laitance. Any wet concrete that is adhered to GFRP that is planned to be exposed shall be removed as soon as possible prior to the concrete laitance setting.

.6 Testing

- .1 Additional GFRP reinforcing bars, required to replace that altered by testing, shall be provided by the Owner under the terms of this Item, unless the GFRP reinforcing bars is shown, by testing, to be in non-conformance with the Specifications, then the GFRP reinforcing bars shall be provided by the Contractor.

.7 Tolerances

- .1 Unless otherwise specified in the Contract Documents, GFRP reinforcing bars shall be constructed within tolerances listed in Table 1306-1.
- .2 The tolerances listed in Table 1306-1 and those presented in Table 1384-1 for formwork are not cumulative.

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**Table 1306-1
GFRP reinforcing bars Tolerances**

Fabrication Tolerances	Cutting to length		(+) 10 mm, (-) 25 mm	
	Hooked bars	out-to-out of hooks	for 10M bars or smaller	± 10 mm
			for bars larger than 10M	+10 mm/ - 40 mm
	Spirals or circular ties	out-to-out dimension	± 5 mm	
	Column ties or stirrups	out-to-out dimension	± 5 mm	

Placing Tolerances	GFRP reinforcing bars shall be placed in specified positions within the following tolerances unless otherwise noted in the Contract Documents:	
	Where the depth (d) of a flexural member, the thickness of a wall or slab or the smallest dimension of a column is:	
	200 mm or less	± 3 mm
	200 mm to 750 mm	± 6 mm
	more than 750 mm	± 10 mm
	Longitudinal locations of bends and ends of bars	± 25 mm *
	*Note: Cover may not be reduced by more than 10 mm or increased by more than 20 mm at the end of a member.	

Spacing Tolerances	GFRP reinforcing bars shall be spaced at the specified spacing within the following tolerances unless otherwise noted in the Contract Documents			
	Footings		± 10 mm	
	Columns	notwithstanding the stated tolerance, all column bars must be in contact with spirals in round columns, and must be in contact with stirrups and in corners of stirrups for rectangular columns	± 10 mm	
	Deck bars and walls		± 10 mm	
	Tee beams	notwithstanding the stated tolerance, all bars must be in contact with stirrups and in the corners and hooks	± 10 mm	

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Bar Cover Tolerances		± 10 mm

1306.6 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the lineal metres of GFRP reinforcing bars supplied and placed in accordance with this Item.
- .2 The quantity of spacer bars or frame-up bars shall be included in the number of lineal metres of bars supplied and installed.

1306.7 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of GFRP reinforcing bars, as identified under the Contract.
- .2 The Owner may make partial payment for GFRP reinforcing bars in accordance with 1382.7.
- 3 The cost of the provision of materials, labour and Equipment to test the GFRP reinforcing bars to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the material does not meet the Specifications, otherwise the Owner shall bear the cost of the test.
 - .1 The cost of any retesting to resolve the supply of the specified GFRP reinforcing bars shall be borne by the Contractor.

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EXTERNAL FRP REINFORCING WRAPS

ITEM: 1307

1307.1 DESCRIPTION

- .1 This Item consists of supply and placement of external FRP reinforcing wrap.

1307.2 REFERENCES

1307.2 .1 American Concrete Institute (ACI)

- .1 ACI PRC-440-R07, Report on Fibre reinforced Polymer Reinforcement for Concrete Structures.
- .2 ACI PRC-440.2-17, Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures.
- .3 ACI PRC-440.3-12, Guide Test Methods for Fiber-Reinforced Polymers (FRPs) for Reinforcing or Strengthening Concrete Structures.
- .4 ACI SPEC-440.8-13, Specification for Carbon and Glass Fiber-Reinforced Polymer Materials Made by Wet Layup for External Strengthening.

1307.2 .2 Canadian Standards Association (CSA International)

- .1 CSA S6-19, Canadian Highway Bridge Design Code.
- .2 CSA S806-12 (R2021), Design and Construction of Building Components with Fibre Reinforced Polymers
- .3 CSA S807-19, Specifications for Fibre Reinforced Polymers.
- .4 CSA S808-14(R2019), Specifications for Fibre-Reinforced Polymer (FRP) Material for Externally Reinforcing Structures.

1307.2 .3 American Standards Testing Methods (ASTM) International

- .1 ASTM C531 - 18 Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
- .2 ASTM D570-22 Standard Test Method for Water Absorption of Plastics
- .3 ASTM C579 - 18 Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
- .4 ASTM C638 - 20 Standard Descriptive Nomenclature of Constituents of Aggregates for Radiation-Shielding Concrete.
- .5 ASTM C882 / C882M - 20 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
- .6 ASTM D638 - 22 Standard Test Method for Tensile Properties of Plastics.
- .7 ASTM D695 - 15 Standard Test Method for Compressive Properties of Rigid Plastics.

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- .8 ASTM D790 - 17 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- .9 ASTM D3039 / D3039M - 17 Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials.
- .10 ASTM D4258 - 05(2017) Standard Practice for Surface Cleaning Concrete for Coating.
- .11 ASTM D4259 - 18 Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application.
- .12 ASTM D4260 - 05(2017) Standard Practice for Liquid and Gelled Acid Etching of Concrete.
- .13 ASTM D7522/D7522M-21 Standard Test Method for Pull-Off Strength for FRP Laminate Systems Bonded to Concrete Substrate.
- .14 ASTM D7565/D7565M-10(2017) Standard Test Method for Determining Tensile Properties of Fiber Reinforced Polymer Matrix Composites Used for Strengthening of Civil Structures.
- .15 ASTM D7616/D7616M-11(2017) Standard Test Method for Determining Apparent Overlap Splice Shear Strength Properties of Wet Lay-Up Fiber-Reinforced Polymer Matrix Composites Used for Strengthening Civil Structures
- .16 ASTM D7905 / D7905M - 19e1 Standard Test Method for Determination of the Mode II Interlaminar Fracture Toughness of Unidirectional Fiber-Reinforced Polymer Matrix Composites
- .17 ASTM D7958/D7958M-17 Standard Test Method for Evaluation of Performance for FRP Composite Bonded to Concrete Substrate using Beam Test

1307.2 .4 The Society for Protective Coatings (SSPC)

- .1 SSPC-SP 5 (WAB) /NACE WAB-1-2015, White Metal Wet Blast Cleaning.
- .2 SSPC-SP 5/NACE No. 1-2006, White Metal Blast Cleaning
- .3 SSPC-SP 6 (WAB)/NACE WAB-3-2015, Commercial Wet Blast Cleaning
- .4 SSPC-SP 6/NACE No. 3-2006, Commercial Blast Cleaning
- .5 SSPC-Paint 39-2015, Two-Component Aliphatic Polyurea Topcoat Fast or Moderate Drying, Performance Based.

1307.2 .5 The International Concrete Repair Institute (ICRI)

- .1 ICRI Technical Guideline 310.2R-2013 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair

1307.3 MATERIALS

- .1 All material shall be supplied by the Contractor.

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- .2 Epoxy primer shall meet the requirements of ASTM D638, D695 and D790.
- .3 Underwater epoxies shall meet the requirements of ASTM C882, D570, D579 and D638.
- .4 All epoxy resins shall meet the requirements of CSA 807 and S808, ACI 440.8, and ASTM D638, D695 and D 790.
- .5 All fibre reinforced polymer (FRP) external reinforcing systems shall be new and shall conform to current CSA, ACI, ASTM standards.
- .6 Coating systems for UV protection, as required or as indicated, shall meet the requirements of SSPC.

1307.4

SUBMITTALS

- .1 The Contractor shall submit the manufacturer's Quality Control Certification for all materials delivered to the site prior to placement of FRP external reinforcing systems. The report shall include production information, including:
 - .1 Supplier
 - .2 Lot number of FRP Sheets.
 - .3 Batch number of resin
 - .4 Batch number of epoxy primers/pastes
 - .5 The start and end date of production for each production lot of material
- .2 The Contractor shall provide testing reports documenting the following:
 - .1 Number of samples tested in each lot
 - .2 Mean, standard deviation and minimum values for the following properties (as applicable):
 - .1 tensile properties (strength, yield, strain, modulus, elongation, ultimate, etc., etc.)
 - .2 compressive properties (yield, strain, modulus, elongation, ultimate, etc., etc.)
 - .3 flexural properties (strength, yield, strain, modulus, elongation, ultimate, etc., etc.)
 - .4 shear properties (strength, yield, strain, modulus, elongation, ultimate, etc., etc.)
 - .5 slant shear bond strength
 - .6 water absorption
 - .7 interlaminar shear bond strength
 - .8 shear strength of overlaps
 - .3 Supply test reports at no additional cost to the contract.
- .3 Submit shop drawings in accordance with section 1383.
- .4 Indicate location, lengths, lap dimensions and connection details.

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1307.5 CONSTRUCTION

1307.5 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall handle and store the FRP material in a manner that ensures it is not damaged or contaminated with dirt or other materials.
- .3 FRP material shall be stored on skids at least 150 mm above ground and adequately covered.

1307.5 .2 Surface Preparation

- .1 Immediately before placing FRP material, the surface shall be prepared in accordance with the following:
 - .1 Steel shall be grit blasted to SSPC Standard in accordance with the manufacturer's recommendations and specifications.
 - .2 Concrete shall be prepared in accordance with ICRI Standard 310.2 and ASTM D 4258. Concrete cracks greater than 3 mm (0.1 inches) in width shall be epoxy injected prior to application of the external reinforcement.
 - .3 Timber shall be free from marine growth and laitance and shall be prepared in accordance with the manufacturer's recommendations and specifications.
- .2 In all cases, the quality of the surface preparation shall be in accordance with the manufacturer's recommendations and specifications. In the event of a conflict, the most stringent provisions shall apply.
- .3 Prior to the placement of FRP external reinforcement, the surface preparation shall be inspected and approved by the manufacturer's technical representative and the Engineer.

1307.5 .3 Application of FRP External Reinforcement

.1 Primer

- .1 Primer shall be compatible with the external reinforcement system being applied.
- .2 Mix the epoxy primer or marine epoxy paste as per the manufacturer's instructions.
- .3 Apply primer/paste as indicated by the manufacturer's literature and specifications.
- .4 Do not apply primer when ambient temperature falls below 5°C or is above 35° C.
- .5 Apply appropriate primer material for underwater applications as required.

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2 FRP External Reinforcement

- .1 Unroll the fabric and cut the desired length and width with scissors. Do not fold the fabric as this will cause the fibres to break. The fabric must be at all times protected from grease, dust and other contaminants.
- .2 Mix the saturant in accordance with the manufacturer's specifications.
- .3 Lay the fabric flat on a clean and dry surface and hand apply the saturant until the fabric is fully saturated. The fabric should be covered with a thickness of 3 mm of paste on each side.
- .4 Carefully transport the saturated fabric underwater and press the fabric onto the structure. The fabric should be worked on the substrate to prevent air entrapment. If the fabric is installed to fully wrap a pile, then each successive horizontal layer shall have an overlap of 150 mm minimum or more as prescribe by the engineers.
- .5 If needed add another layer of FRP reinforcement wrap over the fabric manually.
- .6 Leave the fabric to cure at least 24 hours. If the structure is exposed to water movement or current protect the fabric by wrapping it in plastic protection. Remove the plastic wrapping once the resin is cured.

.3 Topcoat Installation

- .1 Prior to topcoat application, the surface of the FRP external reinforcing wrap shall be fully cured to a tack-free state.
- .2 Topcoat shall be either a two-part polyurethane topcoat or an acrylic UV protection topcoat.
- .3 Topcoats shall be mixed and applied in strict accordance with the manufacturer's specifications and recommendations.

1307.6

MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the square metres of external FRP reinforcing wrap supplied and placed in accordance with this Item.
- .2 The measurement shall be inclusive of all layers of FRP reinforcement wrap installed; that is, second, and subsequent, layers that are required by the contract documents or by the manufacturer's engineer shall not be measured or paid for separately.

1307.7

BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of external FRP reinforcing wrap, as identified under the Contract.
- .2 The cost of the provision of materials, labour and equipment to test the external FRP reinforcing wraps to resolve disagreement between the Owner and the

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Contractor shall be borne by the Contractor if the test results show that the material does not meet the Specifications, otherwise the Owner shall bear the cost of the test.

- .1 The cost of any retesting to resolve the supply of the specified external FRP reinforcing wrap shall be borne by the Contractor.

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EXTERNAL CORROSION PREVENTION/SEALING SYSTEMS

ITEM: 1308**1308.1 DESCRIPTION**

- .1 This item consists of supplying and placing of external corrosion prevention / sealing systems on tubular structural members

1308.2 REFERENCES**1308.2 .1 American Standards Testing Methods (ASTM) International**

- .1 ASTM D4060-19, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.

1308.2 .2 The Society for Protective Coatings (SSPC)

- .1 SSPC-SP 2, Hand Tool Cleaning.
.2 SSPC-SP 3, Power Tool Cleaning.

1308.2 .3 The International Standards Organization (ISO)

- .1 ISO 1183-1:2019, Plastics — Methods for determining the density of non-cellular plastics.
.2 ISO 8501-1:2007, Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness.
.3 ISO 21809-3:2016, Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems.
.4 ISO 18797-2:2021, Petroleum, petrochemical and natural gas industries — External corrosion protection of risers by coatings and linings.
.5 ISO 868:2003, Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness).
.6 ISO 527-1:2019, Plastics — Determination of tensile properties.

1308.3 MATERIALS

- .1 All material shall be supplied by the Contractor.
.2 Corrosion prevention wrap shall meet the requirements of ISO 21809-3:2016.
.3 Mechanical protection systems shall meet the requirements of ISO 21809-3:2016.
.4 Mechanical protection systems shall have a minimum cured hardness of 70 Shore D (ISO 868).
.5 Mechanical protection systems shall have a minimum tensile strength of 250 MPa (ISO 527).

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- .6 Mechanical protection systems shall have an abrasion resistance < 0.11mm / 1000 cycles (ASTM D4060, CS-17).

1308.4 **SUBMITTALS**

- .1 The Contractor shall submit the manufacturer's Quality Control Certification for all materials delivered to the site prior to placement of external corrosion prevention systems. The report shall include production information, including:
 - .1 Supplier.
 - .2 Batch number of the corrosion prevention/sealing wrap.
 - .3 Batch number of tensile outerwrap.
 - .4 Batch number of mechanical protection wrap.
 - .5 The product dates for each lot number.
 - .6 Conformance to the production requirements, including:
 - .1 Viscosity of the corrosion prevention wrap.
 - .2 Thickness of the corrosion prevention wrap.
 - .3 Roll dimensions of the corrosion prevention wrap.
 - .4 Colour of the corrosion prevention wrap.

1308.5 **CONSTRUCTION**

1308.5 .1 **General**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall handle and store the materials in a manner that ensures they are not damaged or contaminated with dirt or other materials.
- .3 FRP material shall be stored on skids at least 150 mm above ground and adequately covered.

1308.5 .2 **Surface Preparation**

- .1 Immediately before applying corrosion prevention materials, the surface shall be prepared in accordance with the following:
 - .1 Steel shall be cleaned with a hand or power tool to SSPC SP2 or SP3 Standard in accordance with the manufacturer's recommendations and specifications.
 - .2 Existing polymeric coatings shall be lightly abraded with hand tools.
 - .3 All other substrates shall be cleaned of loose debris (e.g. marine growth, laitance) with hand or power tools in accordance with the manufacturer's recommendations and specifications.
- .2 In all cases, the quality of the surface preparation shall be in accordance with the manufacturer's recommendations and specifications. In the event of a conflict, the most stringent provisions shall apply.

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- .3 Prior to the placement of FRP external reinforcement, the surface preparation shall be inspected and approved by the manufacturer's technical representative and the Engineer.

1308.5 .3 Application of Corrosion Prevention System

.1 Corrosion Prevention Sealing Wrap

- .1 The corrosion prevention / sealing wrap shall be a polyisobutene-based viscoelastic material supplied in rolls.
- .2 The corrosion prevention / sealing wrap shall be temporarily affixed to the tubular member, overlapping at least 50mm onto the sound coating / substrate. A magnet or multiple applicators may be necessary.
- .3 The corrosion prevention / sealing wrap shall be applied by completing continuous circumferential wraps from the bottom of the coated area boundary to the top.
- .4 The overlap between consecutive wraps shall comply with the manufacturer's directions.
- .5 The wrap shall be applied with tension to minimize water and air entrapments.
- .6 The wrap shall be applied until it overlaps onto sound coating / substrate by at least 50mm above the coated area.

.2 Tensile Outerwrap

- .1 The tensile outerwrap shall be installed immediately following the application of the corrosion prevention / sealing wrap.
- .2 The tensile outerwrap shall be temporarily affixed to the tubular member, overlapping at least 20mm beyond the applied corrosion prevention / sealing wrap. A magnet or multiple applicators worker may be necessary.
- .3 The tensile outerwrap shall be applied by completing continuous circumferential wraps from the bottom of the coated area boundary to the top.
- .4 The overlap between consecutive wraps shall comply with the manufacturer's directions.
- .5 The wrap shall be applied with tension to minimize water and air entrapments.
- .6 The wrap shall be applied until it overlaps onto sound coating / substrate by at least 20mm above the applied corrosion prevention / sealing wrap

.3 Mechanical Protection Wrap

- .1 The mechanical protection wrap shall be applied by completing continuous circumferential wraps from the bottom of the coated area boundary to the top.
- .2 The overlap between consecutive wraps shall comply with the manufacturer's directions.
- .3 A temporary compression film shall be used if required by the manufacturer.

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1308.6 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the square metres of external corrosion prevention / sealing systems supplied and placed in accordance with this Item.
- .2 The measurement shall be inclusive of all layers of external corrosion prevention / sealing systems installed; that is, second, and subsequent, layers that are required by the contract documents or by the manufacturer's engineer shall not be measured or paid for separately.

1308.7 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of external corrosion prevention / sealing systems, as identified under the Contract.
- .2 The cost of the provision of materials, labour and equipment to test the external corrosion prevention / sealing systems to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the material does not meet the Specifications, otherwise the Owner shall bear the cost of the test.
 - .1 The cost of any retesting to resolve the supply of the specified external FRP reinforcing wrap shall be borne by the Contractor.

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STEEL H PILES

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1311.1 DESCRIPTION

- .1 This Item consists of the installation of steel H piles and the supply and installation of cap plates and pile points.

1311.2 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO)
- .1 AASHTO T298-15, Standard Method for Test of High-Strain Dynamic Testing of Piles.
- .2 International Standards Organization (ISO) (ANSI)
- .1 ISO 9013:2002, Thermal Cutting – Classification of Thermal Cuts – Geometric Product Specification and Quality Tolerances.
- .3 American Society for Testing and Materials (ASTM)
- .1 ASTM A992/A992M-22, Standard Specifications for Structural Steel Shapes.
- .4 Canadian Standards Association (CSA International)
- .1 CSA G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Steel/Structural Quality Steel.
- .2 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
- .3 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
- .4 CSA W59-18, Welded Steel Construction (Metal Arc Welding) (metric version).
- .5 CSA W178.2-18, Certification of Welding Inspectors.

1311.3 MATERIALS

- .1 Steel H-Piles shall be in accordance with the requirements of CAN/CSA G40.20/G40.21, Grade 350W and the stock lengths may vary from 6 to 18 metres depending on available stock at the time of the Contract.
- .2 All materials shall be supplied by the Contractor and delivered in sufficient length as to avoid splicing unless otherwise note in the drawings.
- .3 Steel used for pile cap plates shall meet the requirements of CAN/CSA G40.21, Grade 300W.
- .4 Cap plates and pile points for piles shall be supplied as shown on Standard Drawing 1311-1 and 1311-2.
- .1 Where there is another pile size indicated in the Contract Document, the Contractor shall supply the pile points and the respective pile cap plates

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fabricated in accordance with the details presented in the Contract Documents.

- .5 Piles shall be stored in an organized, straight and horizontal fashion to avoid permanent distortion. Caps and points shall be acceptably stored on pallets or blocked at least 150 mm off the ground.
- .6 Electrodes for the Shielded Metal Arc Welding (SMAW) process shall be certified by the Canadian Welding Bureau (CWB), conform to CSA W48, "Filler Metals and allied materials for metal arc welding", and be classified as E4918 or E4918-1.
- .7 Electrodes for the Flux Cored Arc Welding (FCAW) process shall be certified by the Canadian Welding Bureau (CWB), conform to CSA W48, and be classified as gas shielded, E49XT-XX or E49C-XX with a specified minimum Charpy V-Notch Impact Property equal to 27 Joules at -30 °C.
- .1 Electrodes shall have a diffusible hydrogen designator of H16 or less.

1311.4

SUBMITTALS

- .1 The Contractor shall submit, at least 7 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements. Mill test certificate reports shall be provided in accordance with 1383.3.
 - .1 Steel with boron content exceeding 0.0008% shall not be permitted.
- .2 The Contractor shall submit proof of certification for the welders and welding company conducting the Work, prior to commencing the Work.
 - .1 Welding within the Province of Prince Edward Island shall be performed by a welder holding a valid Qualified Welder's Certificate issued by the Canadian Welding Bureau in accordance with CSA W59.
 - .2 Welders shall be certified with the Canadian Welding Bureau for the weld type and positions related to the various metal fabrication elements
 - .3 Pile splicing and welding to piles of top plates and shoes shall be performed by a company certified with the Canadian Welding Bureau, CAN/CSA 47.1, Division 2.
- .3 The Contractor shall submit, for approval by the Engineer, their proposed weld procedures (as developed by their welding engineer) and their proposed electrodes for the FCAW process.
- .4 The Contractor shall submit, for review, at least 14 Days in advance of any pile installation, a detailed description and drawing of the proposed driving system(s) including, the manufacturer's specifications for the hammer and driving system including the leads proposed.
 - .1 The submission shall provide the full details of characteristics necessary to evaluate performance, including but not limited to: the manufacturer's name, type of hammer, rated energy per blow at the normal working rate, the mass of the striking parts of the hammer, the mass of the driving cap

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and the type and elastic properties of the hammer and pile cushion materials.

.2 The submission shall also include, but not be limited to, the following minimum requirements:

- .1 The leads employed shall be supported independent of the pile;
- .2 Impact of the pile driving hammer shall be axial and square with respect to pile axis; and
- .3 Leads shall be immobile during hammer operation but shall be capable of adjustment to accommodate changing the centre of gravity of the driving system during driving.

.5 Preparation and submission to DTI a copy of all pile driving records complete with a plan view indicating piece marks which correspond to the driving records.

.6 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

1311.5 CONSTRUCTION

1311.5 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall carry out the Work with a pile driving system(s) capable of developing the capacity as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .3 The Contractor shall install all cap plates and pile points, in accordance with the details presented on Standard Drawings 1311-1 and 1311-2.
- .4 The Contractor shall splice the pile sections in accordance with the Standard Drawings 1311-3, 1311-4 and 1311-5 and at the approved locations to meet the Work requirements in accordance with this Item.
- .5 Pile lengths as delivered to the site shall not contain any splices.

1311.5 .2 Pile Installation

- .1 The installation of each pile shall be subject to the approval of the Engineer who shall be the sole judge of the acceptability of each pile with respect to the final driving resistance, depth of penetration or other criteria used to determine the capacity of the pile.
- .2 The Contractor shall ensure that the piles are installed in accordance with the specified criteria, provided by the Engineer and based on the Contractor's approved driving system(s).
 - .1 During driving, pile heads showing evidence of damage such as curled flange tips which indicate that the pile stiffness is compromised, shall be

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trimmed immediately prior to finalizing, and immediately prior to each re-tapping sequence.

- .1 When the pile damage is evident only after removal of the hammer from the pile, the pile head shall be trimmed and the pile re-driven to the specified capacity.
- .2 If, in the opinion of the Engineer, the pile head damage results in unnecessary loss of Owner supplied material, or causes excessive uncertainty in estimating pile capacity; and is a result of misaligned, worn, or poorly fitting driving equipment, or improper pile driving technique; the Contractor shall adjust, modify or replace the driving equipment or methods so that further damage does not occur.
- .3 Followers shall only be used with the expressed written consent of the Engineer.
- .4 The first pile driven at any pile group location shall be driven to finalization, prior to commencing the driving of other pile(s) within the same group.
 - .1 Refusal criteria shall be a minimum of 10 blows per 25 mm of pile penetration, with a minimum 30 blows for the last 100 mm of pile penetration, using a hammer energy in the order of 350 N-M/cm² of pile net cross sectional area.
- .5 Any piles which become displaced as the result of the driving of adjacent piles shall be re-tapped to re-establish the finalization criteria and the specified capacity.
- .6 All piles shall be re-tapped and/or driven until it can be demonstrated that the permanent pile capacity meets or exceeds the specified capacity.
 - .1 All re-taps shall be conducted with a hammer warmed by applying a minimum of 20 blows on a pile other than the pile to be tested or any adjacent piles.
 - .2 Re-taps shall not be carried out within 24 hours of the end of the previous driving of that pile or any adjacent pile(s) within a clear distance of 3 m and forming part of the group.
 - .3 Re-taps shall, as a minimum, advance the pile a distance of 100 mm or reach a total of 30 blows whichever occurs first.
 - .4 Re-taps shall continue until 120% of the specified pile capacity has been achieved and upon re-tap this value does not fall below 100% of the specified pile capacity.
 - .5 The Contractor shall keep detailed field notes on all re-tapping tests to confirm that the above provisions have been met, prior to cutting the piles to final grade.

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- .7 The Contractor shall ensure that a minimum of 500 mm of pile length remains above the specified cut-off elevation after finalization and the Contractor shall cut all piles at the specified grade in a horizontal plane only after finalization of the pile has been approved by the Engineer.

1311.5 .3 Pile Installation Tolerances

- .1 The Contractor shall ensure that the pile remains within the specified tolerances throughout the entire length of the driven pile.
- .2 All piles shall be driven with a variation of not more than 10 mm/m from vertical or from the batter specified in the Contract Documents.
- .3 In no case shall the total variation exceed 100 mm from the specified location.
- .4 Pile tolerances shall be measured at the ground line and at the cut-off elevation and in no cases shall piles be loaded horizontally to move the pile within the specified tolerances.
- .5 For piles outside the specified tolerances, the Contractor shall submit a report, for the approval of the Engineer, stamped and signed by a Professional Engineer registered or licensed to practice in the Province of Prince Edward Island, detailing the findings and, if required, any corrective measure(s) to remedy the Work.
- .1 The Contractor shall carry out all remedial Work.

1311.5 .4 H Pile Splices, Cap Plate and Pile Point Connections, and Welds

- .1 Welding of field and shop splices for steel H piles, cap plate and pile point connections shall be by the SMAW or FCAW process.
- .2 The Engineer may request to have the welder tested or approved on the welding procedures outlined in the Specifications.
- .3 Basic electrodes of E480 classification that are not used within 4 hours after removal from ovens shall be dried for at least one hour at a temperature between 370 °C and 430 °C before being used.
- .4 Roughness of oxygen cut surfaces shall not be greater than that defined by the ANSI/AWS Surfaces Roughness Value of 1000.
- .1 Roughness exceeding this value and occasional notches or gouges, not more than 5 mm deep on otherwise satisfactory surfaces, shall be removed by machining or grinding.
- .2 Oxygen cut surfaces and edges shall be left free of adhering slag.
- .3 Corrections of defects shall be flared to the oxygen cut surface with a Slope not exceeding 1 in 10.
- .5 Defects of oxygen cut surfaces shall not be repaired by welding except with the express approval of the Engineer for correction of occasional notches or gouges less than 10 mm deep.

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- .1 These weld repairs shall be made by suitably preparing non-conforming surfaces, welding with basic electrodes not exceeding 4 mm in diameter, observing applicable SMAW requirements of 1311.5.5 and grinding the completed weld smooth and flush with adjacent surface to produce a satisfactory finish.
- .6 Joint Profiles shall be as detailed on Standard Drawings 1311-3, 1311-4 and 1311-5.
- .7 The workmanship of the assembly shall meet the standards of CAN/CSA W59.
- .8 Welding of steel made of CAN/CSA G40.21, Grade 300W of 20 mm thickness and under, shall not require preheating when base metal temperature is above 0° C.
 - .1 When base metal temperature is 0°C or lower, the base metal shall be preheated to at least 10°C and maintained at a minimum temperature of 10°C during welding.
- .9 Steel over 20 mm shall be preheated to 10°C before any welding is done.
- .10 No welding shall be done when the ambient temperature is lower than -18°C.
- .11 The preheating zone shall be a minimum of 75 mm on each side of the joint.
- .12 Protection shall be provided for welding under adverse weather conditions of wind and/or precipitation.
 - .1 All methods of protection shall be subject to the approval of the Engineer prior to any welding being carried out.
- .13 No pile shall be driven until the welded joint has been inspected and approved by the Engineer.
- .14 When piles have been welded within a heated enclosure during cold weather, the pile shall not be removed from this enclosure until the welded joint has cooled so that it is warm to the bare hand.

1311.5 .5 Procedures for Shielded Metal Arc Welding and Flux Cored Arc Welding

1311.5.5 .1 General

- .1 The details of welding procedure, workmanship and technique shall conform to CAN/CSA W59.
 - .1 The design and construction provisions for Cyclically Loaded Structures of Clause 12 of CAN/CSA W59 shall apply.
 - .2 The Work shall be positioned for flat position welding whenever practical.
 - .3 When welding in vertical positions progression for all passes shall be upward.
 - .4 Before welding over previously deposited metal, slag shall be removed, and welds and adjacent base metal shall be brushed clean.

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- .1 This requirement shall apply not only to successive layers but also to successive beads and to the crater area when welding is resumed after interruption.
- .5 Classification and size of electrodes, arc length, voltage and amperage shall be suitable for thickness of material, type of groove, welding positions and other circumstances pertaining to the Work.
- .1 Welding current shall be within the range recommended by the electrode manufacturer.
- .6 For SMAW, the maximum size of electrode, the maximum thickness of layers and the maximum size of one-pass fillets shall be as indicated in Table 1311-1.

**Table 1311-1
Criteria for Prequalified Joints using the SMAW Process**

Maximum size of Electrode	4 mm ϕ	All passes in vertical fillet and groove welds
	5 mm ϕ	All passes in overhead fillet and groove welds
		All passes in horizontal groove welds
		Root passes in grooves with backing where the root opening is less than 6 mm in flat position
		Root passes in grooves without backing in flat position
	6 mm ϕ	All passes for horizontal fillet welds
		Root passes for fillets in flat position
		Root passes in grooves with backing where the root opening is greater than 6 mm in flat position
Maximum Thickness of Layers	8 mm ϕ	All passes subsequent to root passes for fillet and groove welds made in the flat position
Maximum One-pass Fillet	6 mm	For root passes of groove welds with the minimum size being such as to prevent cracking
	5 mm	For subsequent layers of welds made in any position
Maximum One-pass Fillet	10 mm	In the flat position
	8 mm	In the horizontal or overhead positions
	12 mm	In the vertical position

- .7 For FCAW the maximum size of electrode, the maximum thickness of layers and the maximum size of one-pass fillets shall be as indicated in Table 1311-2

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**Table 1311-2
Criteria for Prequalified Joints using the FCAW Process**

Maximum size of Electrode	4 mm ϕ	All passes in flat and horizontal positions
	2.4 mm ϕ	For the vertical position
	2.0 mm ϕ	For the overhead position
Maximum Thickness of Layers	6 mm	All weld layers except for root and surface layers A multiple pass, split-layer technique shall be used in making all multiple pass welds when the width of the layer exceeds 22 mm
Maximum One-pass Fillet weld	12 mm	In the flat and vertical positions
	10 mm	In the horizontal position
	8 mm	In the overhead position

1311.5.5 .2 Details

- .1 Butt joint groove welds, except those produced with the aid of backing, shall have the root of the initial weld air carbon arc gouged, chipped or ground to sound metal before welding is started from the second side.
 - .1 Particular care shall be taken in the gouging, chipping or grinding operation so that the remaining weld metal or base metal is not nicked or undercut.
 - .2 Defective portions of the weld shall be removed without substantial removal of the base metal.
- .2 Groove welds made with the use of backing shall have the weld metal thoroughly fused with the backing.
- .3 Steel H pile splice groove welds shall be terminated at ends of a joint in a manner to ensure sound welds by use of extension bars or runoff tabs.
 - .1 Extensions shall be removed upon completion and cooling of the weld, and the ends of the weld made smooth and flush with the edges of the abutting parts.
- .4 When tack welds are used for alignment, care shall be exercised by properly grinding or preparing stops and starts to make continuous welding satisfactory.
- .5 Flux, pin holes, craters, visual surface defects and excessive crown shall be removed before depositing the next layer of weld.
- .6 Stringer beads shall be used for horizontal welds.

1311.5.6 Inspection of Welds

1311.5.6 .1 Inspection and Testing of Welds

- .1 The procedure and technique for visual and non-destructive testing shall be in accordance with CAN/CSA W59, Clauses 7 and 8.

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- .2 Inspection and Testing Organizations shall demonstrate to the Engineer that the methods they propose to use for non-destructive testing are suitable, and meet one of the following requirements:
 - .1 The methods for non-destructive testing shall be as approved by the Province of Prince Edward Island.
 - .2 The Welding Inspection Organization shall be certified to CSA W178.1, Certification of Welding Inspection Organizations.
- .3 Guided bend tests shall be carried out on coupons in accordance with CAN/CSA W47.1 Section 8.5 and shall be tested by the Engineer.
 - .1 Runoff tabs required for bend tests shall be made of the same material and thickness as the H pile.
 - .2 Guided bend test coupons may be taken from the actual pile splice by removing the coupon from a steel H pile splice.
 - .3 If the Engineer determines that a guided bend test coupon fails to meet the standard, he/she may then test sufficient coupons as she/he feels are necessary to provide assurance that the balance of the welding is satisfactory.
 - .4 The preparation of these test coupons shall be done by the Contractor before the pile splice is driven below the ground.
 - .5 The Contractor shall restore the pile to its original condition, if the weld is acceptable.
 - .6 The length of the weld on 75 mm long runoff tabs shall be a minimum of 65 mm.

1311.5.6 .2 Frequency of Inspection and Testing

- .1 All welds shall be inspected visually.
- .2 Testing shall be carried out by the Contractor as follows:
 - .1 A minimum of 25% of full penetration groove welds and steel H pile splices shall be tested by non-destructive testing methods (radiographic and/or ultrasonic test methods and supplemented by magnetic particle or liquid penetrant test methods as required) to assure the soundness and quality level of the welds.
 - .2 A minimum of 25% of fillet welds shall be tested by non-destructive testing methods (magnetic particle and/or liquid penetrant test methods) to assure the soundness and quality level of the welds.
 - .3 Welds in steel H pile splices may also be tested by guided bend tests on specimens made from a portion of field spliced material removed from the H pile.

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- .1 These specimens shall have the backing removed by mechanical means or by flame cutting to within 3 mm of its thickness followed by grinding or machining.
- .2 All guided bend test coupons shall be stamped by the welder.
- .3 Non-destructive testing may be performed on coupons instead of guided bend tests.
- .4 If defects are identified that are outside the criteria specified in 1311.5.6.3, the Engineer shall determine the additional percentage of testing that shall be carried out to ensure the soundness and quality level of all the welds.
- .5 All corrected welds are to be retested.

1311.5.6 .3 Quality of Welds

- .1 The quality of welds in steel H pile splices shall be in accordance with CAN/CSA W59, Section 12, clause 12.5.4.
- .2 The acceptance criteria for defects shall be in accordance with CAN/CSA W59 clause 12.5.4 and shall meet the limits described in this clause for tension welds.
- .3 The quality of weld required for guided bend tests shall be in accordance with CAN/CSA W47.1, clauses 8.5 and 8.6.

1311.5 .7 Dynamic Pile Testing

- .1 Three piles driven at the first substructure location, or as specifically directed by the Engineer, shall be dynamically tested during driving for measurement and estimation of mobilized resistance, hammer performance, pile stress and soil dynamic properties at the end of initial driving and during all re-taps.
- .2 Dynamic testing shall also be conducted in accordance with 1311.5.7.1 for temporary bridge structures.
- .3 The Engineer, based on the results of dynamic testing and analysis, shall determine the pile acceptance criteria.
- .4 The Contractor shall notify the Engineer at least 7 Days in advance of the pile driving operations.
- .5 The Contractor shall be responsible for arranging and carrying out the testing by an independent third party. This shall be considered incidental to the works and no additional compensation will be considered.
- .6 The testing procedure shall be carried out in accordance with AASHTO T298-15.
- .7 The Contractor shall provide the Engineer with reasonable means of access to the pile for attaching instruments, with the pile in the leads.
 - .1 The Contractor shall provide a work platform, minimum size of 1.2 m by 1.2 m, capable of being raised to the top of the pile.

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- .2 The Engineer shall require approximately one hour per pile, per test, to attach the instruments.
- .8 The Contractor shall supply an electrical power supply of 20 Ampere, 115 Volts, 60 Hz, AC, for use by the Engineer during the tests.
 - .1 Field generators shall be equipped with functioning voltage and frequency meters and shall only supply electrical power for the pile testing.
- .9 The Contractor shall provide the Engineer with access for a motor vehicle (van) within 15 m of the pile test or a shelter within the same distance.
 - .1 The shelter shall have a minimum floor size of 2.5 m by 2 m, a minimum ceiling height of 2 m, and the interior temperature shall be maintained above 10°C.
- .10 With the dynamic testing equipment attached to the pile, the Contractor shall drive to end of initial driving and re-tap the pile with a hammer of the specified size, as directed by the Engineer.
- .11 Stresses in the pile shall be monitored during driving to ensure that the stresses do not exceed 90% of the pile steel yield stress.
 - .1 If directed by the Engineer, the Contractor shall reduce the driving energy delivered to the pile by means of cushion or helmet modifications, or by reducing the energy output of the hammer.
 - .2 If non-axial driving is indicated by the measurements, the Contractor shall immediately realign the driving system.

1311.6 **MEASUREMENT FOR PAYMENT**

- .1 The Quantity to be measured for payment shall be the number of linear metres of piles supplied and/or driven in accordance with this Item.
- .2 All piles shall be measured for payment for supply based on total length supplied to the project. Payment for piles driven shall only be made after all piles in any group or in close proximity to any other pile have been finalized and no further driving in the pile group shall be required.
- .3 The length of driven pile to be measured for payment shall be the difference between the design cut-off elevation and the actual field toe elevation measured along the centreline axis of the pile.

1311.7 **BASIS OF PAYMENT**

- .1 Payment for Work under this Item shall include a separate Unit Price for each size of steel H pile, as identified under the Contract.
- .2 The Owner may make partial payment in accordance with 1382.7 for steel H pile stored at the Work Site.
- .3 Splices and shoes, approved by the Engineer, shall be considered incidental to the work.

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- .4 The cost of the provision of materials, labour and Equipment to test the welds shall be borne by the Contractor if the test results show that the material does not meet the specified requirements, otherwise the Owner shall bear the cost of the test.
- .1 The cost of any testing to resolve the quality of welds shall be borne by the Contractor.
- .5 Re-tapping in excess of four operations, if required, shall be paid for in accordance with Clause 103.03.

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1312.1 DESCRIPTION

- .1 This Item consists of the supply and installation of steel pipe piles, including splicing as required, and the supply and installation of pile points.

1312.2 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO)
- .1 AASHTO T298-15, Standard Method for Test of High-Strain Dynamic Testing of Piles.
- .2 International Standards Organization (ISO) (ANSI)
- .1 ISO 9013:2002, Thermal Cutting – Classification of Thermal Cuts – Geometric Product Specification and Quality Tolerances.
- .3 American Society for Testing and Materials (ASTM)
- .1 ASTM A252/A252M-19, Standard Specification for Welded and Seamless Steel Pipe Piles.
- .2 ASTM A992/A992M-22, Standard Specifications for Structural Steel Shapes.
- .4 Canadian Standards Association (CSA International)
- .1 CSA G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Steel/Structural Quality Steel.
- .2 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
- .3 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
- .4 CSA W59-18, Welded Steel Construction (Metal Arc Welding) (metric version).
- .5 CSA W178.2-18, Certification of Welding Inspectors.

1312.3 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 Steel pipe piles shall have an OD as specified on the design drawings with 13 mm wall thickness conforming to ASTM A252, Grade 3 or as otherwise indicated in the Contract Documents.
- .3 Pile points shall be supplied as shown on Standard Drawing 1312-1 and the steel used for pile points shall meet the requirements of CAN/CSA G40.21 Grade 300W.
- .4 Piles shall be stored in an organized, straight and horizontal fashion with the bottom tier being blocked at least 150 mm off the ground and stickers placed between the

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tiers. Points shall be acceptably stored on pallets or stored at least 150 mm off the ground. Nylon or canvas slings shall be used to handle the pipe piles.

- .5 Electrodes for Shielded Metal Arc Welding (SMAW) process shall be certified by the Canadian Welding Bureau (CWB), conform to CSA W48, "Filler Metals and allied materials for metal arc welding", and be classified as E4918 or E4918-1.
- .6 Electrodes for the Flux Cored Arc Welding (FCAW) process shall be certified by the Canadian Welding Bureau (CWB), conform to CSA W48, and be classified as gas shielded, E49XT-XX or E49C-XX with a specified minimum Charpy V-Notch Impact Property equal to 27 Joules at -30°C.
 - .1 Electrodes shall have a diffusible hydrogen designator of H16 or less.
- .7 The protective coating shall meet the requirements of section 1307.

1312.4

SUBMITTALS

- .1 The Contractor shall submit, at least 7 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements. Mill test certificate reports shall be provided in accordance with 1383.2.
 - .1 Steel with boron content exceeding 0.0008% shall not be permitted.
- .2 The Contractor shall submit proof of certification for the welders and welding company conducting the Work, prior to commencing the Work.
 - .1 Welding within the Province of Prince Edward Island shall be performed by a welder holding a valid Qualified Welder's Certificate issued by the Canadian Welding Bureau in accordance with CSA W59.
 - .2 Welders shall be certified with the Canadian Welding Bureau for the weld type and positions related to the various metal fabrication elements
 - .3 Pile splicing and welding to piles of top plates and shoes shall be performed by a company certified with the Canadian Welding Bureau, CAN/CSA 47.1, Division 2.
- .3 The Contractor shall submit, for approval by the Engineer, their proposed weld procedures (as developed by their welding engineer) and their proposed electrodes for the FCAW process.
- .4 The Contractor shall submit, prior to the commencement of the protective coating Work, certification from the manufacturer of the GFRP wrap system, stating that the proposed method, equipment, and materials used in the blast cleaning are acceptable.
- .5 The Contractor shall submit, for review, at least 14 Days in advance of any coating application, the applicator's name and schedule of Work.
 - .1 The method of repair of a coating shall be submitted for approval 7 Days in advance of the repair.

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- .6 The Contractor shall submit, for approval, at least 14 Days in advance of any pile installation, a detailed description and drawing of the proposed driving system(s) including, the manufacturer's specifications for the hammer and driving system including the leads proposed.
- .1 The submission shall provide the full details of characteristics necessary to evaluate performance, including but not limited to the manufacturer's name, type of hammer, rated energy per blow at the normal working rate, the mass of the striking parts of the hammer, the mass of the driving cap and the type and elastic properties of the hammer and pile cushion materials.
- .2 The submission shall also include, but not be limited to, the following minimum requirements:
 - .1 The leads employed shall be supported independent of the pile.
 - .2 Impact of the pile driving hammer shall be co-axial and square with respect to pile centreline axis.
 - .3 Leads shall be immobile during hammer operation but shall be capable of adjustment to accommodate changing the centre of gravity of the driving system during driving.
- .7 Preparation and submission to TI a copy of all pile driving records complete with a plan view indicating piece marks which correspond to the driving records.
- .8 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

1312.5 CONSTRUCTION

1312.5 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall carry out the Work with a pile driving system(s) capable of developing the capacity as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .3 The Contractor shall fabricate and install all pile points, in accordance with the details presented on Standard Drawing 1312-1 or Standard Drawing 1312-2.
- .4 The Contractor shall splice the pile sections in accordance with Standard Drawing 1312-3 and at the approved locations to meet the Work requirements in accordance with this Item.
- .5 Pile lengths as delivered to the site shall not contain any splices.
- .6 The Contractor must take special care during handling and driving operations to minimize damage to the pile protective coatings.
 - .1 Any damage done to the coatings of the pipe pile casings shall be repaired to the satisfaction of the Engineer prior to driving the pile.

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1312.5 .2 Protective Coating System

- .1 Permanent steel pipe piles at all pier locations shall have a protective coating system, consisting of an external FRP reinforcing wrap system in accordance with Section 1307.
- .2 GFRP coatings shall be applied after pile driving operations have ceased.
- .3 Vertical extend of wrap shall be from underside of pier cap to 1.0m below LLWLT elevation.

1312.5 .3 Pile Installation

- .1 The installation of each pile shall be subject to the approval of the Engineer who shall be the sole judge of the acceptability of each pile with respect to the final driving resistance, depth of penetration or other criteria used to determine the capacity of the pile.
- .2 The Contractor shall ensure that the piles are installed in accordance with the specified criteria, provided by the Engineer and based on the Contractor's approved driving system(s).
 - .1 During driving with an external hammer, pile heads showing evidence of damage such as curled pipe wall which indicate that the pile stiffness is compromised, shall be trimmed immediately prior to finalizing, and immediately prior to each re-tapping sequence.
 - .1 When the pile damage is evident only after removal of the hammer from the pile, the pile head shall be trimmed and the pile re-driven to the specified capacity.
 - .2 If, in the opinion of the Engineer, the pile head damage causes excessive uncertainty in estimating pile capacity; and is a result of misaligned, worn, or poorly fitting driving equipment, or improper pile driving technique; the Contractor shall adjust, modify or replace the driving equipment or methods so that further damage does not occur.
- .3 Followers shall only be used with the express consent of the Engineer.
- .4 The first pile driven at any pile group location shall be driven to finalization, prior to commencing the driving of other pile(s) within the same group.
 - .1 Refusal criteria shall be a minimum of 10 blows per 25 mm of pile penetration, with a minimum 30 blows for the last 100 mm of pile penetration, using a hammer energy in the order of 350 N-M/cm² of pile net cross sectional area.
- .5 Any piles which become displaced as the result of the driving of adjacent piles shall be re-tapped to re-establish the finalization criteria and the specified capacity.

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- .6 All piles shall be re-tapped and/or driven until it can be demonstrated that the permanent pile capacity meets or exceeds the specified capacity.
 - .1 All re-taps shall be conducted with a hammer warmed by applying a minimum of 20 blows on a pile other than the pile to be tested or any adjacent piles.
 - .2 Re-taps shall not be carried out within 24 hours of the end of the previous driving of that pile or any adjacent pile(s) within a clear distance of 3 m and forming part of the group.
 - .3 Re-taps shall, as a minimum, advance the pile a distance of 100 mm or reach a total of 30 blows whichever occurs first.
 - .4 Re-taps shall continue until 120% of the specified pile capacity has been achieved and upon re-taps this value does not fall below 100% of the specified pile capacity.
 - .5 The Contractor shall keep detailed field notes on all re-tapping tests to confirm that the above provisions have been met, prior to cutting the piles to final grade.
- .7 The Contractor shall ensure that a minimum of 500 mm of pile length remains above the specified cut-off elevation after finalization and the Contractor shall cut all piles at the specified grade in a horizontal plane only after finalization of the pile has been approved by the Engineer.
- .8 Place Type "C" concrete within the entire inside area and full height of all new structure piles.

1312.5 .4 **Pile Installation Tolerances**

- .1 The Contractor shall ensure that the pile remains within the specified tolerances throughout the entire length of the driven pile.
- .2 The Contractor shall be responsible for removing all foreign materials and water from within the entire length of the pile.
- .3 All piles shall be driven with a variation of not more than 10 mm/m from vertical or from the batter specified in the Contract Documents.
- .4 In no case shall the total variation exceed 100 mm from the specified location.
- .5 Pile tolerances shall be measured at the ground line and at the cut-off elevation and in no case shall piles be loaded horizontally to move the pile within the specified tolerances.
- .6 For piles outside the specified tolerances, the Contractor shall submit a report, for the approval of the Engineer, stamped and signed by a Professional Engineer registered or licensed to practice in the Province of Prince Edward Island, detailing the findings and, if required, any corrective measure(s) to remedy the Work.
 - .1 The Contractor shall carry out all remedial Work.

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1312.5 .5 Pipe Pile Splices, Pile Point Connections, and Welds

- .1 Welding of field and shop splices for steel pipe piles and pile point connections shall be by the SMAW or FCAW process.
- .2 The Engineer may request to test or otherwise have the welder approved on the procedures outlined in the Specifications.
- .3 Basic electrodes of E480 classification that are not used within 4 hours after removal from ovens shall be dried for at least one hour at a temperature between 370 °C and 430 °C before being used.
- .4 Roughness of oxygen cut surfaces shall not be greater than that defined by the ANSI/AWS Surfaces Roughness Value of 1000.
 - .1 Roughness exceeding this value and occasional notches or gouges, not more than 5 mm deep on otherwise satisfactory surfaces, shall be removed by machining or grinding.
 - .2 Oxygen cut surfaces and edges shall be left free of adhering slag.
 - .3 Corrections of defects shall be flared to the oxygen cut surface with a Slope not exceeding 1 in 10.
- .5 Defects of oxygen cut surfaces shall not be repaired by welding except with the express approval of the Engineer for correction of occasional notches or gouges less than 10 mm deep.
 - .1 These weld repairs shall be made by suitably preparing non-conforming surfaces, welding with basic electrodes not exceeding 4 mm in diameter, observing applicable SMAW requirements of 1312.5.6 and grinding the completed weld smooth and flush with adjacent surface to produce a satisfactory finish.
- .6 The joint detail of the complete penetration groove weld for the butt joint in pipe piles shall be that as shown on Standard Drawing 1312-2.
- .7 The workmanship of the assembly shall meet the standards of CAN/CSA W59.
- .8 Welding of steel pipe piles shall not require preheating when base metal temperature is above 0 °C.
 - .1 When the base metal temperature is 0 °C or lower, the base metal shall be preheated to at least 10 °C and maintained at this minimum temperature during welding.
- .9 No welding shall be done when the ambient temperature is lower than 18 °C.
- .10 The preheating zone shall be a minimum of 75 mm on each side of the joint.
- .11 No welding shall be done when there is a wind and/or when it is raining unless proper protection is provided.
 - .1 All methods of protection shall be subject to the approval of the Engineer prior to any welding being carried out.

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- .12 No pile shall be driven until the welded joint has been inspected and approved by the Engineer.
- .13 When piles have been welded within a heated enclosure during cold weather, the pile shall not be removed from this enclosure until the welded joint has cooled so that it is warm to the bare hand.

1312.5 .6 Procedure for Shielded Metal Arc Welding and Flux Cored Arc Welding

1312.5.6 .1 General

- .1 The details of welding procedure, workmanship and technique shall conform to CAN/CSA W59.
 - .1 The design and construction provisions for Cyclically Loaded Structures of Clause 12 of CAN/CSA W59 shall apply.
- .2 The Work shall be positioned for flat position welding whenever practical.
- .3 When welding in vertical positions progression for all passes shall be upward.
- .4 Before welding over previously deposited metal, slag shall be removed, and welds and adjacent base metal shall be brushed clean.
 - .1 This requirement shall apply not only to successive layers but also to successive beads and to the crater area when welding is resumed after interruption.
- .5 Classification and size of electrodes, arc length, voltage and amperage shall be suitable for thickness of material, type of groove, welding positions and other circumstances pertaining to the Work.
 - .1 Welding current shall be within the range recommended by the electrode manufacturer.
- .6 For SMAW, the maximum size of electrode, the maximum thickness of layers and the maximum size of one-pass fillets shall be as indicated in Table 1312-1.
- .7 For FCAW the maximum size of electrode, the maximum thickness of layers and the maximum size of one-pass fillets shall be as indicated in Table 1312-2.

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**Table 1312-1
Criteria for Prequalified Joints using the SMAW Process**

Maximum size of Electrode	4 mm ϕ	All passes in vertical fillet and groove welds
	5 mm ϕ	All passes in overhead fillet and groove welds
		All passes in horizontal groove welds
		Root passes in grooves with backing where the root opening is less than 6 mm in flat position
		Root passes in grooves without backing in flat position
	6 mm ϕ	All passes for horizontal fillet welds
		Root passes for fillets in flat position
		Root passes in grooves with backing where the root opening is greater than 6 mm in flat position
	8 mm ϕ	All passes subsequent to root passes for fillet and groove welds made in the flat position
Maximum Thickness of Layers	6 mm	For root passes of groove welds with the minimum size being such as to prevent cracking
	5 mm	For subsequent layers of welds made in any position
Maximum One-pass Fillet	10 mm	In the flat position
	8 mm	In the horizontal or overhead positions
	12 mm	In the vertical position

**Table 1312-2
Criteria for Prequalified Joints using the FCAW Process**

Maximum size of Electrode	4 mm ϕ	All passes in flat and horizontal positions
	2.4 mm ϕ	For the vertical position
	2.0 mm ϕ	For the overhead position
Maximum Thickness of Layers	6 mm	All weld layers except for root and surface layers A multiple pass, split-layer technique shall be used in making all multiple pass welds when the width of the layer exceeds 22 mm
Maximum One-pass Fillet weld	12 mm	In the flat and vertical positions
	10 mm	In the horizontal position
	8 mm	In the overhead position

1312.5.6 .2 Details

- .1 Butt joint groove welds except those produced with the aid of backing shall have the root of the initial weld air carbon arc gouged, chipped or ground to sound metal before welding is started from the second side.

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- .1 Particular care shall be taken in the gouging, chipping or grinding operation so that the remaining weld metal or base metal is not nicked or undercut.
- .2 Defective portions of the weld shall be removed without substantial removal of the base metal.
- .2 Groove welds made with the use of backing shall have the weld metal thoroughly fused with the backing.
- .3 When tack welds are used for alignment, care shall be exercised by properly grinding or preparing stops and starts to make continuous welding satisfactory.
- .4 Flux, pin holes, craters, visual surface defects and excessive crown shall be removed before depositing the next layer of weld.
- .5 Stringer beads shall be used for horizontal welds.

1312.5 .7 Inspection of Welds

1312.5.7 .1 Inspection and Testing of Welds

- .1 The procedure and technique for visual and non-destructive testing shall be in accordance with CAN/CSA W59, Clauses 7 and 8.
- .2 Inspection and Testing Organizations shall demonstrate to the Engineer that the methods they propose to use for non-destructive testing are suitable, and meet one of the following requirements:
 - .1 The methods for non-destructive testing shall be as approved by the Province of Prince Edward Island.
 - .2 The Welding Inspection Organization shall be certified to CSA W178.1, Certification of Welding Inspection Organizations.
- .3 Guided bend tests shall be carried out on coupons in accordance with CAN/CSA W47.1 Section 8.5 and shall be tested by the Engineer.
 - .1 Guided bend test coupons may be taken from the actual pile splice by removing the coupon from a steel pipe pile splice.
 - .2 If the Engineer determines that a guided bend test coupon fails to meet the standard, he/she may then test sufficient coupons as she/he feels are necessary to provide assurance that the balance of the welding is satisfactory.
 - .3 The preparation of these test coupons shall be done by the Contractor before the pile splice is driven below the ground.
 - .4 The Contractor shall restore the pile to its original condition, if the weld is acceptable.

1312.5.7 .2 Frequency of Inspection and Testing

- .1 All welds shall be inspected visually.

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- .2 Testing shall be carried out by the Contractor as follows:
 - .1 A minimum of 25% of full penetration groove welds and steel pipe pile splices shall be tested by non-destructive testing methods (radiographic and/or ultrasonic test methods and supplemented by magnetic particle or liquid penetrant test methods as required) to assure the soundness and quality level of the welds.
 - .2 A minimum of 25% fillet welds may be tested by non-destructive testing methods (magnetic particle and/or liquid penetrant test methods) to assure the soundness and quality level of the welds.
- .3 Welds in steel pipe pile splices may also be tested by guided bend tests on specimens made from a portion of field spliced material removed from the pipe pile.
 - .1 These specimens shall have the backing removed by mechanical means or by flame cutting to within 3 mm of its thickness followed by grinding or machining.
 - .2 All guided bend test coupons shall be stamped by the welder.
 - .3 Non-destructive testing may be performed on coupons in lieu of guided bend tests.
- .4 If defects are identified that are outside the criteria specified in 1312.5.7.3, the Engineer shall determine the additional percentage of testing that shall be carried out to ensure the soundness and quality level of all the welds.
- .5 All corrected welds are to be retested.

.3 Quality of Welds

- .1 The quality of the welds in steel pipe pile splices shall be in accordance with CAN/CSA W59, Section 12, clause 12.5.4.
- .2 The acceptance criteria for defects shall be in accordance with CAN/CSA W59 clause 12.5.4 and shall meet the limits described in this clause for tension welds.
- .3 The quality of weld required for guided bend tests shall be in accordance with CAN/CSA W47.1, clauses 8.5 and 8.6.

1312.5 .8 Dynamic Pile Testing

- .1 Three piles, driven at the first substructure location, or as specifically directed by the Engineer, shall be dynamically tested during driving for measurement and estimation of mobilized resistance, hammer performance, pile stress and soil dynamic properties at the end of initial driving and during all re-taps.
 - .1 Piles to be tested shall be driven with an external hammer.
- .2 Dynamic testing shall also be conducted in accordance with 1312.5.8.1 for temporary bridge structures.
- .3 The Engineer, based on the results of dynamic testing and analysis, shall determine the pile acceptance criteria.

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- .4 The Contractor shall notify the Engineer at least 7 Days in advance of the pile driving operations.
- .5 The Contractor shall be responsible for arranging and carrying out the testing by an independent third party. This shall be considered incidental to the works and no additional compensation will be considered.
- .6 The testing procedure shall be carried out in accordance with AASHTO T298-15.
- .7 The Contractor shall provide the Engineer with reasonable means of access to the pile for attaching instruments, with the pile in the leads.
 - .1 The Contractor shall provide a work platform, minimum size of 1.2 m by 1.2 m, capable of being raised to the top of the pile.
 - .2 The Engineer shall require approximately one hour per pile, per test, to attach the instruments.
- .8 The Contractor shall supply an electrical power supply of 20 Ampere, 115 Volts, 60 Hz, AC, for use by the Engineer during the tests.
 - .1 Field generators shall be equipped with functioning voltage and frequency meters and shall only supply electrical power for the pile testing.
- .9 The Contractor shall provide the Engineer with access to a motor vehicle (van) within 15 m of the pile test or a shelter within the same distance.
 - .1 The shelter shall have a minimum floor size of 2.5 m by 2 m, a minimum ceiling height of 2 m, and the interior temperature shall be maintained above 10°C.
- .10 With the dynamic testing equipment attached to the pile, the Contractor shall drive to end of initial driving and re-tap the pile with a hammer of the specified size, as directed by the Engineer.
- .11 Stresses in the pile shall be monitored during driving to ensure that the stresses do not exceed 90% of the pile steel yield stress.
 - .1 If directed by the Engineer, the Contractor shall reduce the driving energy delivered to the pile by means of cushion or helmet modifications, or by reducing the energy output of the hammer.
 - .2 If non-axial driving is indicated by the measurements, the Contractor shall immediately realign the driving system

1312.6 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of linear metres of piles supplied and/or driven in accordance with this Item.
- .2 All piles shall be measured for payment for supply based on total length supplied to the project. Payment for piles driven shall only be made after all piles in any group or in close proximity to any other pile have been finalized and no further driving in the pile group shall be required.

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- .3 The length of driven pile to be measured for payment shall be the difference between the design cut-off elevation and the actual field toe elevation measured along the centreline axis of the pile.

1312.7

BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each size of steel pipe pile, as identified under the Contract.
- .2 The Owner may make partial payment in accordance with 1382.7 for steel pipe pile stored at the Work Site.
- .3 Splices and shoes and protective wrap, approved by the Engineer, shall be considered incidental to the work.
- .4 The cost of the provision of materials, labour and Equipment to test the welds shall be borne by the Contractor if the test results show that the material does not meet the specified requirements, otherwise the Owner shall bear the cost of the test.
- .1 The cost of any testing to resolve the quality of welds shall be borne by the Contractor.
- .5 Re-tapping in excess of four operations, if required, shall be paid for in accordance with Clause 103.03.

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STEEL SHEET PILE COFFERDAMS

ITEM: 1321

1321.1 DESCRIPTION

- .1 This Item consists of the design, supply and construction of all steel sheet pile cofferdam(s) required in the Contract.

1321.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A328/A328M-13a (2018), Standard Specification for Steel Sheet Piling.
 - .2 ASTM A992/A992M-22, Standard Specifications for Structural Steel Shapes.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Steel/Structural Quality Steel.
 - .2 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
 - .3 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
 - .4 CSA W59-18, Welded Steel Construction (Metal Arc Welding) (metric version).
 - .5 CSA W178.2-18, Certification of Welding Inspectors.

1321.3 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 All steel sheet pile shall conform to CAN/CSA G40.20 and G40.21 and, as a minimum, shall be Grade 300W steel.
- .3 The Contractor shall supply the sheet pile in lengths such that the toe elevation specified in the Contract Documents is achieved and an undamaged pile is provided up to the specified cofferdam flooding elevation with due consideration given to driving.
- .4 The Contractor may use welded steel sheet pile section(s) provided that:
 - .1 Welded splices in steel sheet pile shall conform to the requirements of CAN/CSA W59.
 - .2 Welded steel sheet pile splices shall be prequalified full penetration groove welds.
 - .3 Upon the request of the Engineer, the Contractor shall test a minimum of 25% of welded steel sheet pile splices by radiographic inspection.

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- .4 The acceptance for welded steel sheet pile splices shall be as specified in Clause 12 of CAN/CSA W59 for tension welds in dynamically loaded Structures.
- .1 If unacceptable weld defects are found in welded steel sheet pile splices, the Engineer shall reject the pile section, or
- .2 Subject to the approval of the Engineer, the Contractor may undertake to have the weld defects corrected and the splices retested.
- .5 The Contractor shall supply the corners for the cofferdam, in lengths as long as the sheet pile supplied.
- .6 Materials shall be stored in an organized, straight and horizontal fashion to avoid permanent deformation.

1321.4

SUBMITTALS

- .1 The Contractor shall be responsible for the design of the cofferdam and associated bracing and shall submit the design, in accordance with Item 1383.
- .1 The Contractor shall ensure that the dimensions of the cofferdam shall remain at least as large as that shown in the Contract Documents.
- .2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

1321.5

CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall design and construct all cofferdams to be adequately braced to withstand the anticipated design loadings and to be as watertight as practically possible.
- .3 Steel sheet piles in cofferdams constructed before or during the winter months of any year shall be pulled or cut off to final elevation before March 1st of the following year, unless otherwise approved in writing.
- .4 Work on cofferdams may not start until the June 15th of each year unless otherwise approved in writing.
- .5 Steel sheet piles shall be driven to conform with the limits as shown in the Contract Documents and as defined by 1321.4.1 and are subject to the tolerances indicated in Table 1321-1.

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**Table 1321-1
Cofferdam Sheet Pile Tolerances**

Horizontal alignment of walls	± 8 mm per metre of plan length of wall
Vertical Alignment of walls	± 10 mm per metre of vertical length of wall
Misplacement or Eccentricity	± 50 mm parallel to building line, or centreline of Bridge ± 75 mm perpendicular to building line or centreline of Bridge

- .6 Cofferdams tilted or moved out of position as per 1321.5.5, during driving shall be righted or enlarged to provide necessary clearance and proper location.
- .7 Cofferdam walls shall be vented to permit cofferdam flooding at an elevation not higher than the specified cofferdam high water design elevation.
- .8 Cross struts or bracing may extend through foundation concrete when indicated on the cofferdam design and having been approved by the Engineer.
- .9 Excavation shall not be made outside of cofferdams, and the existing stream bed adjacent to the structure shall not be disturbed, unless specifically permitted in the Contract Documents or in writing by the Engineer.
- .10 Steel sheet piles may remain in place as a part of the permanent structure or they may be removed at the option of the Contractor.
 - .1 When the steel sheet piles are to remain in place and form part of the permanent structure, the Contractor shall cut off the steel sheet piles evenly at the elevation indicated in the Contract Documents.
- .11 Superimposed loads shall not be placed on the surrounding soil immediately adjacent to cofferdam, unless specifically permitted in the Contract Documents, in writing by the Engineer or having been submitted as part of 1321.4.1.
- .12 The Contractor shall wait a minimum of 72 hours following the completion of the placing of underwater (tremie) concrete before dewatering the cofferdam unless otherwise altered and approved in writing by the Engineer.
- .13 The Contractor shall ensure that adequate dewatering is provided so that all concrete to be placed on top of the tremie concrete is placed in the dry.
- .14 The Contractor shall familiarize himself with all permits, Section 800 and any environmental conditions at the site prior to the commencement of the dewatering which may, at the discretion of others, influence the chosen style of operations.
 - .1 The Contractor shall be solely responsible for all compliance and undertakings relating to the dewatering discharge and shall maintain records of all pertinent dewatering discharge data required to verify and confirm continuous compliance with the permit parameters though out the period of the Work.
 - .2 The Contractor shall submit a Work plan outlining the scope of the proposed monitoring program and this program shall be of a form

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acceptable to Dept. of Communities, Land and Environment prior to the commencement of the Work.

- .3 A copy of all records shall be submitted to the Engineer on a weekly basis; however, the submission of this data does not relieve the Contractor of any responsibility with respect to the dewatering discharge.

1321.6 MEASUREMENT FOR PAYMENT

- .1 The design, supply and construction of all steel sheet pile cofferdam(s) in accordance with this Item shall be on a lump sum basis.

1321.7 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Lump Sum Price.
- .2 The Owner may make partial payment for steel sheet pile in accordance with 1382.7.
- .1 Partial payment for used steel sheet pile shall be calculated on 30% of the estimated purchase price for new steel sheet pile.
- .3 The cost of carrying out the radiographic testing under 1321.2.4.3 shall be shared equally by the Owner and the Contractor.
- .4 In the event that welded steel sheet pile splices are deficient under 1321.2.4, all additional testing and repair and retesting of these splices shall be at the Contractor's own expense.
- .5 If the Contractor's cofferdam design, submitted under 1321.4.1, results in cofferdam dimensions which are larger than the dimensions specified in the Contract Documents, the Contractor shall be responsible, at her/his own expense, to supply and place the additional concrete, in excess of the specified dimension, to complete the Work.

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EXCAVATION WITHIN COFFERDAMS

ITEM: 1322

1322.1 DESCRIPTION

- .1 This Item consists of the excavation of all materials within cofferdams.

1322.2 MATERIALS

- .1 None identified.

1322.3 SUBMITTALS

- .1 None identified.

1322.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 All material shall be excavated to the full dimension of the cofferdam.
- .3 All excavated materials from inside the cofferdam, shall become the property of the Contractor and shall be disposed of outside of the Work Site, in strict accordance with the Department of Communities, Land and Environment.
- .4 Pre excavation of the riverbed material shall not be permitted unless specifically noted as a requirement in the Contract Documents.

1322.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the volume in cubic metres of material excavated within cofferdams in accordance with this Item.

1322.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price.

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PLANT PRE-CAST STRUCTURAL CONCRETE

ITEM: 1330**1330.1 DESCRIPTION**

- .1 This Item consists of the supply of all materials and labour required to fully construct and deliver pre-cast concrete structural sections in accordance with the Contract documents, including but, not limited to: pre-cast box culverts; pre-cast arches; pre-cast three-sided frames; pre-cast deck panels; pre-cast wall panels and any other pre-cast structural element as indicated within the Contract documents.

1330.2 REFERENCES**1330.2 .1 American Society for Testing and Materials International (ASTM)**

- .1 ASTM C260-10a (2016), Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C309-19, Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM 333-17A, Standard Specifications for Chemical Admixtures for Concrete.
- .4 ASTM C494/C494M-19, Standard Specifications for Chemical Admixtures for Concrete.
- .5 ASTM C1017/C1017M-13e1, Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.
- .6 ASTM C1064-17, Standard Specifications for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
- .7 ASTM A1064/A1064M – 18a, Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

1330.2 .2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .2 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1330.2 .3 Canadian Standards Association (CSA International)

- .1 CSA A3000-18, Cementitious Material Compendium.
- .2 CSA A23,1:19/A23.2:19, Concrete Materials and Methods of Concrete Construction/Methods of Tests and Standard Practices for Concrete.
- .3 A23.3:19, Design of Concrete Structures
- .4 A23.4:16 (R2021), Pre-cast Concrete - Materials and Construction, latest edition.
- .5 A257 Series-19, Standards for Concrete Pipe and Manhole Sections,

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.6 CSA A283:19, Qualification Code for Testing Laboratories.

.7 CSA G30.18:21, Carbon Steel Bars for Concrete Reinforcement.

.8 CSA S269.1-16 (R2021), Concrete Formwork.

.9 CSA S6-19, Canadian Highway Bridge Design Code

1330.3 MATERIALS

1330.3 .1 General

.1 All materials shall be supplied by the Contractor.

.2 Material properties shall conform to CSA A23.1, if not otherwise specified herein.

1330.3 .2 Cements and Supplementary Cementing Materials

.1 All cement and supplementary materials shall be in accordance with 1301.

1330.3 .3 Aggregates

.1 Aggregates used in concrete shall meet the material properties specified in accordance with 1302.2.

1330.3 .4 Admixtures

.1 A written statement shall be provided to the Engineer from the manufacturer stating that the admixture contains no purposely added calcium chloride.

.2 The calcium nitrite corrosion inhibiting admixture shall contain between 30% to 36% calcium nitrite by weight of solution.

1330.3 .5 Water

.1 Water used in production and curing shall be clean and free from any materials which shall cause discoloration or harmful effects to the concrete.

1330.3 .6 Composition of Mix

.1 Concrete shall meet the requirements of type "A" in accordance with Section 1302.

.2 Grout mixes for keyways, closures, joint pour-backs, lift inserts, etc., shall meet the requirements of A23.1, with a 28-day compressive strength of 35 MPa.

.3 Concrete shall have a slump not greater than 210 mm.

.4 No materials shall be used in the mix design that contain purposefully added chloride compounds in any quantity.

.5 A calcium nitrite corrosion inhibitor shall be added in accordance with Section 1302.

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.1 The calcium nitrite shall be added at the concrete ready-mix plant and verification shall be provided to the Engineer for the Quantity of the calcium nitrite added to each batch of concrete.

.1 Acceptable verification shall include, but is not necessarily limited to, printouts from computerized batch plants or printouts from computerized admixture dispensing units.

1330.3 .7 Internal Reinforcement

.1 Internal Reinforcing for pre-cast structural concrete shall be in accordance with Sections 1304 or 1306.

.2 Welding of reinforcing steel, including tack welding, is prohibited without the written permission of the Engineer.

1330.3 .8 Inserts

.1 Inserts shall be of sufficient capacity and of an approved type as specified and shall be placed in the location(s) as indicated by location in the Contract Documents.

1330.3 .9 Other Admixtures Not Covered By ASTM

.1 A written statement shall be provided to the Engineer from the manufacturer stating that the admixture contains no purposely added calcium chloride.

1330.4 SUBMITTALS

.1 The Contractor shall submit shop drawings in accordance with Section 1383.

.1 The Contractor shall provide the Engineer with the name of the proposed cement supplier.

.2 The Contractor shall submit certification that the concrete supplier is certified in accordance with Atlantic Provinces Ready Mix Concrete Association, Plant Certification Program or equivalent.

.1 The concrete supplier shall submit proof of certification in the appropriate categories in accordance with CSA A23.1 and A23.4.

.2 Only concrete supplied from such certified plants shall be acceptable to the Owner and plant certification shall be maintained for the duration of the fabrication and erection until the warranty period expires.

.2 The proposed mix proportions (design), certified by the Contractor or his/her agent, shall be submitted at least 5 Days before concrete production is due to start. The submission shall be stamped and signed by a professional engineer registered in good standing with Engineers PEI.

.3 Submittals are required in accordance with any cross-referenced Item and referred to as forming part of this Item.

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1330.5 CONSTRUCTION**1330.5 1 General**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer and in accordance with CSA A23.4.
- .2 The Contractor shall provide certified copies of quality control tests related to this Contract as specified in CSA A23.2, A23.4 and ASTM A416M.
- .3 The Contractor shall provide records from in-house quality control programs based upon plant certification requirements to the Engineer for inspection and review.
- .4 The Contractor shall, upon request of the Engineer, provide certified copies of the test report(s) of the internal reinforcing supplied, as per Section 1304 and 1306.
- .5 Pre-cast plants shall keep complete records of supply source of concrete material, steel reinforcement, GFRP reinforcement, and shall provide this information to the Engineer.
- .6 The pre-cast plant shall conform to the following minimum requirements:
 - .1 Only steel side forms shall be used.
 - .2 Forms shall be clean and of a configuration to ensure compliance with the tolerances outlined under this item and the Contract Documents.
 - .3 Cold weather facilities to enable complete fabrication of the elements shall be provided between October 31st to May 1st.
 - .4 Floats shall be wood or magnesium. Steel floats shall not be permitted.
- .7 Concrete shall not be placed until all forms, inserts, and reinforcing bars have been checked and approved for compliance with the Contract Documents and any drawings submitted under Item 1383.
- .8 The Contractor/Supplier shall perform a pre-concrete placement inspection (for example but not limited to: rebar size, spacing, protective cover, insert size and location, etc) on each unit prior to concrete placement, with results documented corresponding to its respective label identification. Results shall be submitted to the Department for project record purposes.
- .9 The concrete placement operation shall be in one continuous operation, without the formation of partially hardened layers of concrete.
- .10 The Contractor shall provide regular and practically located office space at his/her pre-cast plant to accommodate the Engineer or the Owner's representative.
 - .1 The office space so provided shall be ventilated, heated, lighted and clean, and shall be furnished with a suitable standard office desk and chair.
 - .1 The office room temperature shall be maintained at 20°C.

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- .2 Convenient telephone, facsimile, photocopy, mail and message handling services shall also be provided.
- .11 The Contractor shall provide 7 Days written notice prior to commencement of any fabrication or change in fabrication schedule.

1330.5 .2 Curing of Concrete

- .1 When the ambient temperature in the plant does not fall below 5 °C and where the manufacturing facilities are protected from the wind and direct rays from the sun, curing and protection may be performed in accordance with CSA A23.1 and A23.4 and per 1302.4.
- .2 Heat treatment may be used to accelerate strength development by accelerated curing or heated concrete.
 - .1 Heated concrete shall have a maximum plastic concrete temperature of 33 °C.
- .3 Heat treatment shall be carried out in accordance with CSA A23.4 and the following:
 - .1 Where accelerated curing is used, the elements shall be maintained on the casting bed in an approved enclosure, designed to insure full circulation of thoroughly saturated air and/or steam around the elements with a minimum loss of moisture and heat.
 - .2 During the initial curing period (typically 4 to 5 hours after completion of casting) the temperature within the enclosure shall be maintained at approximately 20 °C.
 - .3 For the next stage of curing, the temperature within the enclosure shall be raised at a rate not to exceed 15 °C per hour to a minimum of 40 °C and a maximum of 60 °C.
- .4 In the case of the application of steam, radiant heat or forced air for accelerated curing;
 - .1 The accelerated curing shall not begin before the initial set;
 - .2 The accelerated curing shall provide excess moisture for proper hydration of the cement; and
 - .3 In no instance shall the steam, radiant heat or forced air be directly applied to the concrete, forms or test cylinders.
- .5 The exposed surfaces of the concrete shall have an excess of moisture during the entire curing period.
 - .1 If water is applied for this purpose, then this water temperature shall not vary from the concrete temperature by more than 10 °C nor shall this temperature exceed 60 °C.

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- .6 After the required strength for transport has been reached, the temperature shall be lowered at a rate not exceeding 15 °C per hour.
 - .1 The structures shall not be exposed to temperatures below freezing until they have undergone two Days of drying in warm temperatures after the transfer of stress.
- .9 The Contractor/manufacturer shall provide a continuous record of curing temperatures for the entire curing period by means of approved accurate automatic recording devices, spaced one per element to record the temperature throughout the length of the curing enclosure(s).
 - .1 The maximum permissible temperature variation within the enclosure shall not exceed 5 °C.
- .10 Forms shall not be removed until the concrete has obtained 60% of the 28-day compressive strength.
- .11 The Contractor/Supplier shall perform a daily curing inspection (indicating for example but not limited to: type of curing, time duration, and support reasoning for termination, etc) on each unit, with results documented corresponding to its respective label identification. Results shall be submitted to the Department for project record purposes.

1330.5 .3 Finishing of Concrete Surfaces

- .1 All surfaces of all structures shall be smooth and free from honeycomb, spalls, pop-outs, cracks, stain and laitance.
- .2 The Contractor/Supplier shall perform a post-form removal surface inspection on all surfaces for each unit. Items to identify shall include but not limited to: honeycombing, delamination, spall, cracking, disintegration, and cold joint. Each surface as well as all these defects shall be listed on the inspection form, with confirmation whether present or not. If any defect is present, indicate the global location and area / length extent. Each precast unit shall receive a post-form removal surface inspection, with results documented corresponding to its respective label identification. Results shall be submitted to the Department for project record purposes.
- .3 Immediately after the stripping of forms, the Engineer shall be informed of all cases where elements require repair.
 - .1 Proposed repair materials and methods for non-structural repairs shall be submitted for approval of the Engineer. Defect areas with honeycombing, spalls, pop-outs, and any other defect with a depth, shall first be prepared with a minimum 6mm deep vertical 'square edge' cut (not tapered) around the entire perimeter of area, then entire surface area roughen minimum 4mm amplitude, and saturated surface dry. This shall be submitted prior to application of repair material.
 - .2 Repair shall be done before transport of the structure.

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- .3 Structures with structural defects including spalls, cracks and honeycomb are subject to rejection if the load carrying capacity or durability are reduced.
 - .1 Repairs of a structural nature shall not be undertaken until the manufacturer's engineer has carried out and obtained the following:
 - .1 Investigated the structural implications of the defect or the damage.
 - .2 Established the cause of the defect or the damage.
 - .3 Received approval of the proposed repair from the Owner.
 - .4 All repairs shall be performed by the Supplier at no additional cost to the Contract.
- .4 The Contractor shall pressure wash the surface to identify all air voids prior to final finishing.
- .5 Small surface voids shall be filled with an approved cement grout mix of cement and fine sand from the same source as used in the concrete and incorporating a latex bonding agent.
 - .1 The structures shall remain in a controlled temperature environment for a minimum time of 48 hours after completion of the repair.
- .6 All bearing surfaces must be constructed in such a manner to give a smooth surface, true to lines and grades.
- .7 Concrete repairs shall be carried out and allowed to cure for a minimum time in a controlled temperature environment as recommended by the manufacturer of the repair material and approved by the Engineer.
- .8 Concrete surfaces not meeting the approval of the Engineer may be cause for rejection of the item.
- .9 Supplier shall be responsible to repair, at their own expense, any and all damage to as-delivered units as a result of transport/handling by the Supplier to the Department's storage yard or to a construction site.

1330.5.4 Quality Testing

1330.5.4.1 General

- .1 The Contractor shall provide and maintain adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the initial curing period.
- .2 Facilities shall be provided by the Contractor, for the Engineer to inspect all ingredients and processes used in the manufacture and delivery of concrete.

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- .3 The Contractor/Supplier shall carry out Quality Control sampling/testing during the concrete placement, including air, temperature, and slump testing; as well as after casting at time periods indicated for compressive strength. All costs associated with quality testing shall be covered by the Contractor/Supplier.
 - .1 Results of Quality Control tests shall be recorded and made available to the Contractor upon request.
 - .2 Tests shall be conducted by personnel certified under ACI Concrete Field-Testing Technician Grade 1, or CSA A283.
- .4 Test specimens shall be sampled in accordance with CSA A23.2-1C and made and cured to meet the requirements of CSA A23.2-3C.
 - .1 Samples shall be obtained at final point of discharge unless otherwise specified by the Engineer.

1330.5.4 .2 Air & Slump Testing of Plastic Concrete

- .1 The air content of each load, or batch, of concrete shall be tested until consistent and acceptable air content is established, at which point testing frequency may be reduced, at the discretion of the Engineer. Should a test fail to meet the requirements, the frequency of testing shall return to one test per load, or batch, until acceptable air content consistency is re-established.
- .2 The Supplier shall carry out Quality Assurance testing
 - .1 If the measured slump or air content falls outside the limits specified, a check test shall be made immediately on another portion of the same sample.
 - .1 This concrete load, in the event of a second failure, shall be considered to have failed to meet the requirements of this specification, and shall be rejected.
- .3 Density and Yield tests shall be conducted as required by the Engineer, to meet the requirements of CSA A23.2-6C.

1330.5.4 .3 Age of Compressive Strength Testing

- .1 The Engineer shall determine the age of test and shall be indicated on the submitted concrete mix design.
 - .1 In the absence of a Contractor initiated request, the age requirements stipulated in CSA A23.1 for the specified exposure class shall apply.
- .2 Strength tests shall be performed at 7 days and 28 days.
 - .1 Additional tests may be requested by the Contractor or Owner as required.

1330.5.4 .4 Frequency of Compressive Strength Testing

- .1 Frequency of compressive strength testing shall conform to the schedule indicated in Table 1330-1 and per 1330.5.4.3.

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- .2 For each age of compressive strength test (7, 28, 56 & 91 Days) two tests, as defined in 1302.5.12.3.1, shall be required, unless indicated on submittal.
- .1 A test, as defined in 1302.5.12.7.1 to be broken at the specified age submitted with the mix design.

**Table 1330-1
Frequency of Compressive Strength Testing (Concrete)**

Number of Cubic Metres in Placing Operation	Minimum No. of Trucks to be Tested
up to 50	2
51 - 100	3
101 - 200	4
over 200	See Note 1
NOTE: An additional test shall be taken for each additional 100 cubic metres of concrete placed.	

1330.5.4 .5 Hardened Air Void Testing Frequency

- .1 Hardened air void testing shall be carried out by the Owner on an as-required basis.

1330.5.4 .6 Permeability Testing Frequency

- .1 A minimum of two cylinders shall be taken for permeability testing from each placement and cured for a minimum of 56 Days.
- .2 The permeability testing shall be carried out by the Contractor/Supplier.

1330.5.4 .7 Compressive Strength Testing

- .1 Strength tests shall mean the average strength of two-companion 150 mm by 300 mm or three companion 100 mm by 200 mm test cylinder specimens taken from the same batch and tested at the same age.
- .2 Test specimens shall be tested at the age of test submitted with concrete mix design, unless otherwise approved by the Engineer, and shall meet the requirements of CSA A23.2-9C.
- .3 To meet the strength requirements of this Item, the average of all tests shall exceed the specified strength.
- .1 When three or more tests of the same type of concrete are available, the average of any three consecutive tests shall be equal to or greater than the specified strength, and no individual test shall be less than 90% of the specified strength.

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- .2 Concrete that does not meet specified strength shall be subject to Payment Adjustment per 1302.5.7.
- .4 If tests indicate that concrete in a placement does not meet the specified strength, the concrete in that placement shall be deemed noncompliant.
 - .1 Depending upon the severity of the noncompliant concrete, the Engineer may require complete removal, or:
 - .1 The Contractor may submit a proposal for repair of the noncompliant concrete to the Engineer for consideration.
 - .2 Any additional testing requested by the Contractor shall be subject to approval of the Engineer
 - .1 Additional testing shall be conducted at the Contractors own expense.
 - .3 If the remedial measures are accepted by the Owner and the noncompliant concrete is allowed to remain, the concrete in the placement shall be paid according to Table 1330-2.
 - .2 If the noncompliant concrete is removed and replaced, the concrete incorporated into the placement shall be paid according to 1330.6.4.
- .5 Additional tests of cylinders, cured entirely under field conditions, may be required to check the adequacy of curing or cold weather protection.
 - .1 Test cylinders shall be stored as near as possible to the point in the Structure that the test cylinders represent and shall be afforded the same temperature protection and moisture environment as the Structure.
 - .2 At the end of the curing period the test cylinders shall be left in place, exposed to the weather in the same manner as the Structure.
 - .3 All test cylinders shall be removed from the field storage and stored in lime water at $23 \pm 2^{\circ}\text{C}$ for $24 \pm 8\text{h}$ immediately before time of testing to ensure uniform moisture conditions from cylinder to cylinder.

1330.5 .5 Reinforcing Steel

- .1 The Contractor shall be responsible to position the reinforcing steel within the specified tolerances in accordance with 1304.4 and 1306.5.
- .2 All reinforcing steel protruding from the pre-cast member shall be free from oil, grease, any loose or foreign material and excessive concrete.
- .3 Supporting chairs for reinforcing shall be heavy plastic tipped and subject to the approval of the Engineer.

1330.5 .6 Identification of Prefabricated Structures

- .1 This item also includes all costs associated with the supply and placement of

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permanent identification labelling for each precast unit. Label text shall be the casting date (yyyy-mm-dd) of respective unit, and the Supplier's company name.

- .2 Labelling shall be painted/applied directly on the unit's concrete surface. Size and colour of label/paint to be visible and be located within the 'upper middle third' on the inside face (so visible upon site installation, and above expected elevation of top of watercourse). Label paint shall be of quality to resist climate/air/moisture attack throughout the expected service life (75 years) of the structure. Labels must be applied within two (2) days after each unit's curing completion.
- .3 Identification for retaining wall elements shall be placed on the inside surface of the wall section.
- 4 Each element end shall be identified by painting on the approximate compass direction.

1330.5 .7 Care and Storage of Materials

- .1 All concrete materials shall be handled and protected in such a way as to prevent segregation, damage and contamination.
- .2 All cement, aggregate and other concrete construction materials shall be stored in accordance with the requirements of CSA A3001, and CSA A23.1.

1330.5 .8 Proportioning and Composition of Concrete

- .1 The Contractor shall be responsible for providing concrete mix designs for each Exposure Class of concrete specified and proposed for use.
- .2 If, during the progress of the Work, it is determined that the concrete has inadequate workability or does not meet the requirements of the Specification(s), the Contractor shall submit a new mix design to the Engineer, in accordance with 1330.3.2.
- .3 All concrete shall be proportioned in accordance with the submitted mix designs.

1330.5 .9 Concrete Production

- .1 Portland cement concrete shall be produced in accordance with the requirements of CSA A23.1.
- .2 Concrete shall meet the requirements of CSA A23.1, if not otherwise specified herein.
- .3 No loads shall be applied to new concrete including vibration until the concrete has attained a minimum compressive strength of 20 MPa.

1330.5 .10 Delivery

- .1 Delivery of concrete shall be in accordance with CSA A23.1 and shall be regulated so as to enable continuous deposition until the placement of each concrete section is completed.
- .2 The batch delivery ticket meeting the requirements of CSA A23.1 shall accompany each batch of concrete delivered to site.

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- .1 The batch ticket shall include quantities of materials batched.

1330.5 .11 Addition of Water

- .1 Water shall not be added after batching for any purpose without the approval of the Engineer.
- .1 Slump adjustment of superplasticized concrete shall be with admixture only.

1330.5 .12 Placement

- .1 The Contractor shall be responsible for all formwork design and construction in accordance with CSA A23.1.
- .2 All concrete placement shall be in accordance with CSA A23.1, unless otherwise noted.
- .3 Floats shall be wood or magnesium. Steel floats shall not be permitted.

1330.5 .13 Installation

- .1 The Contractor shall be responsible for installation of all pre-cast elements in accordance with CSA A23.4, CSA S6 and the manufacturers strict instructions.
- .2 For Owner Supplied sections, the Contractor shall be responsible for pick-up, delivery and off-loading at the project site.
- .3 Grouting of keyways, closures, joint pour-backs, lift inserts, etc., shall be conducted as soon as practicable.

1330.6 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the Unit Rate bid of pre-cast structure fabricated and supplied and/or installed to the project site, as indicated in the Unit Rate Table.
- .2 The Price Adjustment for Control of Strength shall be paid in accordance with Table 1330-2.

**Table 1330-2
Price adjustment for Control of Strength**

For all pre-cast plant concrete				
Strength	45 MPa+	40-44 MPa	35-40 MPa	Less than 35MPa- To be reviewed by Engineer
Payment per cubic metre component	100%	95%	90%	Removal or 75% (per 1302.5.12.7.4)

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- .3 The price adjustment for Resistance to Chloride Ion Penetration shall be paid in accordance with Table 1330- 3.

**Table 1330-3
Price Adjustment for Resistance to Chloride Ion Penetration**

For Exposure Class C-XL in CSA A23.1					
Coulombs (ASTM C1202)	0-500	500-1000	1000-1300	1300-1500	1500-2500
Payment per cubic metre for component (% of Unit Price)	110%	105%	100%	95%	75%

1330.7 **BASIS FOR PAYMENT**

- .1 Payment for Work under this Item shall include a separate Unit Price for each class of structure, as identified under the Contract.
- .2 The Owner may make partial payment for beams in accordance with 1382.7.
- .3 Payment for units intended for Department inventory shall be made only upon delivery of associated units, with no damage, to Department's storage yard.
- .4 Where noncompliant concrete is removed and replaced in accordance with 1330.5.4.7.5, the concrete incorporated into the component shall be paid at 100% of the Unit Price.
- .5 Payment for units installed shall be made only upon complete installation of the structure, with no damage to any precast units. The supply, mixing and placement of grout material for keyways, closures, joint pour-backs, lift inserts, etc., shall be considered incidental to the work and shall not be measured or paid for separately.

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1331.1 DESCRIPTION

- .1 This Item consists of the supply and installation of the pre-cast prestressed concrete beams.
- .2 Prestressing Method This specification refers to Bulb-Tee's, I-beams, box girders, slabs, hollow core slabs, single and double T sections and similar Bridge products manufactured by the pretensioning method and in accordance with CSA S6.
- .3 All pre-cast prestressed concrete Bridge elements under this Item shall be referred to as beams.

1331.2 MATERIALS

.1 General

- .1 All materials and procedures shall be supplied by the Contractor.
- .2 Material properties shall conform to CSA A23.1, if not otherwise specified herein.

1331.2 .2 Material Properties

1331.2.2 .1 Aggregates

- .1 Aggregates used in concrete shall meet the material properties specified in accordance with 1302.2.

1331.2.2 .2 Admixtures

- .1 A written statement shall be provided to the Engineer from the manufacturer stating that the admixture contains no purposely added calcium chloride.
- .2 The calcium nitrite corrosion inhibiting admixture shall contain between 30% to 36% calcium nitrite by weight of solution.

1331.2.2 .3 Water

- .1 Water used in production and curing shall be clean and free from any materials which shall cause discoloration or harmful effects to the concrete.

1331.2.2 .4 Composition of Mix

- .1 Concrete shall meet the minimum requirements of type "A" concrete in accordance with Section 1302.
- .2 Concrete shall have a slump not greater than 210 mm.
- .3 No materials shall be used in the mix design that contain purposefully added chloride compounds in any quantity.
- .4 A calcium nitrite corrosion inhibitor shall be added to the concrete in accordance with type "A" concrete in accordance with Section 1302.

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.1 The calcium nitrite shall be added at the concrete ready-mix plant and verification shall be provided to the Engineer for the Quantity of the calcium nitrite added to each batch of concrete.

.1 Acceptable verification shall include, but is not necessarily limited to, printouts from computerized batch plants or printouts from computerized admixture dispensing units.

1331.2.2. .5 Stranded Wire

.1 Prestressing strands shall be of the 7-wire stress relieved stabilized type and shall meet the requirements of ASTM A416M and have a guaranteed ultimate tensile strength of 1860 MPa unless otherwise specified in the Contract Documents.

.1 Wire welds, breaks, nicks, bends or any other defect shall not be permitted in any prestressing cable.

.2 All prestressing steel must be free of deleterious materials such as oil, grease, frost, paint, mill scale, loose rust, corrosion and any foreign material, which may prevent bond between steel and concrete.

.3 In pretensioning strands one approved splice per strand shall be permitted, provided the splice is not located within the concrete member. Welded strand joints or wire splices shall not be permitted in any reel or coil of strand.

.2 All stranded wire shall be delivered in coils with a metal tag attached to each coil showing:

.1 The manufacturer's name;

.2 The heat number;

.3 The coil number; and

.4 Each coil shall be accompanied by a stress strain curve, showing:

.1 the corresponding information of the metal tag,

.2 ultimate strength,

.3 the date of manufacture, and

.4 the stress strain curve from zero stress to ultimate.

.3 The shipping package or form shall be clearly marked with a statement that the package contains high strength prestressing steel, and the care to be used in handling.

1331.2.2 .6 Reinforcing Steel

.1 Reinforcing steel shall be supplied in accordance with 1304.2.

.2 Welding of reinforcing steel, including tack welding, is prohibited without the written permission of the Engineer.

1331.2.2 .7 Inserts

.1 Inserts shall be of sufficient capacity and of an approved type as specified and shall be placed in the location(s) as indicated by location in the Contract Documents.

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- .2 Fabrication of miscellaneous metal inserts, shoe plates, bearing assemblies, etc. shall confirm to 1336.

1331.3 SUBMITTALS

- .1 The Contractor shall submit shop drawings for the prestressing system in accordance with Item 1383.
 - .1 The submission shall show the proposed arrangement, location and details, indicating inserts; manufacture, size, type and ultimate strength of tendons, sequence and rate of tensioning in order to provide prestressing forces and eccentricities as detailed in the Contract Documents.
- .2 All prestressing Work shall be carried out by a qualified Contractor or subcontractor, pre-qualified in accordance with CSA-A23.4 and certified by CPCI.
- .3 The Contractor shall provide the following informational items, for review, a minimum of 21 Days prior to commencing prestressing Work:
 - .1 Standard test data certifying that all components of the stressing system conform to minimum specification requirements indicated for these components.
 - .2 The manufacturer shall provide quality control procedures for review.
- .4 The prestressing system is subject to approval by the Engineer and samples of material such as, but not limited to: pre-stress steel, hold-down/hold-up devices, anchors and couplings shall be submitted for approval, when requested by the Engineer.
 - .1 Samples submitted shall be accompanied by all necessary certificates, source of supply, date of manufacture and technical information, to enable the Engineer to carry out a full investigation.
 - .2 Sufficient test specimens may be taken from each coil of prestressing steel and tested by the Owner to determine compliance with the requirements of this specification.
 - .1 With each prestressing steel sample a certificate shall be submitted stating the manufacturer's minimum guaranteed ultimate tensile strength, the corresponding reel number and the date of manufacture.
- .5 The beam manufacturer shall provide the Engineer, in writing, the safety procedures that shall be in force during the period of beam manufacture, prior to the commencement of the manufacture of the beams.
- .6 The Contractor at the conclusion of the prestressing shall provide a copy of following records:
 - .1 Date of tensioning;
 - .2 Beam mark numbers and identification and location in the Structure;
 - .3 Identification of jacking Equipment;
 - .4 Required total load per strand;
 - .5 Initial tension;

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- .6 Anticipated and actual gauge pressure for each strand or strand group;
 - .7 Anticipated and actual elongation; and
 - .8 Any problems encountered.
- .7 Submittals are required in accordance with any cross-referenced Item and referred to as forming part of this Item.

1331.4

CONSTRUCTION

.1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer and in accordance with CSA A23.4.
- .2 The Contractor shall provide certified copies of quality control tests related to this Contract as specified in CSA A23.4 and ASTM A416M.
- .3 The Contractor shall inspect prestressed concrete tendons in accordance with Canadian Precast Prestressed Concrete Institute (CPCI).
- .4 The Contractor shall provide records from in-house quality control programs based upon plant certification requirements to the Engineer for inspection and review.
- .5 The Contractor shall, upon request of the Engineer, provide certified copies of the mill test report(s) of the reinforcing steel supplied, showing physical and chemical analyses.
- .6 Pre-cast plants shall keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and shall provide this information to the Engineer.
- .7 The prestressing plant shall conform to the following minimum requirements:
 - .1 Only steel side forms and steel or concrete bottom forms shall be used for standard members.
 - .2 Forms shall be clean, and of a configuration to ensure compliance with the tolerances outlined under this item and the Contract Documents.
 - .3 Hydraulic jacks and pumps of sufficient capacity shall be used for tensioning cables and only accurately calibrated gauges for registering the stressing forces shall be used.
 - .4 All chucks used for stressing, depressing or lifting pretensioning cables shall be an approved type of sufficient capacity and in good working order.
 - .5 Safety devices shall be installed near the stressing bed to provide an adequate safety shield for the protection of workmen during stressing operations.

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- .6 Cold weather facilities to enable complete fabrication out of the elements shall be provided between October 31st to May 1st.
- .8 Concrete shall not be placed until all forms, inserts, reinforcing steel and prestressing steel have been checked and approved for compliance with the Contract Documents and any drawings submitted under Item 1383.
- .9 The Contractor/Supplier shall perform a pre-concrete placement inspection (for example but not limited to: rebar size, spacing, protective cover, insert size and location, etc) on each unit prior to concrete placement, with results documented corresponding to its respective label identification. Results shall be submitted to the Department for project record purposes.
- .10 The concrete placement operation shall be in one continuous operation, without the formation of partially hardened layers of concrete.
 - .1 For multiple beam set-ups, the mix design shall be adjusted so that the concrete remains plastic throughout the entire placement.
- .11 The Contractor shall provide regular and practically located office space at his/her prestressing plant to accommodate the Engineer or the Owner's representative.
 - .1 The office space so provided shall be ventilated, heated, lighted and clean, and shall be furnished with a suitable standard office desk and chair.
 - .1 The office room temperature shall be maintained at 20°C.
 - .2 Convenient telephone, facsimile, photocopy, mail and message handling services shall also be provided.
- .12 The Contractor shall provide 7 Days written notice prior to commencement of any fabrication or change in fabrication schedule.

1331.4 .2 Curing of Concrete

- .1 When the ambient temperature in the plant does not fall below 5 °C and where the manufacturing facilities are protected from the wind and direct rays from the sun, curing and protection may be performed in accordance with CSA A23.1 and A23.4 and per 1302.4.
- .2 Heat treatment may be used to accelerate strength development by accelerated curing or heated concrete.
 - .1 Heated concrete shall have a maximum plastic concrete temperature of 33 °C.
- .3 Heat treatment shall be carried out in accordance with CSA A23.4 and the following:
 - .1 Where accelerated curing is used, the beams shall be maintained on the casting bed in an approved enclosure, designed to insure full circulation of thoroughly saturated air and/or steam around the beams with a minimum loss of moisture and heat.

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- .2 During the initial curing period (typically 4 to 5 hours after completion of casting) the temperature within the enclosure shall be maintained at approximately 20 °C.
- .3 For the next stage of curing, the temperature within the enclosure shall be raised at a rate not to exceed 15 °C per hour to a minimum of 40 °C and a maximum of 60 °C.
- .4 This temperature shall be maintained until the required strength for the transfer of prestress is reached.
- .4 In the case of the application of steam, radiant heat or forced air for accelerated curing;
 - .1 The accelerated curing shall not begin before the initial set;
 - .2 The accelerated curing shall provide excess moisture for proper hydration of the cement; and
 - .3 In no instance shall the steam, radiant heat or forced air be directly applied to the concrete, forms or test cylinders.
- .5 The exposed surfaces of the concrete shall have an excess of moisture during the entire curing period.
 - .1 If water is applied for this purpose, then this water temperature shall not vary from the concrete temperature by more than 10 °C nor shall this temperature exceed 60 °C.
- .6 After the required strength for transfer of stress has been reached, the temperature shall be lowered at a rate not exceeding 15 °C per hour.
- .7 Stress transfer shall take place when the concrete temperature is between 30 °C and 40 °C but all beams must be kept moist until transfer, in accordance with CSA A23.4, clause 27.6.1.
- .8 After transfer of stress the temperature shall be lowered at a maximum rate of 15 °C per hour until the beam is at the ambient air temperature.
 - .1 The beams shall not be exposed to temperatures below freezing until they have undergone two Days of drying in warm temperatures after the transfer of stress.
- .9 The Contractor/manufacturer shall provide a continuous record of curing temperatures for the entire curing period by means of approved accurate automatic recording devices, spaced one per beam to record the temperature throughout the length of the curing enclosure(s).
 - .1 The maximum permissible temperature variation within the enclosure shall not exceed 5 °C.
- .10 Forms shall not be removed until the concrete has obtained the specified release strength.

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1331.4 .3 Finishing of Concrete Surfaces

- .1 The top surface of pre-cast beams shall be rough, clean, and free of laitance with a full amplitude of approximately 6 mm.
- .2 Immediately after the stripping of forms, the Engineer shall be informed of all cases where beams require repair. Repair procedures shall be in accordance with Section 1330.5.3.
- .3 The Contractor/Supplier shall perform a post-form removal surface inspection on all surfaces for each unit. Items to identify shall include but not limited to: honeycombing, delamination, spall, cracking, disintegration, and cold joint. Each surface as well as all of these defects shall be listed on the inspection form, with confirmation whether present or not. If any defect is present, indicate the global location and area / length extent. Each precast unit shall receive a post-form removal surface inspection, with results documented corresponding to its respective label identification. Results shall be submitted to the Department for project record purposes.
 - .1 Proposed repair materials and methods for non-structural repairs shall be submitted for approval of the Engineer.
 - .2 The Engineer shall determine whether repair shall be done before or after the transfer of prestressing force.
 - .3 Beams with structural defects including cracks and honeycomb are subject to rejection if the load carrying capacity or durability are reduced.
 - .1 Repairs of a structural nature shall not be undertaken until the manufacturer's engineer has carried out and obtained the following:
 - .1 Investigated the structural implications of the defect or the damage.
 - .2 Established the cause of the defect or the damage.
 - .3 Received approval of the proposed repair from the Owner.
- .4 The permanently exposed surfaces of all beams shall be smooth and free from honeycomb, stain and laitance.
- .5 The Contractor shall pressure wash the surface to identify all air voids prior to final finishing.
- .6 Small surface voids shall be filled with an approved cement grout mix of cement and fine sand from the same source as used in the concrete and incorporating a latex bonding agent.
 - .1 The beams shall remain in a controlled temperature environment for a minimum time period of 48 hours after completion of the repair.
- .7 All bearing surfaces must be constructed in such a manner to give a smooth surface, true to lines and grades.
- .8 The prestressing steel shall be ground off with an inset at the ends of the beam and the end surfaces of the beam shall then be finished flush in an approved manner.

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- .1 Hold-down devices in the bottom of the beam shall be finished similarly.
- .9 The end surfaces of all beams, except as specifically noted in the Contract Documents, shall be coated with an approved asphalt or bituminous coating.
- .10 Concrete repairs shall be carried out and allowed to cure for a minimum time in a controlled temperature environment as recommended by the manufacturer of the repair material and approved by the Engineer.
- .11 Concrete surfaces not meeting the approval of the Engineer may be cause for rejection of the beam.

1331.4 .4 Quality Testing and Inspection

- .1 Perform all quality testing in accordance with Section 1330.5.4.
- .2 Concrete strength at transfer shall be determined by the Contractor in accordance with CSA A23.1 and as follows:
 - .1 In the presence of the Engineer, the Contractor shall cast cylinders and subsequently carry out a minimum of one transfer strength test and one 28-day strength test for each beam containing less than 10 m³ concrete, and not less than two transfer strength tests and two 28-day strength tests for each beam containing more than 10 m³ concrete.
 - .2 Each transfer strength test shall consist of two cylinders from the same batch and each 28-day strength test shall consist of two cylinders from the same batch and tests shall be conducted in pairs; that is, transfer strength tests and 28-day strength tests shall be from the same portions of the same batches.
 - .3 Stress transfer shall not take place until at least one cylinder from each transfer strength test has reached a strength not less than 1 MPa below the specified release strength as indicated in the Contract Documents.
 - .1 Stress transfer shall not take place until the average strength of all release test cylinders meets or exceeds the specified release strength.
 - .4 The initial curing of the stress release cylinders shall take place in an area representative of the mean temperature of the enclosure.
 - .5 The average of all cylinders, of any one beam, tested to determine the 28-day strength shall be equal to or greater than the specified minimum 28-day strength.
 - .1 The allowable strength for each individual cylinder shall not be more than 2 MPa below the specified minimum.
 - .2 The average strength for each test of two cylinders shall not be more than 1 MPa below the specified minimum.

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1331.4 .5 Reinforcing Steel

- .1 The Contractor shall be responsible to position the reinforcing steel within the specified tolerances in accordance with 1331.4.8 and 1304.4.
- .2 All reinforcing steel protruding from the pre-cast member shall be free from oil, grease, any loose or foreign material and excessive concrete.
- .3 Supporting chairs for reinforcing steel and prestressing cable shall be heavy plastic tipped and subject to the approval of the Engineer.

1331.4 .6 Tensioning and Stress Transfer

- .1 The tensioning and stress transfer shall be carried out by the Contractor in accordance with CSA A23.4 and as follows:
 - .1 When stressing is done by jacking the strands from one end of the stressing bed, the prestress force shall be additionally measured on at least two strands at the far end.
 - .1 The theoretical jacking force may be increased by a maximum of 5% to attain the required prestress force at the far end of the prestress bed.
 - .1 If the required prestress force is still not achieved, the strands shall be jacked from the far end of the bed to give the required prestress.
 - .2 If the measured elongation is not within 5% of the theoretical elongation when the specified prestress force is applied, the strand may be temporarily overstressed to overcome friction.
 - .1 Such overstressing shall not induce any stress before anchoring exceeding 78% of the specified tensile strength of the strand.
 - .2 Anchorage set shall not result in prestress losses exceeding five percent of the theoretical jacking force.
 - .2 The tensioning procedure and sequence shall be approved by the Engineer and as a minimum shall be in accordance with the following:
 - .1 Each strand may be seated by application of an initial tension of 5 kN, and all further tensioning shall be measured by elongation and verified by jack pressure.
 - .2 If the difference between the stressing force measured by the gauges and that determined from elongation exceeds 5%, the source of error shall be found and corrected before continuing with the stressing operation.
 - .3 Gauges shall be calibrated to read directly in kN or accompanied by a chart from which the dial reading can be converted to kN.

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- .1 The hydraulic pressure system activating the gauges shall have appropriate by-pass piping, valves and fittings to enable the gauge pointer to move steadily and without fluctuations.
- .2 Gauging devices shall be calibrated by an approved authority and re-calibrated as requested by the Engineer and, in all cases, at intervals of not more than one year.
- 4 Before each prestressing operation, all chucks and jaws shall be inspected, cleaned, lubricated and reassembled.
 - .1 Chucks and jaws with hammer marks and/or nicks on their internal working parts shall not be used.
- .5 After the concrete in the beam has reached the specified minimum compressive strength for stress transfer, the strands shall be released in such a manner and sequence that the stresses in the concrete at no time exceed those provided for in the design.
- .6 Stress transfer is to be performed simultaneously at both ends of the bed and between beam ends and while all beams are warm and moist.

1331.4 .7 Identification of Prefabricated Beams

- .1 The Contractor shall adopt and show a beam identification system on the beam layout drawing of the shop drawings, whereby identical beams have identical numbers.
- .2 During construction, the date of fabrication shall be indicated on each beam as per 1330.5.6.
- .3 Identification and fabrication numbers shall be painted on the side of the upper flange of each beam.

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1331.4 .8 Tolerances

Beam Dimensions	Depth (flange, web and fillets)	± 6 mm
	Depth (overall)	+ 12 mm, - 6 mm
	Depth (flanges plus fillet)	+ 10 mm, - 6 mm
	Width (web)	+ 6 mm, - 3 mm
	Length of Beam	± 1 mm per m but not greater than 20 mm
Exposed Beam Ends Deviation (from square or designated skew)	Horizontal	+ 6 mm
	Vertical	± 10 mm per m of beam height
Side Inserts	spacing between centres of insert and from centres of inserts to the end of the beam	± 12 mm
Skew Angle Variation		$\pm 3^\circ$
Bearing Plates	spacing between the centres of bearing plates to the ends of the beams	± 6 mm
Bearing Plates	spacing between the centres of bearing plates	± 1 mm per m of spacing but not greater than 20 mm
Bearing Plate or Bearing Area	deviation from plane	± 2 mm
Stirrup Bars	projection above theoretical top of the beam	± 20 mm
Horizontal Alignment	deviation from a straight line parallel to the centreline of beam	1 mm per m of span
Camber	differential between adjacent beams	1 mm per m of span to maximum of 25 mm
Center of Gravity of Strand Group and Individual Tendons		± 6 mm
Position of Deflection Points for Deflected Strands	Deflection points are to be concentric with respect to the middle of the beam	± 100 mm
Position of Lifting Device		± 150 mm
Position of Temporary Bracing Insert	longitudinal	± 25 mm

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PRE-CAST PRESTRESSED CONCRETE BEAMS

ITEM: 1331

1331.4 .9 Handling, Storage and Shipping

1331.4.9 .1 General

- .1 Beams shall not be shipped until the concrete in the beams has reached the specified 28-day strength.
- .2 The beams shall be handled and stored so that the points of support shall be the same as when the beams are in their final position, except that for transporting they may be supported at a distance equal to the depth of the beam measured along its centreline from the end of the beam, or as indicated on the shop drawings.
- .3 If the finished beam is to be stored on concrete supports, then a softer material such as wood or rubber shall be used between the beam and the support.
- .4 Beams damaged by improper handling, storage, transportation or erection are subject to rejection if their load carrying capacity has been reduced.
- .5 Beams shall be erected by two cranes unless otherwise approved by the Engineer.
- .6 The use of slings which result in a horizontal force component into the beam is prohibited.
- .7 Where beams are proposed to be erected by a single crane, the Contractor shall submit the detailed Work plan and shall obtain written approval prior to conducting the Work.
- .8 Should the bearing surfaces of the prestressed beams or finishing of the concrete bearing blocks leave a gap between the surface of the bearing pad and bottom of the beam, the Contractor shall grind to fit.

1331.4.9 .2 Lifting Devices

- .1 Lifting devices shall be supplied in the beam as indicated in Standard Drawing 1331-1 and/or as specified in the Contract Documents, and;
 - .1 Beams having a mass of more than 23 tonnes and less than 43 tonnes shall have a steel plate, as indicated on the Standard Drawing 1331-1, typical for the NBDOT type I- and AASHTO type IV-Beams.
- .2 Beams having a mass of more than 43 tonnes and less than 60 tonnes shall have a steel plate, as indicated on the Standard Drawing 1331-1, typical for the Bulb-Tee type Beams.
- .3 Lifting devices for beams having a mass of more than 60 tonnes must be approved by the Engineer and shall be submitted for approval as part of 1331.3.1.
- .4 Beams shall be stored on blocks at least 150 mm off solid level ground and adequately braced and secured to prevent overturning.

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1331.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the lineal metres of beams supplied and installed in accordance with this Item.

1331.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each size of pre-cast prestressed concrete beam, as identified under the Contract.
- .2 The Owner may make partial payment for beams in accordance with 1382.7
- .3 Tables 1302-6 and 1330-3 shall not apply to this section.

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POST-TENSIONING SYSTEM

ITEM: 1332

1332.1 DESCRIPTION

- .1 This Item consists of the supply and installation of the complete post tensioning system.

1332.2 MATERIALS

- .1 All materials and procedures shall be supplied by the Contractor.
- .2 Concrete shall be supplied in accordance with Item 1302.2 and shall match the specified concrete requirements of the Structure into which it is being incorporated and/or as specified in the Contract Documents.
- .3 Grout shall be a pre-packaged natural aggregate grout, mixed, placed and cured as recommended by the manufacturer.
 - .1 Grout shall conform to ASTM C1107 Grade B or Grade C when tested at a fluid consistency of 25 - 30 seconds as per ASTM C939, at temperature extremes of 5 °C and 25 °C, and an extended working time of 30 minutes.
 - .2 Grout shall not contain chlorides or other chemicals known to be deleterious to the post-tensioning steel.
 - .1 Chlorides shall be determined in accordance with CSA A23.2-4B.
 - .2 When testing for nitrates the sampling procedure shall be in accordance with CSA A23.2-4B, Clauses 5, 6.1, 6.2 and 6.3, then the nitrates in water, so extracted, shall be determined in accordance with ASTM D4327.
- .4 Grout shall also be supplied in accordance with CSA A23.1 and shall be proportioned to provide the specified properties as indicated in the Contract Documents and as a minimum shall have the following properties:
 - .1 An approved expanding agent additive or approved pre-manufactured non-shrink grout formulation;
 - .2 A water cement ratio between 0.40 and 0.45; and
 - .3 A minimum compressive strength of 20 MPa at 1 Day, 40 MPa at 7 Days and 60 MPa when tested at 28 Days in accordance with CSA A23.2 when cured at 23 °C and shall also meet the 7- and 28-day requirements when tested and cured at the 5 °C and 25 °C limits.
- .5 Reinforcing steel shall be supplied in accordance with Item 1304.2.
- .6 Post-tensioning strands shall be of the 7-wire stress relieved type and shall meet the requirements of ASTM A416 and have an ultimate tensile strength of 1860 MPa, unless otherwise specified in the Contract Documents.
- .7 Post-tensioning wire shall be a high tensile strength wire specifically manufactured for use in prestressed concrete and shall meet the requirements ASTM A421 and shall be of a type BA where cold end deformation is used for anchoring purposes, or type WA where ends are anchored by wedges.

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- .8 Post-tensioning tendons shall also be supplied in accordance with CSA G279 and CSA S6.
- .9 Anchorages and couplings shall be supplied in accordance with CSA A23.1.
- .10 The Contractor shall supply bright or galvanized sheet steel sheaths fabricated and placed to be grout tight.

1332.3

SUBMITTALS

- .1 The Contractor shall be responsible for the design of the post-tensioning system and shall submit the design, in accordance with Item 1383.
- .2 All post-tensioning Work shall be carried out by a qualified Contractor, or subcontractor pre-qualified in accordance CSA A23.4, CPCI and Post Tensioning Institute (PTI).
 - .1 The Contractor shall provide the Engineer with the name of the proposed post-tensioning firm.
 - .2 The post-tensioning firm shall show to the Engineer's satisfaction that he has the Equipment, materials and suitably trained and experienced staff to supply and supervise the installation of the required post-tensioning system.
- .3 The Contractor shall provide the following informational items, for review, a minimum of 40 Days prior to commencing post-tensioning Work:
 - .1 A load strain curve certifying physical properties for each mill heat of bar steel and/or wire steel;
 - .2 The physical properties and chemical composition for bar steel and/or wire steel verifying that the materials conform to the minimum specification requirements indicated;
 - .3 A mill certificate for anchorages and X rays of each multi strand single wire anchorage;
 - .4 Hardness test result(s) for heat treated anchorages;
 - .5 Any other standard test data required to certify that all components of system conforms to minimum specification requirements indicated for these components; and
 - .1 The manufacturer shall provide quality control procedures for review.
- .4 The submission shall also show the proposed arrangement, location and details, indicating wobble coefficients and belt friction, for sheathing and couplings; manufacture, size, type and ultimate strength of tendons, sequence and rate of tensioning in order to provide post tensioning forces and eccentricities as detailed in the Contract Documents.

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- .5 The post-tensioning system is subject to approval by the Engineer and samples of material such as post-tensioning steel, anchors, couplings, sheath and grout components shall be submitted for approval, when requested by the Engineer.
 - .1 Samples submitted shall be accompanied by all necessary certificates, source of supply, date of manufacture and technical information, to enable the Engineer to carry out a full investigation.
 - .2 Sufficient test specimens may be taken from each coil of post-tensioning steel and tested by the Owner to determine compliance with the requirements of this specification.
 - .1 With each sample of post-tensioning cable for testing, there shall be submitted a certificate stating the manufacturer's minimum guaranteed ultimate tensile strength, the corresponding reel number and the date of manufacture.
- .6 All stranded wire shall be delivered in coils with a metal tag attached to each coil showing, the manufacturer's name, the heat number and the coil number.
- .7 Each coil shall be accompanied by a stress strain curve, showing, the corresponding information of the metal tag, the ultimate strength, the date of manufacture and the stress strain curve from zero stress to ultimate.
- .8 The shipping package or form shall be clearly marked with a statement that the package contains high strength post-tensioning cable; the type of care to be used in handling; and the type, kind and amount of corrosion inhibitor used, including the date when placed, safety orders and instructions for use.
- .9 The Contractor at the conclusion of the post-tensioning shall provide a copy of the following records:
 - .1 Date of tensioning;
 - .2 Identification and number of elements;
 - .3 Identification of jacking Equipment;
 - .4 Required total load per strand;
 - .5 Initial tension;
 - .6 Anticipated and actual gauge pressure for each strand or strand group;
 - .7 Anticipated and actual elongation; and
 - .8 Any problems encountered.
- .10 Submittals are required in accordance with any cross-referenced item forming part of this Item.

1332.4 CONSTRUCTION

1332.4 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 All concrete Work shall be carried out in accordance with Item 1302.

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1332.4 .2 Post-tensioning Steel

- .1 All post-tensioning steel must be free of deleterious materials such as oil, grease, frost, paint, mill scale, loose rust, corrosion or any foreign material which may prevent bonding between steel and concrete.
- .2 The use of post-tensioning steel having kinks, bends, nicks or other defects is not permitted.
- .3 During all stages of transport, handling, storage and construction, all post-tensioning materials shall be thoroughly protected against corrosion, crushing or other damage.
- .4 All water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 10 kg/m³.
 - .1 All compressed air used to blow out ducts shall be oil free.
- .5 When wires are to be button headed, the buttons shall be cold formed symmetrically about the axis of the wire.
 - .1 The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire.
 - .2 No cold forming process shall be used that causes indentations in the wire.
- .6 Post-tensioning steel which is installed in members prior to placing and curing of the concrete shall be continuously protected against rust or other corrosion, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct, until grouted.
- .7 When post tensioning steel is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 Days after the installation of the post-tensioning steel, rust which may form shall not be cause for rejection of the steel.
 - .1 Post-tensioning steel installed, tensioned and grouted within 10 Days, shall not require the use of a corrosion inhibitor in the duct following installation of the post-tensioning steel.
 - .1 Post-tensioning steel installed but not grouted within 10 Days shall be subject to all the requirements pertaining to corrosion protection and rust.
- .8 In tensioning strands, one approved splice per strand shall be permitted provided the splice is not located within the concrete member.
 - .1 Welded strand joints or wire splices shall not be permitted in any reel or coil of strand.

1332.4 .3 Placement of Cables

- .1 Post-tensioning cables shall be placed within a tolerance of ± 5 mm of their theoretical position and all kinks and undulations shall be avoided.

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- .2 Cables shall be supported on rigid metal supports not exceeding a spacing of 1 m and attached to the vertical stirrups without welding.
- .3 The Contractor shall repair the sheath to the satisfaction of the Engineer should the sheath become punctured or crushed at any time during the placement of cables and prior to or during the placement of concrete.
- .4 Where the end of a post tensioned assembly will not be covered by concrete, the anchoring devices shall be recessed so that the ends of the post-tensioning steel and all parts of the anchoring devices will be at least 50 mm inside of the end surface of the members, unless otherwise indicated in the Contract Documents.
 - .1 Following post tensioning, the recesses shall be filled with an approved type of dry pack material and finished flush.

1332.4 .4 Anchorage and Couplings

- .1 All post tensioning steel shall be secured at the ends by means of an approved permanent type anchoring device.
- .2 Anchorages shall be capable of transferring the maximum post-tensioning force to the concrete without distress to the concrete.
- .3 The final unit compressive stress on the concrete directly underneath the anchorage assembly shall not exceed 21 MPa.
- .4 Bending stresses in the plates or assemblies induced by the pull of the post-tensioning steel shall not exceed the yield point of the material nor cause visible distortion in the anchorage plate when 100% of the ultimate load is applied.
- .5 Anchorages shall be provided with suitable ports for the injection of grout.

1332.4 .5 Sheath

- .1 The sheath shall be provided with air vents at all high points in the cables.

1332.4 .6 Tensioning Equipment

- .1 Hydraulic jacks and pumps of sufficient capacity shall be used for tensioning of cables.
- .2 All gauges or load cells used for registering the stressing forces shall be calibrated and certified within the previous 12 months of the time of the Work.
 - .1 If a pressure gauge is used it shall have an accurate reading dial at least 150 mm in diameter and each jack and its corresponding gauge shall be calibrated as a unit and shall be accompanied in the field by a certified calibration chart.
 - .2 If a load cell is used it shall be calibrated and shall have an indicator by means of which the post-tensioning force in the cables may be determined.

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1332.4 .7 Cold Weather Requirements

- .1 Cold weather requirements for grout shall be the same as for concrete as outlined in 1302.4.
- .2 The temperature of the concrete surrounding the sheath shall not be less than 5°C during grouting and the temperature of the surrounding concrete shall be maintained at a minimum of 5°C for not less than 7 Days after grouting.

1332.4 .8 Supervision

- .1 The Contractor shall retain personnel on site with extensive experience in post tensioned/prestressed concrete construction and who is thoroughly familiar with the post-tensioning system being used, and this person(s) shall be present at all times during cable placing, stressing and grouting.

1332.4 .9 Post-Tensioning

- .1 No stressing by post-tensioning shall be undertaken until all concrete in the Structure has reached the strength specified in the Contract Documents.
- .2 Prior to post tensioning any member, the Contractor shall demonstrate that the post-tensioning steel is free and unbonded in the duct.
- .3 Stress in the cables shall be measured with a dynamometer accurate to $\pm 0.5\%$ and verified by elongation based on the stress strain characteristics of the wire.

1332.4 .10 Grout

- .1 All cable ducts shall be filled with grout in one continuous operation after the completion of stressing.
- .2 During freezing weather, the grout shall be kept at a minimum of 5°C for not less than 7 Days.
- .3 The grouting Equipment shall be capable of grouting at a minimum pressure of 0.7 MPa and the grouting Equipment shall be furnished with a pressure gauge having a full-scale reading of not more than 2 MPa.
- .4 Standby flushing Equipment capable of developing a pumping pressure of 1.7 MPa and of sufficient capacity to flush out any partially grouted cable ducts shall be provided.
- .5 All grout shall pass through a screen with 1.8 mm maximum clear opening size prior to being introduced into the grout pump.
- .6 If a breakdown of the grout pump occurs during the grouting operation, the cable duct shall be flushed out and the entire cable duct regouted.

1332.5 MEASUREMENT FOR PAYMENT

- .1 The supply and installation of the complete post-tensioning system in accordance with this Item shall be on a lump sum basis.

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1332.6

BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

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MECHANICALLY STABILIZED EARTH WALLS

ITEM: 1333

1333.1 DESCRIPTION

- .1 This Item consists of the provision of all materials and labour required to fully design, fabricate, supply-and erect Mechanically Stabilized Earth (MSE) retaining wall sections, with pre-cast concrete fascia wall panels, in accordance with the Contract documents.
- .2 This item includes; but, is not limited to: excavation for the wall; concrete levelling pads; pre-cast concrete fascia panels or welded wire fascia; supply, placement and compaction of granular backfill material; soil reinforcement; inspection wires; perforated drain pipes complete with filter fabric sock; geotextiles; impermeable geomembranes; surface drains; cast-in-place concrete wall coping cap; permanent safety railing; and all associated hardware and miscellaneous materials require to completely erect the MSE Wall .
- .3 Two-stage MSE retaining walls shall not be permitted.
- .4 The pre-cast concrete or welded wire fascia panels, soil reinforcement, connections, inspection wires, hardware and all associated materials shall be supplied from a single MSE wall supplier.

1333.2 REFERENCES

1333.2 .1 American Society for Testing and Materials International (ASTM)

- .1 ASTM A1064/A1064M-22, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .2 ASTM A572/A572M-21e1, Standard Specifications for High Strength Low-Alloy Columbium-Vanadium Structural Steel
- .3 ASTM A123/A123M-17, Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .4 ASTM A143/A143M-07(2020), Standard Practice for Safeguarding against Embrittlement of Hot-Dipped Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- .5 ASTM A780/A780M-20, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings.
- .6 ASTM D7737/D7737M-15, Standard Test Method for Individual Geogrid Junction Strength.
- .7 ASTM D5262-21, Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behaviour of Geosynthetics
- .8 ASTM D698-12(2021), Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbs/ft³ (600kN-m/m³))
- .9 ASTM A1115/A1115M-19 Standard Practice for Construction of Mechanically Stabilized Earth Walls with Inextensible Soil Reinforcement

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- 1333.2 .2 American Association of State Highway and Transportation Officials (AASHTO)
- .1 AASHTO LRFD Bridge Design Specifications
- 1333.2 .3 Canadian Standards Association (CSA International)
- .1 CSA A3000-18, Cementitious Material Compendium.
- .2 CSA A23.1:19/A23.2:19, Concrete Materials and Methods of Concrete Construction/Methods of Tests and Standard Practices for Concrete.
- .3 CSA A23.3:19, Design of Concrete Structures
- .4 A23.4:16 (R2021), Pre-cast Concrete - Materials and Construction, latest edition.
- .5 CSA A283:19, Qualification Code for Testing Laboratories.
- .6 C22.2 No. 211.1:06 (R2021), Rigid Types EB1 and DB2/ES2 PVC Conduit.
- .7 CSA G30.18:21, Carbon Steel Bars for Concrete Reinforcement.
- .8 CSA G40.20:13 (R2018)/G40.21:13 (R2018), General Requirements for Rolled or Structural Quality Steel/Structural Quality Steel
- .9 CSA S6-19, Canadian Highway Bridge Design Code
- 1333.2 .4 Geosynthetic Institute (GSI)
- .1 GG4(a)-2012, Practice for Determination of Long-Term Design Strengths of Stiff Geogrids.
- .2 GG4(b)-2012, Practice for Determination of Long-Term Design Strengths of Flexible Geogrids.
- 1333.2 .5 Federal Highway Administration (FHWA)
- .1 Design and Construction of Mechanically Stabilized Earth Walls and reinforced Slopes – Volumes 1 and 2 FHWA0-NHI-10_024 and FHWA-NHI10-10_025.
- 1333.2 .6 Transportation Association of Canada (TAC)
- .1 Design, Construction, Maintenance and Inspection Guide for Mechanically Stabilized Earth Walls.
- 1333.3 MATERIALS
- 1333.3 .1 General
- .1 All materials shall be supplied by the Contractor.
- 1333.3 .2 Cements and Supplementary Cementing Materials
- .1 All cement and supplementary materials shall be in accordance with 1301.

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1333.3 .3 Concrete Materials

- .1 All pre-cast concrete facing elements shall meet the material and fabrication requirements specified in accordance with 1330.
- .2 All cast-in-place concrete shall meet the material requirements specified in accordance with 1301 and 1302.

1333.3 .4 Internal Reinforcement

- .1 Internal Reinforcing for pre-cast structural concrete shall be in accordance with Sections 1304 or 1306.
- .2 Welding of reinforcing steel, including tack welding, is prohibited without the written permission of the Engineer.

1333.3 .5 Steel-Soil Reinforcement, Connections and Hardware

- .1 Steel-soil reinforcement strips consisting of welded-wire reinforcement shall meet the requirements of ASTM A1064/A1064M.
- .2 Steel-soil reinforcement strips consisting of steel strip type reinforcement shall meet the requirements of ASTM A572/A572M.
- .3 Inspection wires, if required by the Owner, shall meet the requirements of ASTM A1064/A1064M.
- .4 All galvanizing shall conform to ASTM A123/A123M with a minimum net retention of 610 g/m².
- .5 Steel with a boron content exceeding 0.0008% shall not be permitted.

1333.3 .6 Geosynthetic Soil reinforcement

- .1 All geosynthetic soil reinforcement strips shall conform to the appropriate provisions of 1333.2.1 and 1333.2.4.
- .2 Geosynthetic Reinforcement shall also meet the requirements of AASHTO LRFD Bridge Design Specifications, Clause 11.10.6.4.3b.
- .3 Geosynthetic reinforcing materials shall contain stabilizers or inhibitors to prevent degradation of properties due to ultraviolet light exposure.

1333.3 .7 Geotextile Filter Fabric

- .1 All Geotextile Filter Fabric shall meet the material requirements specified in accordance with 218, Type N2.

1333.3 .8 Impermeable Geomembrane

- .1 Impermeable geomembrane shall be PVC, HDPE or LLDPE with a minimum thickness of 0.75 mm and shall meet the physical requirements outlined in Table 1333 – 1.

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- .2 Geomembrane material shall be installed above the upper reinforcement strip within the backfill zone and extend 1000 mm beyond the longitudinal extent of the structure. It shall be sandwiched between two layers of geotextile fabric.
- .3 There shall be 100 mm diameter perforated interceptor pipes at the transverse edges of the geomembrane and daylighted at an appropriate location.
- .4 Geomembrane shall be Layfield Enviro Liner 6000 HD or approved equivalent.

1333.3 .9 Welded Wire Fascia

- .1 Welded Wire Fascia shall meet the requirements of ASTM A1064/A1064M.

**Table 1333– 1
Impermeable Geomembrane Requirements**

Physical Property	Test Method (ASTM)	Minimum Required Value
Tear Strength	D1004	45 N
CBR Puncture Strength	D6241	140 N

1333.3 .9 Inserts

- .1 Inserts shall be of sufficient capacity and of an approved type as specified and shall be placed in the location(s) as indicated by the manufacturer's design specifications.
- .2 All proposed inserts shall be of material sufficient to meet the design life requirements.

1333.3 .10 Safety Railings

- .1 Steel safety railings shall be fabricated, galvanized, supplied and installed in accordance with 1336.
- .2 Steel railings shall conform to CSA G40.21M, Grade 300W.

1333.3 .11 Aggregates

- .1 Aggregates used in structural backfill shall meet the minimum material properties specified in accordance with Section 401 and the provisions of Tables 1333-2 and 1333-3.

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**Table 1333-2
Backfill Requirements for Galvanized Steel Soil Reinforcing**

Backfill Requirements		Test Method (ASTM)	Test Method (AASHTO)
Resistivity	≥ 3000 ohm-cm	G57	T288
pH	5 – 10	G51	T 289
Chlorides	≤ 100 ppm	D4327	T 291
Magnesium Sulphate Soundness	Loss less than 30% after four cycles	D5240	T 104
Sulphates	≤ 200 ppm	D4327	T 290
Organic Content	≤ 1.0%	D2974	T267

**Table 1333-3
Backfill Requirements for Geosynthetic Soil Reinforcing**

Backfill Requirements		Test Method (ASTM)	Test Method (AASHTO)
pH	3 – 12	G51	T 289
Organic Content	≤ 1.0%	D2974	N/A
Design Temperature at Site	< 30°C	N/A	N/A

1333.3 .12 Pre-Cast Concrete Fascia Panel Fabrication

- .1 The fabrication of pre-cast concrete fascia panels shall be in accordance with 1330, A23.4 and this section.
- .2 Concrete materials used in the fabrication of pre-cast concrete fascia panels shall be in accordance with 1301 and 1302, Type “B”.
- .3 Pre-cast concrete fascia panels shall have a minimum thickness of 140 mm, excluding any thickness required for aesthetic surface treatments.
- .4 Exposed concrete fascia panels shall have an Ashlar Stone finish or approved equivalent. The entire exposed surface shall be form finished and not washed or rubbed finish.
- .5 All front face edges of pre-cast concrete fascia panels shall be chamfered.
- .6 Minimum cover to internal reinforcement shall be 50 mm on all faces. Steel reinforcement shall be electrically isolated from steel connection hardware and/or steel soil reinforcement.

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- .7 Joints between panels shall have a lip and recess (ship lap) configuration. Butt-joints may be used if a pre-cast HPC concrete (Type "A") backing block with filter fabric is designed and installed along the joint to prevent soil infiltration.
- .8 Pre-cast concrete fascia panels shall be designed to accommodate a differential settlement of 1% along the wall face and from the front face to the tail end of soil reinforcement.
- .9 Geosynthetic reinforcing embedded into the concrete fascia panels shall meet the following:
 - .1 Geosynthetic reinforcement shall be facilitated using structural steel jigs to maintain alignment and projection lengths.
 - .2 Geosynthetic reinforcement shall exit perpendicular to the pre-cast concrete fascia panel unless otherwise reviewed and approved by the Engineer and the department.
 - .3 Geosynthetic reinforcing tabs exiting pre-cast concrete fascia panels shall have uniform projection lengths.
- .10 Concrete shall have a minimum strength of 15 MPa prior to removal from forms.
- .11 All surface cavities shall be filled with a Department approved concrete patching material.
- .12 Pre-cast concrete fascia panels with the following defects shall be rejected:
 - .1 Units with variation in pre-cast concrete fascia panel face trueness for any line across a pre-cast concrete fascia panel face from a straight edge more than 5 mm over 1 m.
 - .2 Units with honeycombing, cracks, spalls or broken corners that are beyond CSA A23.4 limits for minor repair.
 - .3 Units with surface cavities greater than 10 mm in diameter that are beyond CSA A23.4 limits for minor repair.
- .13 Inspection and assessments of the pre-cast panel shall be carried out by the MSE Wall Manufacturer immediately after stripping of forms.
- .14 If permitted by the Department, repair procedures of any surface cavities or defects shall be submitted in writing by the Contractor and approved by the Department prior to repairs being conducted.

1333.4 **SUBMITTALS**

- .1 The Contractor shall submit shop drawings in accordance with Section 1383.
- .2 The contractor shall submit details related to their concrete mix in accordance with 1330.4.
- .3 As a minimum, MSE Wall shop drawings shall contain the following:

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- 1 Wall layout plan and elevation complete with dimensions and elevations and typical wall cross-sections;
 - .2 Pre-cast concrete fascia panel reinforcing, connection and hardware detailing;
 - .3 Cross-reference to relative bridge design drawings;
 - .4 Design criteria and list of material properties;
 - .5 Backfill requirements and properties;
 - .6 All components and connection details;
 - .7 MSE Wall Drainage Details; and
 - .8 Construction procedures and construction sequencing.
- .4 Provide Mill Test Certificates for all steel fabricated components, steel soil reinforcement, steel concrete reinforcement, connections and associated hardware in accordance with 1383.
- .1 Steel with boron content exceeding 0.0008% shall not be permitted.
- .5 The Contractor shall provide certified copies of quality control tests related to this Contract as specified in CSA A23.2, A23.4, and ASTM A416M.

1333.5 CONSTRUCTION

1333.5 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall employ qualified personnel experienced in constructing MSE Walls to supervise and perform the work.
- .3 The Contractor shall, at no additional cost to the contract, provide an on-site technical representative at all times during construction in order to advise the Contractor's personnel regarding construction procedures and to ensure construction is being conducted in accordance with the suppliers' standard specifications and the shop drawings.
- .4 All pre-cast wall elements shall be designed, fabricated, supplied and erected in accordance with 1330, 1333.3.12 and 1333.5.5.
- .5 The Contractors technical Representative or Geotechnical Engineer shall provide documentation of compliance for the following:
 - .1 Foundation base preparation;
 - .2 On-site delivery of MSE wall components;

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- .3 Backfill requirements;
- .4 Alignment of pre-cast concrete fascia elements;
- .5 Wall alignment and tolerance measurements.
- .6 The documentation listed above shall be sealed and signed by a Professional Engineer, registered with Engineers PEI.
- .7 The Contractor shall maintain soil reinforcement placement records, soil compaction records and pre-cast concrete fascia panel alignment and tolerance records throughout MSE wall construction.

1333.5 .2 Excavation

- .1 Excavation shall be carried out in accordance with Section 200 and these specifications.
- .2 The Contractor shall establish the locations and extents of all existing underground services in the work area prior to commencing excavations. Damage to any underground services during the course of construction shall be repaired at the Contractors expense.
- .3 Excavations shall be conducted to the lines and grades as in dictated in the contract documents, shop drawings or as determined on site by the Engineer.
- .4 The contractor shall proof roll the foundation sub-grade and identify any soft areas.
- .5 Soft areas, as determined by the Engineer, shall be removed and replaced with compacted, crushed aggregate material to the satisfaction of the Engineer.
- .6 MSE wall construction shall not commence until the foundation preparation has been inspected and approved by the technical representative on site or the Contractor's Geotechnical Engineer. Such approval shall be in writing and a copy forwarded to the department for their files.

1333.5 .3 Concrete Levelling Pads

- .1 Construction of concrete levelling pads shall be in accordance with section 1302, Concrete Type "D".
- .2 Concrete levelling pads shall be placed by instrument and shall not deviate from the detailed design profile elevations by more than 0.5 %.
- .3 Pre-cast concrete levelling pads shall only be permitted if they are included in the design by the MSE Wall supplier.
- .4 Concrete levelling pads that are not constructed to the elevations shown on the contract drawings and/or within the specified tolerances shall be removed and replaced.
- .5 After removal, the foundation base shall be prepared and inspected and approved in accordance with 1334.4.2.

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1333.5 .4 Backfilling

- .1 Backfill shall be placed and compacted in accordance with sections 207, 209, the MSE Wall supplier's recommendations and these specifications. In the event of a conflict, the most stringent requirements shall govern.
- .2 All backfill shall be placed in lifts not exceeding 200 mm in thickness of loose material.
- .3 Backfill shall not be placed on frozen substrate.
- .4 Backfill shall be placed so that the soil reinforcement is fully supported along its entire length. Small, localized pockets shall be permitted at the soil reinforcement/pre-cast panel connection. Size of pockets shall be in accordance with the supplier's recommendations and approved by the Engineer.
- .5 Equipment shall not be permitted to ride on soil reinforcement strips.
- .6 Backfill compaction shall be performed so that equipment moves parallel to pre-cast fascia panels and away from panels towards the ends of the soil reinforcement.
- .7 Heavy vibratory rollers shall only be permitted up to 1000 mm from the back of the pre-cast wall panels. Only hand operated power tampers and vibratory equipment shall be permitted within 1000 mm of the wall panels.
- .8 At the end of each day, backfill shall be sloped away from the pre-cast fascia panels to direct any potential run-off away from the panels.
- 9 Backfill placement and compaction shall closely follow erection of each course of pre-cast concrete fascia panels.
- .10 Backfill shall be placed in such a manner as to avoid damage or misalignment to the pre-cast concrete fascia panels. Any damaged fascia panels shall be replaced and/or any misaligned panels shall be rest at the expense of the contractor.
- .11 Backfill shall be placed and compacted to a minimum 95% standard proctor density, or to a minimum density required by the wall supplier, whichever is more stringent.

1333.5 .5 Pre-Cast Concrete Fascia Panel Installation

- .1 The height of shims at any location shall not exceed the pre-cast concrete fascia panel installation tolerances outlined below.
- .2 Any pre-cast concrete fascia panels damaged during shipping, installation or backfilling operations, including cracks, spalls or broken corners, which are deemed not repairable, shall be rejected and replaced at no additional cost to the contract.
- 3 All lifting hook pockets shall be filled with a Department approved concrete patching material and shall be placed in accordance with the manufacturer's recommendations.

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- 4 Pre-cast concrete fascia panels shall be installed to the following tolerances:
 - .1 The out-of-flatness of wall surface measured in any direction shall not exceed 25 mm under a 3 m straight edge;
 - .2 The offset at adjacent panel joints shall not exceed 10 mm;
 - .3 The out-of-vertical alignment of the complete wall shall not exceed 4mm/m of the total MSE wall height; and
 - .4 The joint gap width shall be a nominal 19 mm +/- 10 mm.
- .5 For any pre-cast concrete fascia panels that do not meet the specified installation tolerances, the Contractor shall remove the backfill and reset the pre-cast concrete fascia panel(s) to the specified tolerances at no additional cost to the contract.
- .6 A minimum 300 mm wide strip of filter fabric shall be installed behind all pre-cast concrete fascia panel joints. Adhesive shall be used to hold the fabric securely in place during backfilling operations. Strips shall be centered on horizontal and vertical joints.

1333.5 .6 Cast-in-Place Concrete Wall Coping Caps

- .1 Construction of cast-in-place concrete wall coping caps and surface finishes shall be in accordance with 1301 and 1302.
- .2 Internal reinforcement shall be in accordance with 1304 or 1306.
- .3 Galvanized anchor bolt assemblies for safety railings shall be cast into the concrete coping.
- .4 Cast-in-place concrete wall coping cap section cast at corners or against existing structures shall be isolated from contact with other concrete components with 12 mm thick closed cell foam.
- .5 The tops of cast-in-place concrete coping caps shall be smooth, have no steps or abrupt changes in elevation, and shall have a 3% slope towards the MSE soil mass.
- .6 Control joints and drip grooves shall be detailed on the shop drawings. Control joints shall be centered on pre-cast concrete fascia panel joints, be perpendicular to the wall direction and in no case exceed a 4 m spacing.
- .7 The MSE wall and cast-in-place coping shall be designed to fully resist the loads specified on the drawings or that are applied to roadway barriers, railings or any attachments required by S6.

1333.5 .7 Impermeable Geomembrane

- .1 Seams of impermeable geomembrane shall be parallel to the MSE wall and be lapped in the direction of positive drainage away from the wall to produce a shingling effect.

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- .2 The membrane shall be installed in accordance with the manufacturer's recommendations and in weather conditions suitable for installation.

1333.5 .8 Safety Railings

- .1 All steel components of safety railings shall be fabricated, galvanized, supplied and erected in accordance with 1336.

1333.5 .4 Material Storage

- .1 Storage area for MSE wall units shall be graded level to ensure the pre-cast concrete fascia panels are uniformly supported on timber bearing blocks with plastic separation.
- .2 Pre-cast concrete fascia panels shall be stored in such a manner as to maintain the uniform colour and protect them from staining or discolouration. Panels with stained, discoloured or damaged front faces shall not be incorporated into the wall.
- .3 All materials shall be stored above ground, covered and protected from rain, snow, dirt and ultraviolet light. Any damage identified shall be repaired to the full satisfaction of the Engineer.

1333.5 .5 Drainage Management during Construction

- .1 The Contractor shall maintain temporary drainage features to prevent adverse amounts of surface run-off from entering the MSE wall construction area.
- .2 Any erosion or other adverse effects, resulting from inadequate drainage management, shall be immediately addressed by the Contractor and repaired to the full satisfaction of the Engineer.

1333.6 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be for the square metre of Mechanically Stabilized Earth Walls designed, fabricated, supplied to the project site, and successfully installed as indicated in this specification section.

1333.7 BASIS FOR PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each class of structure, as identified under the Contract.
- .2 The Owner may make partial payment for beams in accordance with 1382.7.

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1335.1 DESCRIPTION

- .1 This Item consists of the supply including but not limited to, the fabrication, surface preparation, shop and field painting, delivery and erection of steel Superstructure to the Work Site.
- .2 The Bridge Superstructure has been designed according to CSA-S6, with a CL625 live loading and all Work shall conform to this, except as noted in the Contracts Documents.

1335.2 MATERIALS**1335.2 .1 General**

- .1 All materials shall be supplied by the Contractor.
- .2 The supply of any additional structural steel not shown on the Contract Documents, deemed necessary for the erection condition, including falsework and guys that may be required to maintain stability, shall be at the Contractor's own expense.

1335.2 .2 Structural Steel

- .1 All structural steel with the exception of secondary members comprised of rolled shapes shall meet the requirements of CSA G40.21 Grade 350 AT Category 3, "Atmospheric Corrosion Resistant Structural Steel" with "Improved Low Temperature Properties" or ASTM A588 when Charpy Impact Energy test indicate adequate toughness.
 - .1 This material shall possess a minimum Charpy V Notch impact energy of 27 Joules when tested at minus 30 °C.
 - 2 HSS Sections shall meet the above requirements. In lieu of 350AT, and only if approved by the Department, ATSM A500 Grade C sections shall be considered acceptable
- .2 All tee sections, channels, rolled beam and angle shapes and pintles shall conform to CSA G40.21 M Grade 350A or ASTM A588.
- .3 Sample preparation and testing shall be in accordance with the requirements of CSA G40.20.
- .4 All steel shall be delivered in accordance with CSA G 40.20.
- .5 Structural shapes and angles shall be individually colour marked in accordance with CSA G40.21 or CSA G40.20, when shapes under 150 mm in cross sectional dimension are shipped in bundles and tagged in bundles.
- .6 All anchor and anchor bolt assemblies including fabricated sections, nuts and washers shall conform to CSA G40.21 Grade 350A.

1335.2 .3 High Tensile Bolts

- .1 High tensile bolts, nuts and washers shall conform to ASTM F3125 Graded A325M or A490M, as specified in the Contract Documents. ASTM F3125 Grade A325M bolts

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shall be galvanized Type I for painted steel or Type 3 for unpainted corrosion-resistant steel.

- .2 Nuts shall be Grade A563 DH for galvanized applications and C3 (recommended) or DH3 (suitable) for unpainted applications
- .3 Nuts and bolts shall be shipped together as an assembly.

1335.2 .4 Welding Electrodes

- .1 Electrodes shall conform to CSA W48.1, W48.3, W48.5 and W48.6.
- .2 Filler metal shall be in accordance with Table 5-1, "Filler Metal Requirements for Exposed Bare Applications of CSA G40.21 350 A, 350 AT, 400 A, 400 AT and ASTM A242 and A588 Steels" of CSA W59.
- .3 Deposited weld metal shall have a minimum Charpy Impact Energy of 27 Joules at minus 30°C in accordance with Appendix A of CSA-S6.
 - .1 The Contractor shall provide certification of groove welds.
- .4 The selection, supply and storage of electrodes and fluxes shall be in accordance with Clause 5 of CSA W59-M.
 - .1 Only controlled hydrogen (CH) designation electrodes shall be used for the flux-cored welding process.
- .5 Weld material used with corrosion resistant steels in unpainted applications shall have similar corrosion resistance and colour as the base metal, as required by CSA W59.

1335.2 .5 Stud Shear Connectors

- .1 Stud shear connectors shall be of a headed stud type, in accordance with the requirements of CSA W59.

1335.2 .6 Formwork

- .1 All formwork shall be carried out in accordance with Item 1384.

1335.3 SUBMITTALS

1335.3 .1 Qualifications of Fabricator/Certification

- .1 Structural steel elements shall be fabricated in plants that have third party certification under an industry recognized quality certification program specific to steel bridge fabrication.
- .2 Acceptable third-party certifications include:
 - .1 Canadian Institute of Steel Construction (CISC):
 - .1 Complex Steel Bridges
 - .2 Simple Steel Bridges with fracture critical endorsement
 - .3 Simple Steel Bridges without fractural critical endorsement

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- .2 American Institute of Steel Construction (AISC)
 - .1 Advanced Steel Bridges
 - .2 Simple Steel Bridges with fracture critical endorsement
 - .3 Simple Steel Bridges without fractural critical endorsement
- .3 Within 12 Days after Tender Closing and prior to Award of the Contract, the Contractor shall submit the following:
 - .1 Documentation from the CISC or AISC indicating the steel fabricator is a member in good standing with verification of Certification Level required based on the project specifications.
 - .2 Documentation from the Canadian Welding Bureau indicating the fabrication shop is fully certified to the requirements of CSA W47.1, Division 1.
 - .1 Certification shall be in effect prior to the beginning of the Work and shall be maintained throughout the period of manufacture.

1335.3 .2 Quality Systems Manual

- .1 The Contractor shall submit the steel fabricator's Quality System Manual to the Engineer five (5) weeks prior to the start of fabrication, in accordance with the latest version of the CISC's Steel Bridge Certification Standard.
- .2 In addition to the requirements of the CISC's Steel Bridge Certification Standard, the Quality System Manual shall include the following:
 - .1 Method of transferring heat numbers, including traceability.
 - .2 Method of ensuring dimensional correctness, including traceability.
 - .3 Method of ensuring camber checks are complete, including traceability.

1335.3 .3 Shop Drawings

- .1 The Contractor shall submit shop drawings in accordance with Item 1383 and with, but not limited to, the following additional requirements:
 - .1 The Contractor shall prepare shop drawings of all metal Work and shall submit shop drawings and certified mill reports to the Engineer for review in accordance with Section 1383.
 - .2 The Contractor shall arrange to have the shop drawings in the hands of the Engineer five (5) weeks prior to the start of fabrication.
 - .3 After the Engineer's review, the Contractor shall submit one complete set of the as-built drawings, after all revisions have been made.
 - .4 No fabrication shall be undertaken until the Engineer has returned the shop drawings to the Contractor.

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- .5 The review of the Contractor's shop drawings by the Engineer shall not relieve the Contractor of her/his responsibility for the correctness of his/her drawings.
- .6 All shop drawings, erection drawings, welding procedures, design briefs, and all other such documents shall be stamped and signed by a Professional Engineer registered or licensed to practice in the Province of Prince Edward Island.

1335.3.3

.2

Shop Details

- .1 Shop drawings shall provide shop details, which includes:
 - .1 Full detail dimensions and sizes of all components and parts of the Structure;
 - .1 These dimensions shall make allowance for changes in shape due to weld shrinkage, camber and any other effects which cause finished dimensions to differ from initial dimensions.
 - .2 All necessary specifications for the materials to be used;
 - .3 Identification of areas requiring special surface treatment;
 - .4 Identification of fracture critical and primary tension members and component parts;
 - .5 Bolt installation requirements; and
 - .6 Details of all welds.
 - .2 Symbols for welding and non-destructive test on shop drawings shall be in accordance with the provisions of CSA W59.

1335.3 .4

Welding Procedures

- .1 The Contractor shall submit the welding procedure specifications and welding procedure data sheets, conforming to CSA W59 and CSA W47-1, to the Engineer at least two weeks in advance of fabrication and review must be obtained before commencing the Work.
 - .1 The following shall be included, but not limited to;
 - .1 The welding process to be used, the position of welding, filler metal, flux, shielding gas if required, joint configurations, number and size of passes, preheat and inter-pass temperatures if required, sequence of passes, current, rate of pass, electrode size, electrical stick out and polarity, and methods of storing consumables.
 - .1 All groove welds shall be considered as primary tension members and shall be certified by the Canadian Welding Bureau to provide a minimum Charpy Impact Energy of 27 Joules at minus 30°C, in accordance with the testing requirements of CSA W47.1, Annex E.

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- .1 This shall include the testing of five subsurface weld metal Charpy V-Noth (CVN) impact test specimens and five subsurface HAZ CVN test impact specimens.

- .2 The methods that shall be used for the preparation of the edges.

- .3 Measures which shall be taken to control the effects of distortion, shrinkage and residual stresses.

- .4 The proposed methods and sequence of assembling.

- .5 The welding Equipment which shall be used.

1335.3 .5 Detailed Fabrication Schedule

- .1 A fabrication schedule shall be submitted to the Engineer fourteen (14) days prior to the commencement of fabrication.

- .2 The Contractor shall provide seven (7) days written notice prior to commencement of fabrication or change in the fabrication schedule.

1335.3 .6 Conformance

- .1 The Contractor shall submit, at least two (2) weeks in advance of the commencement of the steel fabrication, the manufacturer's certification that the materials supplied meet the specified requirements. Mill test certificate reports shall be provided in accordance with 1383.2.

- .1 Steel with boron content exceeding 0.0008% shall not be permitted.

- .2 The Contractor shall submit to the Engineer, at least two (2) weeks in advance of the steel fabrication, a letter certifying that the stud shear connectors conform to 1335.2.5.1.

1335.3 .7 Erection Procedure Drawings and Calculations

- .1 The Contractor shall, prior to commencing the Work of erection, furnish the Engineer with erection procedure drawings, together with complete calculations of stresses in the steelworks in the various stages of erection and shall inform the Engineer fully as to the method of erection he proposes to use.

- .2 The whole of this information shall be submitted to the Engineer for review, at least four weeks before the Work of erection is to commence and shall be stamped by a Professional Engineer who is registered or licensed to practice in the Province of Prince Edward Island.

1335.3 .8 Transportation

- .1 Two (2) weeks prior to transportation to the site, the Contractor shall submit a transportation plan to the Engineer showing support details, lateral bracing, and tie-down locations for primary members during transportation to the work site.

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1335.3 .9 Submittal Summary and Other Requirements

- .1 Submittals are required for this Item that are contained within the sections applicable to the specific phase of the Work being undertaken, separate and distinct to those listed here.

**Table 1335-1
Submittal Summary and Other Requirements**

Document	Reference Specification	Frequency and/or Timeline Requirement
Qualifications and Fabricator	1335.3.1	Once per contract
Quality Systems Manual	1335.3.2	Once per contract
Shop Drawings	1335.3.3 & 1385	Once per contract
Detailed Fabrication Schedule	1335.3.5	
Erection Procedure Drawings and Calculations	1335.3.7	Once per contract
Transportation Plan	1335.3.8	Once per contract
Welding procedure specifications, welding repair procedures and welding procedures data sheets	1335.3.4	
Mill test reports	1335.3.6 and 1335.4.3.2	Per plate, 48 hours prior to fabrication
Conformance for Shear Stud Connectors	1335.3.6	
Lamination Scan results	1335.4.6.6	
Alignment and dimensional checks at shop trail assembly with verified records of the actual measured camber layout/blocking details ¹	1335.4.2.10.1	Within 4 days of girder fabrication
Fit up of web-to-flanges, ensuring dimensional correctness and proper members used ¹	N/A	Within 4 days of girder fabrication
Fit up and layout of all stiffeners near side and far side, ensuring dimensional correctness and proper members used ¹	N/A	Within 4 days of girder fabrication
All web and flange splices tested and approved by quality control ¹	N/A	For each girder, prior to fit up and welding
Traceability of documentation of transfer of heat numbers	1335.4.3.2 and 1335.4.6.5	Within 4 days of girder fabrication
Shear stud connector installations ¹	1335.2.5	Within 4 days of girder fabrication
Dimensional inspection reports, including individual pieces, diaphragms and lateral bracing ¹	N/A	Within 4 days of girder fabrication
Quality Control NDT reports ¹	1335.4.6.7	Within 4 days of girder fabrication
Non-Conformance Reports (NCRs)	N/A	Immediately upon occurrence
Tracking documents to be on hand at fabrication plant for review by the Engineer's representative when visiting the facility.	1335.4.6.3	Updated daily and provided upon request by the Engineer's representative.
NOTES: 1) Submittals shall include the signature of the person responsible, verifying conformance to the contract specification 2) The Engineer may request revisions and resubmittals at any time.		

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1335.4 CONSTRUCTION

1335.4 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

1335.4 .2 Fabrication

1335.4.2 .1 Fabrication Standards

- .1 The fabrication of all structural steel shall conform to the AASHTO Specification with latest revisions, AWS Specification D1.5 Bridge Welding Code and to CSA W59, except that all welding shall conform to CSA W59 and CSA W47.1.

1335.4.2 .2 Workmanship and Finish

- .1 All edges of all members and plates, whether rolled, cut or sheared, that are exposed to view or weather in the finished assembly, and are to be coated, shall be rounded to a 1.5 mm minimum radius by grinding, prior to blast cleaning for assembly.
- .2 All edges of all members and plates that are not to be coated shall be chamfered 2.0 mm by grinding prior to blast cleaning and/or fit up.

1335.4.2 .3 Storage of Material

- .1 Structural material, either plain or fabricated, shall be stored at the fabricator's shop or elsewhere above the ground upon platforms, skips or other suitable supports and shall be kept free from dirt and other foreign matter.
- .2 Structural material, either plain or fabricated, shall be protected as far as practicable from corrosion.
- .3 Long members shall be so supported as to prevent deflection.
- .4 Plates damaged due to handling techniques or devices may be subject to rejection.

1335.4.2 .4 Shipping of Material

- .1 Damaged members shall be repaired or replaced as required by the Engineer.

1335.4.2 .5 Camber

- .1 All plate girders shall be cambered to compensate for full dead load deflections and the vertical curve as may be required by the profile grade as shown in the Contract Documents.
- .1 The maximum error in girder camber shall conform to Clause 5.8 of CSA W59, except that the error shall not exceed ± 20 mm.

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- .2 Rolled sections may be heat cambered using an approved procedure, while plate girders shall have the required camber cut into the web with suitable allowance for camber loss due to cutting, welding, and heat-curving.

1335.4.2

.6

Girder Splices

- .1 The locations of the field bolted main girder splices are shown in the Contract Documents.
 - .1 Additional field splices or the relocation of the main bolted field splices shall not be allowed.
- .2 The locations of the shop-welded splices are shown in the Contract Documents.
 - 1 No other shop-welded splices shall be permitted without prior approval of the Engineer.
 - .2 Welded field splices of the main girders shall not be allowed.
- .3 The locations of the main girder shop welded splices for the flanges are shown on the Contract Documents.
- .4 Should the Contractor require additional shop welded complete penetration groove weld splices in the flanges, these shall only be permitted with the written approval of the Engineer.
- .5 The location of complete penetration shop welded groove welds for the web plate shall be subject to the approval of the Engineer.

1335.4.2

.7

Re-entrant Cuts

- .1 A fillet of not less than 25 mm radius shall be provided at the junctions of all re-entrant cuts, and the fillet shall be formed before the cuts are made.

1335.4.2

.8

Flame Cutting

- .1 Steel may be flame-cut, provided a smooth surface is secured by the use of a mechanical guide.
- .2 Flame cutting by hand shall be done only when approved by the Engineer, and the surface shall be made smooth by planing, chipping or grinding.
- .3 The quality and repair of the cut edges shall conform to Clause 5 of CSA W59.
- .4 All cut edges which are not to be welded shall have a surface roughness not greater than 1000, as defined by CSA B95.

1335.4.2

.9

Fabrication Tolerances

1335.4.2.9

.1

Structural Members

- .1 Structural members consisting of a single rolled shape shall meet the straightness tolerances of CSA G40.20, except that columns shall not

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deviate from straight by more than 1/1000 of the length between points of lateral support.

.2 A variation of not more than 1 mm from the detailed length is permissible in the length of members which have both ends finished for contact bearing.

.3 Other members without finished ends may have a variation from the detailed length of not more than 2 mm for members 10 m or less in length, or not more than 4 mm for members over 10 m in length.

1335.4.2.9

.2 Abutting Joints

.1 When compression members are butted together to transmit loads in bearing, the contact faces shall be milled or saw-cut.

.1 The completed joint shall have at least 75% of the entire contact area in full bearing, defined as not more than 0.5 mm separation, and the separation of the remainder shall not exceed 1 mm.

.2 At joints where loads are not transferred in bearing, the nominal dimension of the gap between main members shall not exceed 10 mm.

1335.4.2.9

.3 Bearing Plates

.1 Bearing plates shall meet the following requirements:

.1 Rolled steel bearing plates 50 mm or less in thickness may be used without planing provided that a satisfactory contact bearing is obtained.

.2 Rolled steel bearing plates over 50 mm but not over 100 mm may be straightened by pressing or by planing on all bearing surfaces to obtain a satisfactory contact bearing.

.3 Rolled steel bearing plates over 100 mm in thickness shall be planed on all bearing surfaces, except for those surfaces which are in contact with concrete foundations and are grouted to ensure full bearing.

1335.4.2.9

.4 Fabricated Components

.1 Tolerances for welded components shall conform to Clause 5.4 of CSA W59.

.2 Dimensional tolerances of welded structural members shall conform to those prescribed in Clauses 5.8 and 12.5.3 of CSA W59.

.3 Built-up, bolted structural members shall satisfy the straightness tolerances of CSA G40.20 for rolled wide flanged shapes.

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- .4 Bearing stiffeners fitted to bear shall have a minimum bearing contact area of 75%, with a maximum separation of 1 mm over the remaining area.
 - .1 Contact is defined as a gap less than 0.25 mm.
- 5 Fitted intermediate stiffeners shall have a minimum bearing contact area of 25%, and a maximum separation of 2 mm.
 - .1 Contact is defined as a gap less than 0.25 mm.
- .6 The use of force to move flanges inward to achieve fit-up tolerances shall be approved by the Engineer.

1335.4.2 .10 Pre-assembly of Field Connections

1335.4.2.10 .1 Shop Trial Assembly

- .1 Girders and other main components shall be pre-assembled in the shop to prepare or verify the field-splices.
- .2 Components shall be supported in a manner consistent with the finished geometry of the Bridge, as defined in the Contract Documents, with allowance for any camber required to offset the effects of dead-load deflection.
- .3 Holes in the webs and flanges of main components shall be reamed or drilled to final size while in assembly.
 - .1 The components shall be pinned and firmly drawn together by bolts before reaming or drilling.
 - .2 Drifting done during assembly shall only be sufficient to align the holes and not to distort the steel.
 - .3 If required, reaming shall be used to enlarge holes.
- .4 Where a number of sequential assemblies are required because of the length of the Bridge, the second and subsequent assemblies shall include at least one section from the preceding assembly to provide continuity of alignment.
- .5 Trial assemblies are required when the field-splices are bolted.
 - .1 Each assembly shall be checked for camber, alignment, accuracy of holes, and fit-up of welded joints and milled surfaces.
 - .1 Corrective Work, if necessary, shall be carried out.

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- 1335.4.2 .11 Hole Drilled using Numerically Controlled Machines
- .1 As an alternative to the above trial assembly, when the bolt holes have been prepared by numerically controlled drilling or using a suitable template, the accuracy of the drilling may be demonstrated by a check assembly consisting of the first components of each type to be made.
 - .2 If the check assembly is satisfactory, further assemblies of like components are not required.
 - .3 If the check assembly is unsatisfactory for any reason, the Work shall be redone or repaired in a manner acceptable to the Engineer.
 - .1 Further check assemblies shall be required as specified by the Engineer to demonstrate that the required accuracy of fit-up has been achieved.
- 1335.4.2 .12 Welding, General
- .1 All welding, including Workmanship, technique, qualification, etc., shall conform to the requirements of CSA W59, except as modified by the following conditions:
 - .1 The electroslog and electrogas welding processes (see Clause 5 of CSA W59) shall not be used for welding quenched and tempered steels nor for welding components of members subject to tension stress or stress reversal.
 - .2 All shop splice welds shall be pre-qualified welds in accordance with CSA W59 and shall be subject to the approval of the Engineer.
 - .3 All groove welds in web and flange plates shall be done to the individual plates prior to the welding of flanges to the web plates.
 - .1 Groove weld procedures shall be pre-qualified welds in accordance with CSA W50 and CWB certified to provide a minimum Charpy Impact Energy of 27 Joules when tested at minus 30° C as per CSA W47.1 Annex E.
 - .2 No field groove welds shall be allowed.
- 1335.4.2 .13 Repair Welding
- .1 All welding corrections and repairs shall be performed according to CSA-S6, clause 10.23, except as amended herein.
 - .2 Repair of base metal by welding at the producing mill shall not be permitted.
 - .3 In addition to CSA-S6, clause 10.23, non-critical repairs which may receive prior approval include the following:
 - .1 The repair of welds requiring excavation of defects including porosity, slag, and lack of fusion, the repair of arc strikes and removal of tack welds not incorporated into a final weld.

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- .2 The repair of gouges not more than 5 mm deep on otherwise satisfactory cut or rolled surfaces which may be repaired by machining or grinding without welding; the procedures recommended in Clause 5.3.2 of CSA Standard W59 shall be followed.
- .3 The repair of occasional gouges exceeding 5 mm, but not more than 10 mm in depth on edges not to be welded, which may be repaired by welding; the procedures recommended in Clause 5.3.2 of CSA Standard W59 shall be followed.

1335.4.2 .14 Blast Cleaning - Painted Areas

- .1 All steel that is to be painted shall be blast cleaned to conform to "The Steel Structures Painting Council" specification SSPC SP10 No. 10 "Near-White Blast Cleaning".
- .2 All steel surfaces of the top of the top flanges that are not to be painted shall be blast cleaned to conform to "The Steel Structures Painting Council" specification SSPC SP6, No. 6, "Commercial Blast Cleaning".
- .3 All oil and grease and any other surface contamination shall be removed according to the requirements of SSPC SP1 "Solvent Cleaning", before any other surface preparation is started.
- .4 The blasting medium (silica sand, grit or shot) used shall be of a size that produces a surface profile acceptable to the manufacturer of the inorganic zinc coating being used.
- .5 The Contractor shall supply the Owner with a letter from the inorganic zinc coating manufacturer stating that the proposed method, Equipment and materials used in the blast cleaning is acceptable.
 - .1 No blast cleaning shall commence until the Owner is in possession of this letter.
- .6 No blast cleaning shall be carried out when the surfaces of the steel are damp.
- .7 The blast cleaned surfaces shall be coated with inorganic zinc before any rusting occurs.
- .8 Under no circumstances are blast cleaned surfaces to be left uncoated overnight.
- .9 If the blast cleaned areas become damp and/or rusted, these areas shall be re-blasted after the steel has dried.
- .10 The Contractor shall ensure that all applicable safety precautions are taken during the blast cleaning operation.
- .11 All surfaces to be painted shall be free from any or all contaminants.

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- 1335.4.2 .15 Blast Cleaning - Unpainted Areas
- .1 All exposed steel surfaces shall be blast cleaned to conform to "The Steel Structures Painting Council" specification SSPC SP6-63 "Commercial Blast Cleaning".
- .2 The blast cleaning shall preferably be carried out after the complete erection of the structural steel, but may be carried out in the shop, provided the Contractor cleans the steel work of all cutting oil, dirt, erection marks or other foreign material after the completion of the erection.
- 1335.4.2 .16 Facing of Bearing Surfaces
- .1 The surface finish of bearing and base plates and other bearing surfaces that are to come in contact with each other or with bearings or concrete shall meet the ANSI surface roughness requirements as defined in the 2017 AASHTO LRFD Bridge Construction Specifications, 4th Ed., Section 11.
- .2 Surfaces of flanges which are in contact with bearing sole plates shall be flat within 0.5 mm over an area equal to the projected area of the bearing stiffeners and web.
- .1 Outside this area 2 mm deviation from flat is acceptable.
- .2 The bearing surface shall be perpendicular to the web and bearing stiffeners.
- 1335.4.3 Fracture Control
- 1335.4.3 .1 General
- .1 The provisions of this clause shall apply to members designated as fracture critical and primary tension members as identified in the Contract Documents.
- 1335.4.3 .2 Identification
- .1 Shop drawings shall identify the extent of fracture critical and primary tension members.
- .2 Attachments having a length of more than 100 mm in the direction of tension and welded to the tension zone of a fracture critical or primary tension member shall be treated as part of that member.
- .3 For each component of a fracture critical or primary tension member, records are to be kept identifying the heat number of the material and its corresponding mill test certificate.
- 1335.4.3 .3 Fracture Toughness Requirements
- .1 The Charpy V-notch requirements given in the Tables 1335-2, 1335-3 and 1335-4 are for standard full-size specimens.
- .1 For plates from 8 mm to 11 mm in thickness, sub-sized specimens with adjusted energy levels may be used as permitted by CSA G40-20.

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- .2 Requirements apply to both bolted and welded construction.
- .2 For fracture critical members, Charpy V-notch tests shall be specified on a per plate frequency, and the steel shall meet the impact requirements given in Table 1335-2.

**Table 1335-2
Impact Test Temperatures and Charpy Impact Energy Requirements for
Fracture Critical Members**

Grade G40.21	Minimum Average Energy Joules	Test Temperature T_t for Minimum Service Temperature, T_s		
		$T_s \geq -30^\circ\text{C}$	$30^\circ\text{C} > T_s \geq -60^\circ\text{C}$	$T_s < -60^\circ\text{C}$
Commonly used steels				
260 WT	34	0°C	-20°C	-40°C
300 WT	34	0°C	-20°C	-40°C
350 WT and AT	40	0°C	-20°C	-40°C
400 WT and AT	40	0°C	-20°C	-40°C
These steels may be used if approved				
480 WT and AT	40	-10°C	-40°C	-60°C
700 QT	50	-20°C	-40°C	-60°C

- .3 For primary tension members, Charpy V-notch tests shall be specified on a per heat frequency, and the steel shall meet the impact energy requirements given in Table 1335-3, or as specified in Table 1335-2, whichever governs.

**Table 1335-3
Impact Test Temperatures and Charpy Impact Energy Requirements for
Primary Tension Members**

Grade G40.21	Minimum Average Energy Joules	Test Temperature T_t for Minimum Service Temperature, T_s		
		$T_s \geq -30^\circ\text{C}$	$30^\circ\text{C} > T_s \geq -60^\circ\text{C}$	$T_s < -60^\circ\text{C}$
Commonly used steels				
260 WT	20	0°C	-20°C	-30°C
300 WT	20	0°C	-20°C	-30°C
350 WT and AT	27	0°C	-20°C	-30°C
400 WT and AT	27	0°C	-20°C	-30°C
These steels may be used if approved				
480 WT and AT	27	-10°C	-30°C	-40°C
700 QT	34	-20°C	-40°C	-50°C

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- 1335.4.3.3 . 4 Service Temperature
- .1 The applicable minimum service temperature, T_S shall be the minimum daily mean temperature taken from "Canadian Climate Normals" published by Environment Canada.
- 1335.4.3.3 .5 Steel for Permanent Backing Bars
- .1 Steel for permanent backing bars shall meet the requirements of Clause 5.5.1.1 of CSA W59 and shall meet the CVN requirements of Tables 1335-2 and 1335-3 as appropriate.
- 1335.4.3.3 .6 Weld Metal Toughness Requirements
- .1 For fracture critical and primary tension members, the weld metal shall meet the impact requirements of Table 1335-4.

**Table 1335-4
Impact Test Temperature and Charpy V-Notch Impact Requirements for
Weld Metal**

Base Metal Grade G40.21	Minimum Average Energy Joules	Test Temperature T_t for Minimum Service Temperature, T_s	
		$T_s \geq -40^\circ\text{C}$	$T_s < -40^\circ\text{C}$
260 WT	20	-30°C	-40°C
300 WT	20	-30°C	-40°C
350 WT and AT	27	-30°C	-40°C
400 WT and AT	27	-30°C	-40°C
480 WT and AT	27	-45°C	-45°C
700 QT	40	-45°C	-45°C

- 1335.4.3 .4 Welding Fracture Critical and Primary Tension Members
- .1 The requirements of 1335.4 shall apply and as supplemented herein.
- .2 Except as permitted by 1335.4.3.4.6, only welding consumables certified by the CWB to an appropriate CSA W48, or to AWS A5 if no appropriate W48 standard exists, that includes Charpy V-notch toughness requirements meeting the requirements of Table 1335-4, shall be used.
- .3 In groove welds connecting two different grades of steel, the classification of consumables used, including CVN impact requirements, shall be applicable to the grade having the lower ultimate tensile strength.
- .4 For groove welds in fracture critical and primary tension members using certified consumables where the CVN test temperature required by Table 1335-4 is lower than the test temperature in the CSA W48 or AWS A5 classifications, or where the standards are not applicable, welding consumables shall be approved by the CWB and qualified using a verification test assembly to establish the impact properties of the weld metal.

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- .1 Testing procedures shall follow those of the relevant CSA W48 or AWS standard, except that only CVN tests are required, and that welding shall be carried out using the preheat and the maximum heat input to be used in practice.
- .2 CVN results shall meet the requirements of Table 1335-4.
- .3 Qualifications are required for each electrode diameter used and for the consumables supplied by each manufacturer.
 - .1 The qualification is valid for consumables for all groove weld procedures of the same or lower heat input as that used in the qualification test.
- .5 For groove weld procedures in fracture critical and primary tension members of 700 Q and 700 QT material, consumables shall be qualified by welding procedure tests approved by the Canadian Welding Bureau.
 - .1 Tests shall be conducted according to CSA W47.1 using 700 Q or 700 QT material for the base plate and shall include weld metal and heat affected zone CVN impact tests according to CSA W47.1 Appendix D.
 - .2 Weld metal impact tests shall meet the requirements of Table 1335-4 and HAZ impact tests shall meet the requirements of Table 1335-2 or Table 1335-3 for the base plate as appropriate.
 - .3 Only consumables supplied by the manufacturer supplying those qualified shall be permitted in fabrication.
 - .1 The qualification is valid for all groove weld procedures with the same or lower heat input as that used in the qualification test.
- .6 When the welding consumables have not previously been certified by the Canadian Welding Bureau, consumables shall be qualified by welding procedure tests in accordance with the provision of Clause 8.2.2.4 of CSA W47.1 and shall include CVN impact tests of the weld metal.
 - .1 For steels other than 700 Q and 700 QT CVN tests in the HAZ are not required.
 - .2 Weld metal CVN properties shall be established by qualification tests in accordance with CSA W47.1 (including appendix D) and shall meet the requirements of Table 1335-4.
 - .3 Only consumables supplied by the manufacturer who provided those qualified shall be permitted in fabrication.
 - .4 Qualification shall be done for each lot or batch of consumables.
 - .5 The qualification is valid for all welding procedures with the same lower heat input as that used in the qualification test.

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- .6 Consumables for 700 Q and 700 QT materials shall be qualified according to 1335.4.3.4.5.
- .7 Tack welds shall not be used on fracture critical or primary tension members unless they are incorporated into the final weld.
 - .1 Temporary welds shall not be used on fracture critical, primary tension members and flange material in compression, unless approved by the engineer.

1335.4.3

.5 Repair Welding

- .1 All welding corrections and repairs shall be performed according to CSA S6, clause 10.23, except as amended herein.
- .2 Repair of base metal by welding at the producing mill shall not be permitted.
- .3 In addition to CSA S6, clause 10.23.5.4, non-critical repairs which may receive prior approval include the following:
 - .1 The repair of welds requiring excavation of defects including porosity, slag, and lack of fusion; the repair of arc strikes, and removal of tack welds not incorporated into a final weld.
 - .2 The repair of gouges not more than 5 mm deep on otherwise satisfactory cut or rolled surfaces which may be repaired by machining or grinding without welding; the procedures recommended in Clause 5.3.2 of CSA Standard W59 shall be followed.
 - .3 The repair of occasional gouges exceeding 5 mm, but not more than 10 mm in depth on edges not to be welded, which may be repaired by welding; the procedures recommended in Clause 5.3.2 of CSA Standard W59 shall be followed.

1335.4.4

Construction Requirements for Structural Steel

1335.4.4

.1 Fabrication of Curved Girders

- .1 A detailed procedure for the heat-curving operation shall be submitted for review.
 - .1 The procedure shall describe the type of heating to be employed, the extent of the heating patterns, the sequence of operations, and the method of support of the girder, including an assessment of any dead-load stresses present during the operation.
- .2 Transverse web stiffeners may be welded in place either before or after the heat-curving operation.
 - .1 However, unless allowance is made for the longitudinal shrinkage, bracing connection plates and bearing stiffeners shall be located and welded after curving.
- .3 Girders shall be cambered before heat-curving.

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1335.4.5 Erection1335.4.5 .1 General

- .1 The erection procedure drawings and calculations shall fully illustrate the proposed method of erection including the sequence of erection, the weights and lifting points of the members, and the location and lifting capacities of the cranes used to lift them.
 - .1 Details of temporary bracing and bents to be used during construction shall be shown.
 - .2 Calculations shall be provided to show the members and supports are not overloaded during erection.
- .2 The Contractor shall erect the whole of the fabricated structural steel Work which he supplies under the Contract.
- .3 The Contractor shall erect the structural steel in accordance with the requirements of the AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, the Bridge Construction Specifications, and CSA-S6.
- .4 Components shall be lifted and placed, using appropriate lifting Equipment, temporary bracing, guys or stiffening devices so that they are at no time overloaded or unstable.
- .5 Additional permanent material may be provided, if approved, to ensure that the member capacities are not exceeded during erection.
- .6 All falsework, including necessary foundations, required for the safe construction of the Bridge shall be designed, furnished, maintained and removed by the Contractor.
 - .1 The Contractor shall not use any of the material intended for use in the finished Bridge for temporary purposes during erection, unless such use is approved.
- .7 All temporary falsework towers, cables, dampers, etc., shall be removed from the erected steelworks following complete erection of the steelworks.
- .8 Any additional bracing or guys required, other than those shown in the Contract Documents, to maintain the stability for the construction stage shall only be removed by the Contractor at a time that is mutually suitable to the Engineer and the Contractor.
- .9 The company undertaking field-welding shall be certified to Division 1 of CSA W47.1.
- .10 Tack welds used for attachments, or for any other purpose, are expressly forbidden unless they subsequently become part of welds detailed in the Contract Documents.
- .11 The use of tack welds which are not part of the welds detailed in the Contract Documents, shall not be made on any portion of the girders.

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- .12 The Substructure shall be protected, under a separate Item as specified in the Contract Documents, against rust-staining by water run-off from the Bridge.

1335.4.5 .2 Erection and Construction Stresses

- .1 The Contractor shall assume full responsibility to verify all Bridge components for erection stresses and shall provide any additional steel and/or bracing, if required, for his/her erection procedure.
- .2 The Contractor shall not commence erection until the Engineer has received and reviewed these calculations, along with erection stresses and erection methods.
- .1 Review of these calculations shall not relieve the Contractor of her/his responsibility to maintain overall stability of the steel in the construction phase.
- .3 Under no circumstances may stresses occurring in the members of the Structure exceed the basic allowable stresses, except with the express permission of the Engineer.
- .1 All allowable stresses shall be based upon CSA-S6 Canadian Highway Bridge Design Code or the AASHTO LRFD Bridge Design Specifications.
- .4 Release of temporary supports or temporary members, etc. must be gradual and, under no circumstances, shall a sudden release be permissible.
- .5 The method of erection proposed to be used shall be subject to the authorization of the Engineer, but such authorization shall not relieve the Contractor of any responsibility for the safety of the proposed method of erection, or of the Equipment, or from carrying out the Work in full accordance with the Contract.
- .1 The Contractor shall not start any erection operation before this authorization is obtained.

1335.4.5 .3 Erection Methods and Equipment

- .1 The Contractor shall ensure that all cranes, rigging and Equipment are in good condition and properly maintained at all times during the period of the Work.
- .2 The Contractor shall ensure that all cranes, rigging and Equipment is of adequate capacity to carry out the required steel erection.
- .3 The Engineer shall have the right to inspect all Equipment to be used for the erection to satisfy himself that such Equipment is of good quality, and he may forbid the use of any Equipment that is, in his/her opinion, in any way faulty.
- .1 The inspection of the erection Equipment by the Engineer shall in no way relieve the Contractor of her/his primary responsibility for the safety and adequacy of all erection methods and Equipment.

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- .4 All structural steelworks shall be handled in such a manner so as to prevent shock or impact loadings to any steel member or Substructure component.
- .5 Slings and other lifting apparatus used in the handling of structural steelworks shall be of a type which will not damage shop primed or painted surfaces of fabricated steelworks.

1335.4.5 .4 Falsework and Guys

- .1 The Contractor shall construct, erect, maintain and subsequently remove and dispose of all falsework and guys required for the erection of the Work.
- .2 Falsework shall include all temporary supports and foundations and shall be properly designed and substantially constructed and maintained to sustain the loads which shall come upon it.
- .3 Falsework shall be carried out in accordance with Item 1385.

1335.4.5 .5 Field Assembling of Steel

- .1 Insofar as the cantilever method of erection is followed, the splice or splices which connect a member to the part of the Structure already erected shall be fully bolted before any further members are put in place.
- .2 Cylindrical erection pins for use in shop-reamed holes shall be machined to a push fit so as to obtain an accurate matching of corresponding holes.
- .3 Shop reamed holes shall not be re-reamed on the site.

1335.4.5 .6 High Strength Bolts

- .1 High strength bolts shall be installed and inspected in accordance with "Specification for Structural Joints using ASTM A325 or ASTM A490 bolts" approved by the Research Council on Bolted Structural Joints of the Engineering Foundation and AASHTO specifications with latest revisions.
- .2 The "turn of the nut" method shall be used for tightening bolts.
 - .1 The Contractor shall supply personnel to assist in inspecting all high strength bolted connections for conformance to the job inspection torque and the Contract Documents.
- .3 The Contractor shall pay particular attention to the lubricant required for the nuts and additional test requirements required for galvanized bolts.

1335.4 .6 Quality Control

1335.4.6 .1 Responsibility

- .1 It is the Contractor's responsibility to supply the material and execute, complete and maintain the Work in strict accordance with the terms of the Contract, and inspection and testing by the Engineer shall not be deemed to relieve the Contractor of any of his/her obligations.

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- 1335.4.6 .2 Inspection
- .1 Inspection by the Engineer may extend to all or any part of the Work and to the preparation, fabrication or manufacture of any of the materials.
 - .2 The Engineer shall be furnished by the Contractor with such information as is required to make a complete and detailed inspection and shall be allowed access to all parts and phases of the Work.
 - .3 Any Work done or materials used without supervision or inspection by the Engineer may be ordered to be removed and replaced at the Contractor's own expense.
- 1335.4.6 .3 Owner's Representative
- .1 An Owner's representative shall be assigned to the project to report to the Engineer on the progress of the Work as a whole and the manner in which they are being performed, to secure adherence to the requirement of the Contract, to report on any noted failure by the Contractor to fulfil the requirements of the Contract and to direct the Contractor's attention to such failure.
 - .2 Testing engineers and inspectors may be appointed by the Engineer to fulfil duties similar to those of the Engineer in connection with various aspects of the Work and to carry out the testing of materials and Work.
 - .3 The Engineer's representative(s) shall, within the limits of the written authorization given them by the Engineer, have authority to reject material or Work that is not in conformity with the requirements of the Contract, but no representative of the Engineer shall have authority to revoke, alter, enlarge, relax or release any requirement of the Contract.
 - .4 No representative of the Engineer shall perform any duty or management on the Contractor's behalf.
 - .5 The Contractor shall provide regular and practically located office space at her/his steel fabrication plant to accommodate the Engineer or the Owner's representative
 - .1 The office space so provided shall be ventilated, heated, lighted and clean and shall be furnished with a suitable standard office desk and chair.
 - .1 The office room temperature shall be maintained at 20°C.
 - .2 Convenient telephone, facsimile, photocopy, mail and message handling services shall also be provided.
- 1335.4.6 .3 Samples and Testing
- .1 The Engineer shall have the right to call for any additional samples, specimens and tests that are, in his/her opinion, necessary to secure proper quality control of the material and the Work.

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- .2 The Contractor shall bear all costs for the provision, preparation and testing of samples and specimens, including the costs of re-inspection and retesting as associated with Work not meeting the requirements of the Contract Documents.
- .3 The Owner shall bear the costs and fees of the testing engineer and other representatives of the Engineer.
- 1335.4.6 .5 Transfer of Heat Numbers
- .1 The Contractor shall transfer heat numbers on plates for flanges, webs and diaphragm plates in the presence of the Inspector.
- .2 Heat numbers are not to be stamped on plates but shall be marked with chalk or crayon in the presence of the Inspector.
- .3 The Contractor shall prepare a drawing indicating the heat number of steel used for various components of the steel Superstructure.
- .6 Lamination Scans
- .1 The contractor shall perform lamination scans by ultrasonic examination on all plates with a thickness of 25 mm or greater.
- .2 Ultrasonic examination shall be performed in accordance with ASTM A435/A435M.
- .3 Personnel performing ultrasonic examination shall be qualified as a minimum Level 2 or 3 Ultrasonic Operator in accordance with the pertinent requirements of CSA S6, CSA W59, CSA W178.1 and CAN/CGSB-48.9712/ISO 9712.
- .4 The contractor shall submit the inspection reports to the Engineer prior to the plate being placed into fabrication.
- 1335.4.6 .7 Inspection of Welds
- .1 Quality control shall be in accordance with CSA S6, Clause A10.18. The acceptance standards for CSA W59 for dynamically loaded structures shall also apply.
- .2 In addition to quality control measures instituted by the Contractor, the Contractor shall be responsible for quality control procedures specified herein.
- .3 The Contractor shall utilize an independent agency for quality control non-destructive weld inspection. The independent agency shall select the locations for testing.
- .4 All weld inspection personnel and agencies shall be certified to the requirements of CSA W47 and CSA W59.
- .5 The Engineer reserves the right to submit welds, chosen at random, to non-destructive testing.

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- .1 If faults in the welds are discovered, the Engineer may order such additional testing as he may consider necessary to satisfy himself as to the overall quality and Workmanship of the welded construction.
- .6 Any welds found to be faulty shall be removed, re-welded and retested at the Contractor's own expense.
- .7 The amount and location of non-destructive testing shall be determined by the Engineer.
- .8 In general, the following minimum testing shall be conducted.
 - .1 All welds shall be visually inspected.
 - .2 Groove welds in flanges and webs of built-up members shall be tested radio-graphically as follows:
 - .1 All flange tension splices and flange splices subject to stress reversal shall receive 100% radiographic inspection.
 - .2 Web splices shall receive 100% radiographic inspection for ½ of the depth beginning at the point or points of maximum tension and 25% of the remainder of the web splice shall be so tested.
 - .3 Flange compression splices shall receive 25% radiographic inspection.
 - .3 Web-to-flange fillet welds shall be subject to magnetic particle inspection in accordance with Table 1335-5

**Table 1335-5
Magnetic Particle Inspection Sequence**

Submerged arc welds	25 percent of length
Semiautomatic welds	50 percent of length
Manual welds	100 percent of length

- .4 Fillet welds for attaching gusset plates, diaphragm welds and stiffeners shall have 25% of the total tested by magnetic particle inspection.
- .5 All transverse welds on tension flanges shall receive magnetic particle inspection.
- .6 All gusset plates and stiffeners for attaching diaphragm bracing shall be tested for 100% of the length from the mid depth of the web to the tension flange.
- .9 Radiographic and/or ultrasonic testing shall be performed prior to assembly of the flanges to the web.
- .10 In the event that defects are found, all welds shall be tested, and all inferior welding shall be corrected and retested, at the Contractor's own expense.

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1335.4.6	.8	<u>Repair of Welds</u> .1 Any welds which do not meet the acceptance standards shall be removed, re-welded and re-tested. .2 The repair and non-destructive testing of fracture-critical and primary-tension members shall be in accordance with 1335.4.2.
1335.4.6	.9	<u>Standards of Acceptance of Defects</u> .1 The standards of acceptance of defects shall be in accordance with CSA W59 "Welded Steel Construction (Metal Arc Welding) Clause 12 - Dynamically Loaded Structures".
1335.4.6	.10	<u>Fabrication Outside of Canada and the United States of America</u> .1 In addition to the requirements of Section 1335.5.4.6, Inspection and Testing shall be completed at the fabrication facility, and all costs incurred by the Consultant and their designated testing agencies, and the Department shall be paid for by the Contractor. .2 All components fabricated outside of Canada shall be shipped to a steel fabricator located in Canada that is: .1 CWB certified in accordance with CSA W47.1 to Division 1; and .2 Either CISC or AISC certified in the applicable category of steel bridges for re-inspection and testing. .3 The components shall be in a condition that facilitates all re-inspection and testing requirements. The re-inspection and testing at the Canadian shop shall be completed in accordance with Section 1335.4.6. The Contractor shall also arrange for inspection by a CSA 178.2 Level III certified welding inspector accredited with W47.1/W59 to inspect: .1 All components to ensure that they were undamaged during transportation; and .2 Shop assembly of all components is required in accordance with Clause 1335.4.2.10. .4 Components shall not be shipped from the Canadian shop until all requirements have been met and the work has been reviewed and accepted by the consultant. .5 The Contractor shall be responsible for all verification inspection and testing costs, including all costs incurred by the Consultant and the Department. The Contractor shall also be responsible for all hourly charge out rates, travel, meals and accommodation of the Consultant inspector(s) to complete inspection and testing duties at the fabrication facility for 100% of the fabrication time. .6 The Contractor shall also be responsible for the cost of one trip every two weeks for two Department representatives to and from the fabrication facility.

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- .7 The Contractor shall have no claim against the Department resulting from delays caused by these requirements.

1335.5 MEASUREMENT FOR PAYMENT

- .1 The labour, Equipment and materials required for, but not limited to, the loading, shipping, supply, fabrication, surface preparation, painting, delivery and erection of the complete steel Superstructure in accordance with this Item shall be on a lump sum basis.

1335.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Lump Sum Price.
- .2 The Contractor may be granted progress payments in accordance with Section 1382.7 and;
- .1 The Contractor shall provide the Engineer, at the time of signing of the Contract, a breakdown of the Lump Sum Price, including but not necessarily limited to, identifying the portion of the price attributable to the supply of materials to the fabricator's shop (structural plate and rolled shapes), steel fabrication, shop painting preparation and application, material transportation, erection and painting but excluding temporary access Structures, temporary erection supports and fasteners.
- .2 The Owner shall take ownership of the materials and Work covered by the progress payment; however, the Contractor shall assume full responsibility for the care and maintenance of all such materials until placed and accepted in the Structure.
- .1 The Contractor shall be solely responsible to repair or replace, at his/her own expense, any materials or components of the Work which become damaged or lost between the period of the progress payment and the inclusion of the materials or components into the Work.

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MISCELLANEOUS METALS

ITEM: 1336

1336.1 DESCRIPTION

- .1 This Item consists of the supply, fabrication and installation of miscellaneous metals onto the structure, including; but, not limited to: deck drains, miscellaneous plates and embedded items, including expansion joint cover plates, steel angle on the top of each abutment ballast wall, anchor rods, all bent plates, angles, anchors, bolts, etc. for timber bridge construction, steel traffic barriers, including barrier rails, posts, post caps, base plates, anchor bolts, handrails, and all other metals not associated with the steel superstructure as identified in Section 1335 or steel piles as indicated in Sections 1311 and 1312.

1336.2 MATERIALS

- .1 All materials shall be supplied by the Contractor and shall be new materials, free from corrosion and mill scale.
- .2 All steel angles and plate sections shall conform to CAN/CSA G40.21 M Grade 300 W.
- .3 All hollow structural sections shall confirm to CAN/CSA G40.21 M – Class C, grade 350W.
- .4 Welding materials to CSA W59.
- .5 Bolts and anchor bolts to ASTM A307.
- .6 Galvanizing shall be hot dipped method in accordance with ASTM A123/A123M, minimum 720 g /m².
- .7 High Strength bolts shall conform to ASTM F3125/F3125M and shall be Type 1-galvanized.

1336.3 SUBMITTALS

- .1 The Contractor shall submit the shop drawings in accordance with Item 1383.
- .2 Shop drawings shall include; but, not be limited to:
- .1 Elevation views (both sides of bridge) indicating all post and rail components with piece marks;
- .2 Dimension of overall rail, longitudinal post locations relative to girder or deck ends; post spacing;
- .3 Thermal joint locations relative to post(s) and associative details. Minimize number of thermal joints; maximize stock length of longitudinal rail members
- .4 Cross sections, details of items identified above as well as anchorage details, deck connection details, rail-to-post details, post to base plate connection details, etc.;

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- .5 Individual components, including description, size, location, grade, coating requirements, hole locations and diameters, stiffener plates, size and locations of all studs/bolts, connection details, and all other pertinent information.
- .6 Isometric views shall be avoided.
- .3 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.
 - .1 Fabrication shall be performed by companies certified by the CWB to CSA W47.1 Standard Division 2.
 - .2 Welders shall be certified with the Canadian Welding Bureau for the processes and positions related to the various metal fabrication elements.
- .4 The Contractor shall submit, at least 7 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements. Mill test certificate reports shall be provided in accordance with 1383.2.
 - .1 Steel with boron content exceeding 0.0008% shall not be permitted.

1336.4

CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 All miscellaneous metals shall be stored at least 100 mm off the ground. Ballast wall angles shall be stored in a manner to maintain the cross slope and avoid permanent distortion.
- .3 All welding shall conform to the requirements of CAN/CSA W59.
- .4 Steel ballast wall assemblies shall be fabricated in one piece in the fabricating shop, unless otherwise specified.
- .5 Traffic barrier rails shall permit thermal expansion and contraction. The quantity of thermal joints shall be minimized based on a maximum supply length of railing.
- .6 Handle miscellaneous metal materials with care so not to dent or scratch protective coating. Portions of hot dip galvanized coating, damaged by field welding or by any other means, shall be mechanically cleaned and recoated in the field with an approved coating material.
- .7 All miscellaneous metal assemblies shall be fabricated to the dimensions and installed in the position indicated in the Contract Documents and Standard Drawings 1336-1, 1336-2 and 1336-3.

1336.5

MEASUREMENT FOR PAYMENT

- .1 The supply and installation of the complete miscellaneous metal assemblies in accordance with this Item shall be on a lump sum basis.

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BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Lump Sum Price.
- .2 The Owner may make partial payment for miscellaneous metals in accordance with 1382.7.

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TIMBER STRUCTURES

ITEM: 1337

1337.1 DESCRIPTION

- .1 This Item consists of the installation of timber structure; including; but, not limited to: timber piles, timber pile caps, timber stringers, timber decking, timber sheathing, timber wales, timber posts, timber rails, timber curbing, and all other timber members associated with the timber sub-structure and superstructure.

1337.2 MATERIALS

- .1 All materials shall be supplied by the Owner, unless stipulated otherwise in the Contract Documents, and shall be new materials.
- .2 All timber piles shall conform to CAN/CSA O56.
- .3 All structural timber members shall conform to CSA O86 and S6.
- .4 Preservative treatments shall be in accordance with CAN/CSA 080 Series.
- .5 Hardwood shall conform to CSA 0115.
- .6 Adhesives shall conform to CSA 0112 series.
- .7 Structural Glue-Laminated timber shall conform to CAN/CSA O112 and S6. Manufacturers of Glue-Laminated Timber shall be qualified in accordance with O177.
- .8 Lag screws shall conform to ASTM A449
- .9 Bolts, anchor bolts and drift pins to ASTM A307.
- .10 Galvanizing shall be hot dipped method in accordance with ASTM A123/A123M, minimum retention of 720 g /m².
- .11 High Strength bolts shall conform to ASTM F3125 and shall be Type 1- galvanized.

1337.3 SUBMITTALS

- .1 The Contractor shall submit the shop drawings in accordance with Item 1383.
- .2 The Contractor shall submit proof of lumber grading in accordance with O80 series and NGLA.

1337.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 All timber members shall be stored at least 100 mm off the ground.
- .3 All miscellaneous metals shall be in accordance with Section 1336.
- .4 The Contractor shall provide all labour, materials, and equipment required for the assembly of respective timber item as indicated on the drawings.

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- .5 All end cuts, pre-drilled holes, minor damage due to handling, etc. shall be treated with approved end-cut preservative material in accordance with O80 series.
- .6 Loading, transport, delivery and unloading of material from the Department's storage yard to the site shall be conducted by the Contractor. The Contractor shall coordinate pick-up times with the Department's inventory manager and shall be familiar with the bridge yard surroundings.
- .7 The Contractor shall load, transport, unload and handle timber members using methods and materials so not to damage (split, crack, snap, burr, score, indent, etc.) the members. Any damage caused by the Contractor during unloading and/or handling of material prior to its final installation shall be recorded by the Department, with an associated cost of material (full section and supply length) credited to the Department from the Contractor. Material replacement as a result of damage during handling shall be at the Department's discretion.
- .8 Provide all labour, materials and equipment necessary to completely install and secure the timber structure as indicated in the drawings or as instructed on site by the Engineer.
- .9 Dispose of all excess materials in an environmentally acceptable manner. Any excess material deemed suitable to future use elsewhere shall be delivered to the departments bridge yard facility at no additional cost to the contract.

1337.5 MEASUREMENT FOR PAYMENT

- .1 The installation of the complete timber structural members in accordance with this Item shall be based on the unit price bid for each item as indicated in the unit price bid table.

1337.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price Bid.
- .2 The Owner may make partial payment for timber structures in accordance with 1382.7.

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CORRUGATED METAL STRUCTURES

ITEM: 1338**1338.1 DESCRIPTION**

- .1 This Item consists of the design, fabrication, supply construction and erection of corrugated metal structures; including, but not limited to: metal forming, cutting, welding, hole drilling, bending, galvanizing or other coating, delivery, fabrication and erection of corrugated metal structures and all other ancillaries required to completely erect a corrugated metal superstructure.

1338.2 MATERIALS

- .1 All materials shall be supplied by the Contractor
- .2 All pipe and appurtenances shall be manufactured of aluminum coated steel, aluminum alloy, galvanized steel or polymer coated steel and shall meet the requirements of Table 1338 – 1.
- .1 Bolts and nuts shall be of the same material as the pipe or arch. For polymer coated, aluminum zinc flake coated bolts are required in accordance with CSA G401 or ASTM A1113.

**Table 1338 – 1
Material/Fabrication Standards**

Culvert/Structure Type	Material Standard	Fabrication Standard
Aluminum coated steel (pipe)	CSA G401	CSA G401
Aluminum alloy (pipe)	ASTM B209 ASTM B744/B744M	ASTM B745/B745M
Aluminum Structures (pipe & Arch)	ASTM B209 ASTM B221 AASHTO M219	ASTM B746/B746M ASTM B789/B789M ASTM B790/B790M
Aluminum Structures (box)	ASTM B209 ASTM B221 AASHTO M219	ASTM B864/B864M ASTM B746/B746M
Galvanized Steel (plate arch)	CSA G401	CSA G401
Polymer Coated Steel (pipe, plate arch, box)	CSA G401	CSA G401

- .3 Helical corrugated pipe shall have ends re-corrugated to annular corrugations for coupling purposes.
- .4 All cut edges and any damage to aluminum coatings or galvanized steel shall be ground smooth and recoated in accordance with CSA G401.
- .5 Materials for inlet/outlet control structures and cut-off walls (where required) shall be compatible with the primary structure material.

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- .6 Baffles (where required) shall be manufactured by the structure's fabricator, be of the same material as the structure and shall be installed at the fabrication plant (not on site).
- .7 Backfill material shall be in compliance with Section 7 of S6 and shall conform to Section 1365.
- .8 Impermeable geomembrane shall be PVC, HDPE or LLDPE with a minimum thickness of 0.75 mm and shall meet the physical requirements outlined in Table 1338 – 2. – reference CSPI Tech Bulletin 31.
- .9 Geomembrane material shall be installed above the structure, within the backfill zone, and extend 1000 mm beyond the longitudinal extent of the structure and it shall be sandwiched between two layers of geotextile fabric.
- .10 There shall be 100 mm diameter perforated interceptor pipes at the transverse edges of the geomembrane and daylighted at an appropriate location.
- .11 Geomembrane shall be Layfield Enviro Liner 6000 HD or approved equivalent.

**Table 1338– 2
Impermeable Geomembrane Requirements**

Physical Property	Test Method (ASTM)	Minimum Required Value
Tear Strength	D1004	45 N
CBR Puncture Strength	D6241	140 N

1338.3 DESIGN

- .1 The Contractor shall conduct detailed engineering design of the corrugated metal structure based on the Canadian Highway Bridge Design Code, CSA S6, Latest Edition, including, but not limited to, the following:
 - .1 Culvert wall;
 - .2 Granular bedding;
 - .3 Footings;
 - .4 Reinforced concrete cut-off walls;
 - .5 Reinforced concrete collar walls;
 - .6 Reinforced concrete head walls, and
 - .7 Engineered backfill envelope.
- .2 The Contractor shall also provide detailed engineering design, as required, for the following:

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- .1 Corrugated metal structure lift design, and
- .2 Temporary ground supports.
- .3 The Contractor shall submit all submittals for the items above in accordance with 1338.

1338.4

SUBMITTALS

- .1 The Contractor shall submit the design drawings in accordance with section 1383, for each structure type. The drawings shall contain; but, not be limited to, the following:
 - .1 Station of pipe, name of watercourse, contract number and description;
 - .2 General layout, showing pipe and appurtenances;
 - .3 Sections and details of all items listed in 1338.3.1 and 1338.3.2, including;
 - .1 Assembly components;
 - .2 Dimensions and elevations;
 - .3 Connection details with end and edge distances, bolt diameters, torque criteria etc.;
 - .4 Material grades;
 - .5 Cast-in anchor details;
 - .6 Lifting diagrams, spreader beams, crane details, etc.;
 - .7 Temporary ground support details;
 - .8 Construction methodologies and/or restrictions.
 - .3 Length and weight (mass) of individual sections, and
 - .4 Itemized supply list.
- .2 The Contractor shall submit, 7 days in advance of the commencement of the work, the manufacturer's certification that the materials supplied for the fabrication meet the specified requirements as detailed in the Contract Documents. Mill test certificate reports shall be provided in accordance with 1383.2.
 - .1 Steel with boron content exceeding 0.0008% shall not be permitted.
- .3 The contractor shall submit the proposed source of the supply of backfill material and all associated testing documentation.

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- .4 The Contractor shall submit storage drawings, indicating all blocking and/or supports. Storage drawings shall indicate both transport trailer condition and ground storage condition and shall be submitted for general review only. Storage drawings shall be signed and sealed by a Professional Engineer in accordance with section 1383.
- .5 Submittals are required in accordance with any cross-referenced item forming part of this item.

1338.5

CONSTRUCTION

- .1 The Contractor shall, at no additional cost to the contract, supply an on-site technical representative at all times during erection and back filling of the structure. The technical representative will submit daily report logs and a final report addressing all items listed in Cl. 7.6.5 of CSA S6.
- .2 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .3 The Engineer shall provide control points in the field to provide vertical and horizontal control at select locations or as may be required.
- .4 The Contractor shall be responsible for the layout and maintenance of control for all lines and grades for the Work as shown on the plans or within the shop drawings.
- .5 Excavation shall be carried out in accordance with Section 203 and to the limits indicated.
 - .1 If over-excavation occurs that was not approved, then the Contractor shall, at his/her own expense, repair and fill the over-excavation with an approved backfill material, placed in accordance with Section 200 or 400 and compacted to 95% of the modified proctor dry density.
- .6 The pipes or arch sections shall be joined in a straight line using standard industry methods.
- .7 Pipes or arch structures shall be assembled and/or erected as shown in the manufacturer's drawings and standard specifications.
- .8 Backfill shall be placed and shaped to the lines and grades as indicated in the manufacturer's drawings and standard specifications.
- .9 No backfill shall be placed in the excavation until the excavation has been approved by the Engineer, including, but not limited to, the dimensions of excavation and the character of the foundation materials.
 - .1 Material over 75 mm in size shall not be placed within 300 mm of the structure.

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- .2 Backfill shall be placed in lifts not more than 150 mm uncompacted thickness when within 1000 mm of the structure sidewall and 200 mm uncompacted thickness beyond 1000 mm of the structure sidewall.
- .3 Backfill shall be compacted in accordance with section 1365 or as specified by the structural supplier , whichever is most stringent.
- .10 Backfilling of metal pipe or arch structure shall proceed simultaneously and evenly on both sides of the structure and shall never exceed 300 mm in differential elevation.
- .11 No traffic or construction equipment shall be permitted to pass over the structures until the backfill cover indicated on the manufacturer's drawings and standard specifications has been placed.
- .12 Shoring, bracing, sheeting, pumps, temporary roads and/or bridges that are necessary to the Work shall be employed, maintained and removed by the contractor.

1338.6

MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of linear metres of metal pipe or arch structure supplied and installed in accordance with this Item.
 - .1 The measurement shall be taken along the invert of the pipe or the bottom edge of the arch at the connection to the foundation.

1338.6

BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price Bid for each size of metal pipe or arch structure as identified under the Contract.
- .2 The Owner may make partial payment for corrugated metal structures in accordance with 1382.7.

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HDPE STRUCTURES

ITEM: 1339

1339.1 DESCRIPTION

- .1 This Item consists of the design, fabrication, supply and installation of High-Density Polyethylene (HDPE) pipe structure, complete with baffles (as required or indicated), inlet control element, inlet cut-off wall, steel reinforcement (as required), and all other ancillaries required to completely supply and install HDPE structures.

1339.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
- .1 ASTM A1008/A1008M-21a, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- .2 ASTM A1011/A1011M-18a, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- .3 ASTM D2321-20, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- .4 ASTM D3350-21, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- .5 ASTM F2562/F2562M-15(2019), Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage.
- .2 Canadian Standards Association (CSA International)
- .1 CSA S6-19, Canadian Highway Bridge Design Code.

1339.3 MATERIALS

- .1 General
- .1 All materials shall be new and supplied by the Contractor.
- .2 The pipe structure's inside surface, as well as the inlet control element's exposed surfaces, shall have a Manning's Roughness Coefficient no more than 0.013.
- .3 HDPE pipe structure shall be manufactured in accordance with ASTM D2321 or, in the case of steel reinforced HDPE pipe structure, ASTM F2562. Note that the material for both the inlet control element and the cut-off wall must be compatible with the pipe structure's material.
- .4 Baffles shall be fabricated by the pipe structure fabricator, be the same material as the pipe structure, and be connected to the pipe structure at the fabricator's plant.

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.2 Resins

- .1 HDPE resins used to manufacture the pipe structure shall conform to cell classification PE 345464 C as per ASTM D3350.

.3 Steel Reinforcement

- .1 Steel reinforcing shall conform to ASTM A1011 and A1008.

.4 Backfill

- .1 Backfill material shall be Class 'A' material in accordance with Section 401.

1339.4

DESIGN

- .1 The Contractor shall conduct detailed engineering design of the HDPE pipe structure. The engineered culvert design shall be in accordance with AASHTO LRFD Bridge Design Section 12. The applied live load shall be CL-625 in accordance with CSA S6. The design components shall include; but, not limited to, the following:

- .1 Pipe structure;
- .2 Inlet control element;
- .3 Granular bedding complete with its material and thickness;
- .4 Cut-off walls, collar walls and/or head walls;
- .5 Engineered backfill envelope complete with its material and extent;
- .6 HDPE structure lift design (lift locations, spreader beam details, etc); and
- .7 Storage drawings (for transport trailer and ground) indicating blocking locations.

- .2 The Contractor shall submit all submittals for the items above in accordance with 1338.

1339.5

SUBMITTALS

- .1 The Contractor shall submit design drawings in accordance with section 1383, for each structure type. The drawings shall contain; but, not be limited to, the following:

- .1 Station of pipe, name of watercourse, contract number and description;
- .2 General layout, showing pipe and appurtenances;
- .3 Sections and details of all items listed in 1339.4.1 and 1339.4.2, including, but not limited to:
 - .1 Assembly components;
 - .2 Dimensions and elevations;

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- .3 Component-to-component connection details (structurally integral and watertight);
- .4 Baffle thickness and connection details;
- .5 Inlet cut-off wall details and connection details;
- .6 Material grades;
- .7 Calculated maximum soil bearing pressure below pipe structure;
- .8 Granular bedding thickness (min 450 mm) and compaction criteria;
- .9 Compaction criteria for engineered backfill;
- .10 Temporary ground support details;
- .11 Construction methodologies and/or restrictions.
- .4 Length and weight (mass) of individual sections, and
- .5 Itemized supply list.
- .2 The Contractor shall submit, 7 days in advance of the commencement of the work, the manufacturer's certification that the materials supplied for the fabrication meet the specified requirements as detailed in the Contract Documents.
- .3 The contractor shall submit the proposed source of the supply of backfill material and all associated testing documentation.
- .4 The Contractor shall submit storage drawings, indicating all blocking and/or supports. Storage drawings shall indicate both transport trailer conditions and ground storage conditions and shall be submitted for general review only. Storage Drawings shall be signed and sealed by a Professional Engineer in accordance with section 1383.
- .5 Submittals are required in accordance with any cross-referenced item forming part of this item.

1339.6 CONSTRUCTION

1339.6 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Engineer shall provide control points in the field to provide vertical and horizontal control at select locations or as may be required.

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- .3 The Contractor shall be responsible for the layout and maintenance of control for all lines and grades for the Work as shown on the plans or within the shop drawings.
- .4 The pipe structure shall be joined in a straight line using standard industry methods.
- .5 Pipe structures shall be assembled and/or erected as shown in the manufacturer's drawings and standard specifications and ASTM D2321-18.
- .6 No traffic nor construction equipment shall be permitted to pass over the structures until the backfill cover indicated on the manufacturer's drawings and standard specifications has been placed.
- .7 Shoring, bracing, sheeting, pumps, temporary roads and/or bridges that are necessary to the Work shall be employed, maintained and removed by the contractor.

1339.6 .2 Excavation

- .1 Excavation shall be carried out in accordance with Section 203 and to the limits indicated.
 - .1 If over-excavation occurs that was not approved, then the Contractor shall, at his/her own expense, repair and fill the over-excavation with an approved backfill material, placed in accordance with Section 200 or 400 and compacted to 95% of the maximum dry density.

1339.6 .3 Backfill

- .1 Backfill shall be placed and shaped to the lines and grades as indicated in the manufacturer's drawings and standard specifications.
- .2 No backfill shall be placed in the excavation until the excavation has been approved by the Engineer, including; but, not limited to, the dimensions of excavation and the character of the foundation materials.
 - .1 Material over 75 mm in size shall not be placed within 300 mm of the structure.
 - .2 Backfill shall be placed in lifts not more than 200 mm in thickness for vibratory plate or rammer-type compactors and not more than 300 mm for vibratory rollers.
 - .3 Backfill shall be compacted in accordance with section 401.
- .3 Backfilling of HDPE pipe structure shall proceed simultaneously and evenly on both sides of the structure and shall never exceed 600 mm in differential elevation.
- .4 Within 300 mm of the structure the material shall be compacted with a hand tamper.

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1339.6 .4 Testing and Inspection

- .1 Pipe structure supplier shall provide a technical representative on site at all times during the placement and compaction of granular bedding, pipe structure installation, pipe structure component-to-component joint connection work, and placement and compaction of the granular backfill envelope.
- .1 Contractor to submit to the Department daily reports from technical representative indicating extent of work observed, any directives, and a statement indicating work is in compliance with pipe structure design.

1339.6 .5 Delivery

- .1 The Contractor shall supply, transport to site, off-loading, on-site storage (if required), lift reinforcement and/or spreader beams, and installation and alignment of the entire culvert to the satisfaction of the Engineer, manufacturer, and pipe structure supplier's technical representative.
- .1 The Contractor shall adhere to the strict instructions or recommendations of the pipe structure supplier's installation and/or his on-site technical representative.

1339.7 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of linear metres of HDPE pipe structure supplied and installed in accordance with this Item.
- .1 The measurement shall be taken along the invert of the pipe structure.

1339.8 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price Bid for each size of HDPE pipe structure as identified under the Contract.

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STEEL LAMINATED BEARINGS

ITEM: 1341

1341.1 DESCRIPTION

- .1 This Item consists of the supply and installation of steel reinforced bearings.

1341.2 MATERIALS**1341.2 .1** General

- .1 All materials shall be supplied by the Contractor and shall conform to the requirements of CSA S6.
- .2 The bearings shall be of an approved type sufficient to provide as a minimum, the loading and movement capacities indicated in the Contract Documents.
- .3 The elastomer used in the bearings shall be 100% virgin natural polyisoprene of nominal 55 ± 5 durometer hardness having properties conforming to the requirements of CSA S6.
- .4 The elastomer compound used in the bearings shall conform to Grade 5 low temperature behaviour.
- .5 The steel laminations incorporated into the bearings shall be rolled mild steel sheets, with a minimum yield strength of 230 MPa and not less than 3 mm nor more than 5 mm in thickness.
- .6 The rubber/steel bearings must be moulded as complete units.
- .1 Vulcanizing or otherwise bonding rubber sheet to bearings cut from larger moldings shall not be accepted.
- .7 Bearing pressures, compressive deflections, rotation and shear deformations shall conform to the limits as specified in CSA S6.
- .8 Where indicated on reference bearings, all bearings shall be supplied complete with locating dowels and PVC caps.
- .1 The minimum effective rubber thickness shall take into consideration the effect of dowel penetration.
- .9 The effective rubber thickness, denoted as T in CSA Standard CSA S6 and T_e in Table 1341-2, shall be the sum of the thicknesses of all laminates with a shape factor less than or equal to 12.
- .10 Bearings shall be stored at least 100 mm off the ground in a weatherproof enclosure.

1341.2 .2 Elastomers

- .1 The elastomers shall conform to the following:
- .1 Virgin natural polyisoprene shall be the only raw polymer permitted; and
- .2 The physical properties of the polyisoprene used shall conform to the requirements of Table 1341-1.

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**Table 1341-1
Physical Properties of Polyisoprene**

Property	Test	Requirements
Hardness, °Shore A	ASTM D2240	55 ± 5
Tensile Strength, MPa	ASTM D412	min. 17.0
Ultimate Elongation, %	ASTM D412	min. 400
Heat Resistance	ASTM D573	70h at 70°C
Change in hardness, °Shore A		max. +10
Change in tensile strength, %		max. -25
Change in ultimate elongation, %		max. -25
Compression Set, %	ASTM D395 Method B	22h at 70°C max. 25
Ozone	ASTM D1149 Mounting Procedure A 20% strain 40 ± 2°C	25 pphm, 48 h no cracks
Bond between steel and Elastomer laminates, N. mm ⁻¹	ASTM D429 Method B	min. 7.0
Brittleness at - 40°C	ASTM D746 Procedure B	no failure
Low temperature crystallization increase in hardness, °Shore A	ASTM D2240	168 h at -25°C max. +15

1341.3

SUBMITTALS

- .1 Only bearings which comply with the Contract Documents and have previously been approved by the Engineer, in writing, shall be considered acceptable for supply.
 - .1 The Contractor shall submit in writing, a minimum of 30 Days in advance of the installation, the name of the pre-approved manufacturer supplying the bearings, the manufacturer's part number and the physical dimensions of the bearing to be supplied.
- .2 The Contractor shall submit shop drawings for the bearings in accordance with Item 1383 and the manufacturer shall provide the full data for the bearings including as a minimum the following:
 - .1 Individual laminate and total bearing dimension;
 - .2 Part numbers for bearings;
 - .3 Maximum load capacity in compression;
 - .4 Compression stiffness;
 - .5 Maximum movement capacity in shear;
 - .6 Installation details;
 - .7 Load capacity at serviceability limit states Combination 1, including:
 - .1 maximum compressive permanent and total loads,
 - .2 compressive stiffness, and
 - .3 shear stiffness;
 - .8 Number of steel plates in each bearing;
 - .9 Rotational capacity of each bearing under maximum and minimum load; and

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.10 Material properties of the bearing components and test procedures employed to determine the properties.

.3 The Contractor shall submit to the Engineer, in advance of the installation, the manufacturer's certification, as a written affidavit, that the materials supplied meet the specified requirements as detailed in the Contract Documents. Mill test certificate reports shall be provided in accordance with 1383.2.

.1 Steel with boron content exceeding 0.0008% shall not be permitted.

.4 All bearings being supplied for the Work shall be approved in writing by the Engineer prior to the placement of the bearing into the structure.

1341.4 CONSTRUCTION

1341.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

1341.4 .2 Fabrication

.1 The fabrication of the steel laminated bearings shall conform to CSA S6.

.2 Where pintles are specified, the depth of the pintle holes shall be such as to fully engage only one steel plate.

.3 Each laminated bearing shall be marked with the date of manufacture and an individual alphanumeric identification. The latter shall consist of the designated identification letter of the supplier and source followed by the letter "I" for polyisoprene and a sequential five-digit number.

.1 The characters shall be not less than 10 mm high, stamped or engraved into two adjacent sides, with the indentations or protrusions not less than 1 mm in width and 1 mm in depth.

.4 The tolerances shall be as indicated in Table 1341-2.

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**Table 1341-2
Bearing Tolerances**

Bearing thickness		
	≤ 40 mm	-0 mm to +3 mm
	> 40 mm	-0 mm to +6 mm
Bearing plan dimension		-0 mm to +6 mm
Thickness of individual layers of elastomer		± 20%
Deviation from plane parallel to theoretical surface		
	Top	1 in 200
	Sides	1 in 100
	Steel Laminates	0.25 T _e (Note 1)
Cover to embedded steel		±2 mm
Pintle hole diameter		-0 mm to + 2 mm
Relative position of pintle holes to each other		± 2 mm
NOTE 1: The tolerance of steel laminates shall be determined as follows: (a) The distance from the base of the bearing to the bottom of every plate shall be measured. Measurements shall be taken at each corner of rectangular bearings and at the extremities of two perpendicular diameters of circular bearings. (b) The difference between the highest and lowest measurements for every plate shall be recorded. (c) The cumulative total of the differences recorded, expressed as a fraction of the effective rubber thickness of the bearing, shall be recorded.		

.5 Bearing Assemblies Fabricated outside of Canada and the United States

- .1 In addition to the requirements of Subsection 1341.4.2, bearing components fabricated outside of Canada or the United States of America shall be shipped to a shop located in Canada that is:
 - .1 CWB certified in accordance with CSA W47.1 to Division 1 or 2; and
 - .2 Either CISC or AISC certified in the application category of steel bridges for verification and testing.
- .2 Components shall not be shipped from the Canadian shop to the project site until all requirements have been met and the work has been reviewed and accepted by the Consultant
- .3 Testing and Inspection shall be completed at the fabrication facility, and all costs incurred by the Consultant and their designated testing agencies, and the Department shall be paid for by the Contractor.
- .4 All components to ensure that they were undamaged during transportation. The components shall be in a condition that facilitates all re-inspection and testing requirements. The re-inspection and testing at the Canadian shop shall be completed in accordance with Section 1335.
- .5 The Contractor's visual quality control welding inspector shall be certified by the CWB as a Level 2 or Level 3 inspector in accordance with CSA W178.2;

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- .1 Non-destructive testing (NDT) methods shall be in accordance with Subsection Section 1335;
- .2 100% of all fillet and partial penetration welds using magnetic particle inspection in accordance with Section 1335;
- .3 NDT technicians shall be certified to Level 2 in accordance with CAN/CGSB-48.9712 and employed by an independent testing agency certified to CSA W178.1

1341.4 .3 Installation

- .1 The Contractor shall place bearings accurately with respect to the location and elevation, on level and smooth bearing surfaces, as indicated in the Contract Documents.
- .2 Bearing block elevations shall be adjusted when bearing thickness varies from the reference bearing thickness shown in the Contract Documents.
- .3 The tolerances shall be as indicated in Table 1341-3.

**Table 1341-3
Tolerance for Top of Bearing Elevations**

Structure Type	Top of Bearing Elevation
Concrete Structures	± 2.5 mm
Steel Structures	+ 3 mm
Box Girders	+ 2 mm
Deviation from level	± 0.1°

1341.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of steel laminated bearings supplied and installed in accordance with this Item.

1341.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price.
- .2 The Owner may make partial payment for steel laminated bearings in accordance with 1382.7.

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BRIDGE POT BEARINGS

ITEM: 1342

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BRIDGE POT BEARINGS

ITEM: 1342

1342.1 DESCRIPTION

- .1 This Item consists of the fabrication, supply and installation of all confined elastomer (pot) Bridge bearings required in the Contract.

1342.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 Bearings shall possess the minimum horizontal and vertical load capacity, and shall be constructed for the movement capacities, as indicated in the Contract Documents.
 - .1 The rotational bearings and sliding surfaces shall consist of components arranged so as to transmit all loads (including uplift) and accommodate the rotations and, where necessary, translations of the Structure.
 - .2 At serviceability limit state, the design shall be such that the bearings will not suffer damage which would affect their performance.
 - .3 At ultimate limit states, the strength and stability of the bearings shall be adequate to resist the factored loads and accommodate movements of the Structure.
- .3 Bearing material and workmanship shall comply with CSA S6.
- .4 The allowable bearing pressures on the confined elastomer and bonded confined polytetrafluoroethylene polymer (TFE) elements are to be as stipulated in clause 11 of CSA S6.
- .5 Steel components of the bearings (other than stainless steel sliding surfaces) shall conform to the requirements of CAN/CSA G40.21M, Grade 350A.
- .6 Stainless steel for sliding surfaces shall have a minimum corrosion resistance conforming to ASTM A167 Type 304.
- .7 Steel fasteners shall conform to ASTM A325 and shall be galvanized to conform to ASTM A 123.
 - .1 For centre guide bars alternative steel fasteners may be approved.
- .8 Brass sealing rings for confined elastomer bearings shall conform to ASTM B36 Half-hard.
- .9 Polyisoprene (natural rubber) shall conform to 1341.2 except that the hardness may be 50 ± 5 .
- .10 TFE resin for use in sliding surfaces shall be virgin material and shall conform to ASTM D1457.
 - .1 It shall be unfilled and conform to the physical requirements indicated in Table 1342-1.

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**Table 1342-1
Physical Requirements for TFE Resin**

Physical Property	ASTM Test Method	Requirement
Tensile Strength, MPa	D 638	minimum 20
Elongation, %	D 638	minimum 200
Relative Density	D 792	2.16 ± 0.03

- .11 Material used as mating surface for guides for lateral restraint may be:
- .1 Unfilled TFE;
 - .2 TFE filled with up to 25% by mass of glass fibres; or
 - .3 Lead filled TFE in a bronze matrix.
- .12 Lubricant shall be silicone grease and shall conform to OPSS 1203.05.06.
- .13 Adhesives for bonding TFE to metal shall produce a bond with a minimum peel strength of 4 N/mm width when tested in accordance with ASTM D429 Method B and shall not degrade in the service environment.
- .14 All steel bearing components, other than the stainless steel sliding surfaces, shall be painted with a primer coat of inorganic zinc silicate paint with a dry film thickness of 75 microns (-10 microns or +15 microns) of Carbo Zinc 11, manufactured by Corrosion Service Company Limited, or approved equivalent in accordance with 1335.2 and 1335.4.
- .15 All surfaces, with the exception of the faying surface between the top of the top plate and the underside of the tapered shoe plate attached to the bottom flange of the girders (supplied under Item 335), shall be top coated with two coats of high build, modified aluminum epoxy mastic paint (Carbomastic 15) in accordance with 1335.2 and 1335.4.
- .1 Each of these topcoats shall have a film thickness of 125 microns ± 20 microns.
- .16 The organic zinc primer shall be applied to a surface that is blast cleaned to conform to "The Steel Structures Painting Council" specification SSPC-SP10 - No. 10 "Near White Blast Cleaning".
- .17 All surface preparation and painting shall conform to 1335.3 and 1350.
- .18 The bolts for attaching the bearing top plate to the girder shoe plate shall be A325-Type I galvanized.
- .19 At full design load, the maximum rotation and/or the eccentricity of the axial load shall not exceed 3% of the diameter of the elastomeric disc.
- .20 Grout shall be In-Pakt Nonshrink Premix Grout or approved equivalent and shall have a minimum 28-day strength of 40 MPa.
- .21 The entire bearing assembly, except for the top plate used to attach it to the Superstructure and the base plate used to anchor it to the Substructure; but, including

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both contact surfaces of the sliding interface, shall be replaceable without damage to the Structure and without removal of the concrete, welds or anchorages permanently attached to the Structure and without lifting the Superstructure more than 5 mm.

.1 Bearings shall not be recessed into plates that are permanently attached to the Structure.

.22 Bearings shall be stored at least 100 mm off the ground in a weatherproof enclosure.

1342.3 SUBMITTALS

1342.3 .1 General

.1 The Contractor shall submit the design for the bearings, designed for the specified translation and load capacities, in accordance with Item 1383.

.1 Notwithstanding the requirements in 1342.3.1.1, the submission shall include but not be limited to:

.1 Bearing layout and orientation;

.2 The top and bottom plate details including anchorages;

.3 Installation details;

.4 Method of attachment of bearings to the top and bottom plates;

.5 Load capacity at Serviceability Limit States Combination 1 (SLS1), including:

.1 maximum vertical permanent and total load,

.2 maximum lateral load and corresponding vertical load, and

.3 maximum rotational capacity about any horizontal axis and about the vertical axis through the centre of the bearing;

.6 The bearing ID letter and numbers.

.2 The Contractor shall have a stamped copy of these drawings at the site before and during site installation.

.2 Upon request, the Contractor shall submit certification that the fabrication is being performed by a recognized bearing manufacturer having experience in the manufacture of "pot" bearings.

.3 The Contractor shall submit to the Engineer a copy of the manufacturer's recommended procedures for handling, storing and installation of the bearings.

.4 The Contractor shall submit the manufacturer's signed written guarantee for the bearings, guaranteeing as a minimum:

.1 Each bearing is to perform satisfactorily, in the opinion of the designer/manufacturer, for a period of five years after the Bridge has been opened to regular vehicular traffic.

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- .2 If, during the five-year guarantee period, the bearings do not perform satisfactorily, the manufacturer of the bearings shall replace the bearings.
 - .1 All costs related to repairs, replacements, jacking of the Bridge, installation and any other Work necessary to complete the Work of replacing the bearings shall be incidental to this guarantee and shall be borne by the manufacturer of the bearings.
 - .2 All required repairs shall be carried out in accordance with this Item and shall be approved by the Engineer.
- .5 All grouting procedures shall be submitted for approval prior to commencement of the Work.
- .6 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

1342.3 .2 Approval of Supplier

- .1 The Engineer may request for the supplier to be approved, in which case the supplier may be required to submit the following data for each class and type of bearing:
 - .1 Typical drawings showing all materials, tolerances, details of construction including uplift restraint devices, if applicable, and methods of installation.
 - .2 Load range (minimum and maximum).
 - .3 Maximum rotational capacity about any horizontal axis and the vertical axis through the centre of the bearing.
 - .4 Maximum translational capacity.
 - .5 Lateral Load capacity of rotational bearings.
 - .6 Capacity of lateral restraints of translational elements.
 - .7 Corrosion protection.
 - .8 A TFE sample of at least 200 mm in diameter.
 - .9 A typical sample of elastomeric disc.
 - .10 A sample of the smallest production size unidirectional bearing with a translational capacity of at least ± 50 mm, the shop drawings and the design calculations for the bearing.
 - .11 The design calculations shall be stamped and signed by a Professional Engineer registered or licensed to practice in the Province of Prince Edward Island.
 - .12 Final approval of the source of supply shall be based on compliance of the sample bearing, and the shop drawings with the specified requirements noted in the Contract Documents.

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- .2 Any deviation from the materials and details indicated on the typical drawings and the typical sample shall be cause for cancellation of approval and necessitate application for approval.
- .3 The Contractor shall submit, at least 7 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements. Mill test certificate reports shall be provided in accordance with 1383.2.
- .1 Steel with boron content exceeding 0.0008% shall not be permitted.

1342.4 CONSTRUCTION**1342.4 .1 Design Requirements****1342.4.1 .1 General**

- .1 The bearings shall be proportioned to function satisfactorily under the critical combinations of the maximum and minimum factored loads and the factored translations and rotations at the serviceability limit state and the ultimate limit states as shown on the Contract Documents.
- .2 Bearings subject to uplift shall limit the separation of the bearing components to the value specified.
- .3 All steel components of the bearings, including fasteners, shall be proportioned in conformance with the requirements of CSA S6.
- .4 The average stress in the elastomer at serviceability limit state Combination 1 loads shall conform to the requirements of 1342.2.4.

1342.4.1 .2 Translation Rotation

- .1 Provision for translation shall be through sliding of a stainless-steel surface against a mating TFE element.
- .2 The translational capacity in the unrestrained direction or directions shall be as specified, or ± 50 mm, whichever is greater.
- .3 Translational elements with lateral restraints shall be capable of resisting the greater of the lateral loads as specified or either of the following:
 - .1 For bearings with a capacity of 5000 kN or less at serviceability limit state Combination 1, 10% of the vertical load capacity.
 - .2 For bearings with a capacity over 5000 kN at serviceability limit state Combination No. 1 plus 5% of the vertical load in excess of 5000 kN.
- .4 Provision for rotation about any horizontal axis shall be by means of a single disc of confined elastomer for pot bearings.
- .5 The rotational capacity about the vertical axis through the centre of the bearing shall be as specified or $\pm 1^\circ$, whichever is greater.
- .6 Uplift restraint devices shall not restrict rotations.

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- .7 At Serviceability Limit State Combination 1 loads and maximum rotation, the shift in the axial load from the centre of bearing shall not exceed the following values:
 - .1 3% of the diameter of the confined elastomer for pot bearings.
- .8 Rotational bearings shall be capable of resisting, in any direction, the lateral loads as specified in combination with the applicable vertical loads.
- .9 The rotation of confined elastomeric bearings about a horizontal axis shall be limited so that the vertical strain at the perimeter of the elastomer, at serviceability limit state Combination 1 loads does not exceed 0.15 of the elastomer thickness.
- .10 Brass sealing rings at least 6 mm wide shall be provided at the perimeter of the elastomer to prevent the elastomer from extruding between the piston and the pot wall.
- .11 A minimum of two layers of flat sealing rings shall be used with the split ends equally positioned around the circumference of the elastomer and shall fit snugly against the surface of the inside perimeter of the pot wall.
- .12 The sealing rings shall be flat and smooth on all surfaces.
- .13 The upper edge of the elastomer shall be recessed to accommodate the sealing rings.
- .14 The depth of the pot wall shall be such that a minimum vertical distance of 2.5 mm remains between the top of the pot wall and the closest point of contact of the sealing rings with the pot wall upon rotating the piston and amount equal to the required rotation plus 1°.
- .15 The pot and piston surfaces in contact with the confined elastomer shall be lubricated with silicone grease.
- .16 The bearing shall be sealed by a one piece continuous performed closed-cell compressible ring against entry of dirt, Dust and moisture between the elastomer and the pot and piston contact surfaces.
- .17 Any joint in the ring shall be bonded and the strength shall be at least equal to the strength of the ring.

1342.4.1 .3 Sliding Surfaces

1342.4.1.3 .1 General

- .1 Sliding surfaces shall allow translation or rotation by sliding of a metal surface against a mating TFE element.
 - .1 For plane surfaces, the metal surface shall be stainless steel; and for spherical surfaces, the metal surface shall be stainless steel or anodized aluminum alloy.
- .2 The metal surface shall overlap the TFE by at least 5 mm at extremes of movement and except for guides for lateral restraint, shall be

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positioned above the TFE element so that the sliding movements will cause the accumulations of Dust and dirt to fall off.

- 1342.4.1.3 .2 TFE Element
- .1 Except when used as mating surfaces for guides for lateral restraint, the TFE resin shall be virgin material and shall be used as unfilled sheets and shall contain spherical reservoirs for lubricant pressed into its surface.
- .2 The diameter of the reservoirs shall not exceed 8 mm, measured at the surface of the TFE, and the depth shall not be less than 2 mm nor more than half the thickness of the TFE.
- .3 The reservoirs shall be evenly distributed across the surface of the TFE and shall occupy not less than 20% nor more than 30% of the surface.
- .4 Material used as mating surface for guides for lateral restraint shall conform to 1342.2.12 and 1342.2.13 and shall not be dimpled or lubricated.

- 1342.4.1.3 .3 Stainless Steel
- .1 The thickness of the stainless-steel sheet shall not be less than that given in Table 1342-2 for dimensional differences between stainless steel and the TFE in the direction of movement.

**Table 1342-2
Thickness Of Stainless Steel**

Dimensional Difference between Stainless Steel and TFE mm	Minimum Thickness of Stainless Steel mm
≤ 300	1.5
> 300 and ≤ 500	2.0
> 500 and ≥ 1500	3.0

- 1342.4.1.3 .4 Lubrication
- .1 All TFE surfaces except those which act as mating surfaces for guides or are subject to a contact pressure of less than 5 MPa, shall be permanently lubricated with silicone grease.

- 1342.4.1.3 .5 Thickness of TFE and Depth of Recess
- .1 The TFE element shall be fully bonded in the manufacturer's plant and recessed in a rigid backing material.
- .2 Thickness of the TFE element and the depth of recess shall be as given in Table 1342-3.

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**Table 1342-3
Thickness of TFE Elements and Depth of Recess**

Maximum Plan Dimension, mm	≤ 1200	> 1200
Thickness, mm	5.0	5.5
Depth of Recess, mm	2.5	3.0

1342.4.1.3 .6 Contact Pressure

- .1 The average contact pressure for unfilled TFE elements based on the gross area of the TFE, shall not exceed the values given in Table 1342-4.

**Table 1342-4
Average Contact Pressure for TFE Elements**

Limit State	Dead Load MPa	Total Load MPa
Serviceability - Combination 1	30	45
Ultimate	45	70

- .2 The maximum contact pressures at the extreme edges of flat and curved TFE elements shall not exceed 1.2 times the values given in Table 1342-4.
- .3 The average contact pressure at serviceability limit state Combination 1 loads for filled TFE elements used to face mating surfaces for guides for lateral restraint shall not exceed the following:
- .1 TFE filled with up to 25% by mass of glass fibres 45 MPa.
- .2 Lead filled TFE in a bronze matrix 60 MPa.

1342.4.1.3 .7 Coefficient of Friction

- .1 The coefficient of friction between stainless steel and lubricated virgin TFE shall not exceed the values given in Table 1342-5 and shall be interpolated linearly for contact pressures within the range given.

**Table 1342-5
Coefficient of Friction**

Contact Pressure MPa	Coefficient of Friction
10	0.06
25 and above	0.03

1342.4.1 .4 Guide for Lateral Restraint

- .1 The guides for lateral restraint shall be arranged to permit the required rotations about both the horizontal and the vertical axis.
- .2 Unless the guide bars are machined from the solid steel base plate, they shall be bolted and recessed not less than 5 mm into the plate to which they are attached.

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- .3 The translational elements of guides for lateral restraint shall be faced with stainless steel and shall provide lateral restraint by sliding against mating surfaces faced with TFE conforming to 1342.2.12 and 1342.2.13.
 - .4 Lead filled TFE shall be at least 2 mm thick and shall be mechanically fastened and bonded to the substrate.
 - .5 Glass fill or virgin TFE shall be recessed and bonded to the substrate to conform to 1342.4.1.3.5.
- 1342.4.1 .5 Top and Base Plates
 - .1 The top and base plates which are permanently attached to the Structure shall be provided with the bearings and shall conform to the requirements of the bearing and the Structure.
- 1342.4.1 .6 Fasteners and Anchorage
 - .1 Fasteners, used to attach the bearing to the top and base plates, and anchorage devices shall be capable of resisting the greater of the lateral loads as specified or either of the following:
 - .1 For bearings with a capacity of 5000 kN or less at serviceability limit state Combination 1, 10% of the vertical load capacity.
 - .2 For bearings with capacity over 5000 kN at serviceability limit state Combination 1, 500 kN plus 5% of the vertical load capacity in excess of 5000 kN.
 - .2 The beneficial effect of friction shall be neglected in proportioning the fasteners and anchors.
- 1342.4.1 .7 Replaceability
 - .1 The entire bearing assembly, except for the top plate used to attach it to the Superstructure and the base plate used to anchor it to the Substructure but including both contact surfaces of the sliding interface, shall be replaceable without damage to the Structure and without removal of any concrete, welds or anchorages permanently attached to the Structure and without lifting the Superstructure more than 5 mm.
 - .2 Bearings shall not be recessed into plates that are permanently attached to the Structure.
- 1342.4.1 .8 Durability
 - .1 The bearings shall be fabricated from materials which are durable and are protected against corrosion so to perform their intended function.
 - .2 Bearings shall be designed to prevent moisture and dirt from entering the internal surfaces.

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- 1342.4.1 .9 Concrete Bearing Pressure
- .1 At the serviceability limit state Combination 1 loads the average concrete bearing pressure shall not exceed 17 MPa.
 - .2 At ultimate limit states, the average concrete bearing pressure shall not exceed 24 MPa.
 - .3 The top and base plates of the bearing shall be proportioned to ensure that the permissible bearing pressures are not exceeded.
 - .4 The effective area for distributing the bearing load shall be taken as the contact area of the elastomer or TFE transferring the load to the plate plus the area within the uninterrupted dispersal lines drawn at 45° to the line of application of the load from the contact area.
- 1342.4 .2 Fabrication
- 1342.4.2 .1 Welding
- .1 Welding of structural quality steels shall conform to 1335.4.
 - .2 Welding of stainless steel shall be done with appropriate electrodes conforming to CAN/CSA W48.2 or AWS A5.22.
 - .3 The welding procedure shall be approved by the Canadian Welding Bureau.
 - .4 The stainless-steel sheets which will be in contact with TFE shall be one piece continuously welded around the perimeter to its backing plate to prevent ingress of moisture.
 - .5 The weld shall be clean, uniform and without overlaps and shall be located outside the area in contact with TFE.
- 1342.4.2 .2 Fasteners
- .1 The threaded portion of the bolts shall be coated with silicone grease prior to installation.
- 1342.4.2 .3 Anchors
- .1 When the Contract Documents specify that bearings shall be supplied from a listed source, the top and base plate anchorage to concrete may be provided by studs, using the fusion welding process, unless otherwise indicated in the Contract Documents.
 - .1 The anchorage for steel structures shall be provided with bolts and anchor bolts as indicated on Standard Drawing 1342-1 and in the Contract Documents.
 - .2 Alternative methods of anchoring these plates may be approved.

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1342.4.2 .4 Machining

- .1 Machining shall be carried out after welding wherever possible.
- .2 Metal to metal contact surfaces shall be machined or fine ground.
- .3 The pots and pistons for confined elastomer bearings shall be machined from solid metal plate or castings.
- .4 There shall be no openings or discontinuities in the metal surfaces in contact with the elastomer or TFE.

1342.4.2 .5 Roughness of Metal Surface

- .1 The roughness of metal surface in contact with TFE, measured to conform to CAN/CSA B95, shall not be greater than 0.25 μm arithmetic average for plane surfaces.
- .2 The roughness of metal surfaces in contact with elastomers measured to conform to CAN/CSA B95, shall not be greater than 3.0 μm arithmetic average.

1342.4.2 .6 Attachment of TFE

- .1 Virgin or glass filled TFE elements shall be recessed in a rigid backing material and shall be bonded over the entire area with an adhesive.
- .2 The rigid backing material shall be grit blasted prior to applying the adhesive.
- .3 Lead filled TFE shall be mechanically fastened and bonded to the backing plates.

1342.4.2 .7 Corrosion Protection

- .1 All exposed metal surfaces except stainless steel, and components permanently attached to steel Superstructures shall be protected against corrosion by an inorganic/aluminum epoxy mastic system conforming to 1335.3 and 1350.
- .2 Steel fasteners shall be galvanized or protected by other approved methods.
- .3 For corrosion protection purposes, bearing components permanently attached to steel Superstructures shall be considered part of the structural steel.

1342.4.2 .8 Identification

- .1 The bearings shall be supplied with each bearing marked with the date of manufacture and an individual alphanumeric identification.
- .2 The latter shall consist of the designated identification letter of the supplier and source followed by a sequential five-digit number.

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- .3 The characters shall be stamped or engraved into two adjacent sides and shall be clearly legible after installation.
- .4 The characters shall not be less than 10 mm high with indentations not less than 1 mm in width and 0.5 mm in depth.

1342.4.2 .9 Tolerances

1342.4.2. .1 General

- .1 The deviation from flatness of stainless steel or aluminum alloy surfaces in contact with TFE for plane surfaces and from the theoretical surface for spherical surfaces shall not exceed 0.0003 LH mm for rectangular bearing nor 0.0006 RH mm for circular TFE elements, where L is the greater plan dimension for a rectangular bearing, R is the radius of a circular bearing and H is the free height of TFE element.
- .2 For confined elastomer bearings, the tolerance of fit between the piston and the pot shall be +0.75 mm to +1.25 mm.
- .3 The inside diameter of the pot cylinder shall be the same as the nominal diameter of the elastomer and shall be machined to a tolerance of -0, +0.125 mm for diameters up to and including 500 mm and -0, +0.175 mm for diameters over 500 mm.
- .4 The plan dimensions of the recess for the TFE shall be the same as the nominal plan dimensions of the TFE and shall be machined to a tolerance of 0, +0.2% of diameter or diagonal.
- .5 Overall bearing plan dimension ± 3 mm.
- .6 Overall bearing height ± 3 mm.
- .7 Machined surfaces except where otherwise specified ± 0.4 mm.

1342.4.2.9 2 Elastomer

- .1 Diameter +0.0 / -1.5 mm for diameters < 500 mm
+0.0 / -2.0 mm for diameters > 500 mm
- .2 Thickness -0.0 / +1.0 mm
- .3 Brass rings
 - .1 Difference between internal diameter of brass ring and diameter of recess in the moulded elastomer shall be -0 / + 0.5 mm.
 - .2 Difference between sum of thickness of brass rings and recess depth in the moulded elastomer shall be -0 / + 0.25 mm.
- .4 Recessed Guide Bars - American Standard Clearance Locational Fit Class LC3.

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- .5 Guides for Lateral - Gap between metal surfaces Restraints and mating TFE elements shall be 0.50 mm $\pm$ 0.25 mm.
- .6 TFE plan dimension + 0 / - 0.2% of diameter or diagonal
- .7 TFE thickness - 0 / + 10.0% of thickness
- .8 Depth of recess for TFE - 0 / + 0.3 mm

1342.4.2 .10 Bearing Assemblies Fabricated outside of Canada and the United States

- .1 In addition to the requirements of Subsection 1342.4.2, bearing components fabricated outside of Canada or the United States of America shall be shipped to a shop located in Canada that is:
 - .1 CWB certified in accordance with CSA W47.1 to Division 1 or 2; and
 - .2 Either CISC or AISC certified in the applicable category of steel bridges for verification inspection and testing.
- .2 Components shall not be shipped from the Canadian shop to the project site until all requirements have been met and the work has been reviewed and accepted by the Consultant
- .3 Testing and Inspection shall be completed at the fabrication facility, and all costs incurred by the Consultant and their designated testing agencies, and the Department shall be paid for by the Contractor.
- .4 All components to ensure that they were undamaged during transportation. The components Shall be in a condition that facilitates all re-inspection and testing requirements. The re-inspection and testing at the Canadian shop shall be completed in accordance with specification section 1335.
- .5 The Contractor's visual quality control welding inspector shall be certified by the CWB as a Level 2 or Level 3 inspector in accordance with CSA W178.2;
 - .1 Non-destructive testing (NDT) methods shall be in accordance with specification section 1335;
 - .2 100% of all fillet and partial penetration welds using magnetic particle inspection in accordance with Section 1335;
 - .3 NDT technicians shall be certified to Level 2 in accordance with CAN/CGSB-48.9712 and employed by an independent testing agency certified to CSA W178.1

1342.4 .3 Installation

1342.4.3 .1 General

- .1 The Contractor shall carry out the Work at the locations as indicated in the Contract Documents.

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- .2 The Contractor shall ensure that all materials, workmanship, construction and inspection shall conform to the requirements of 1335.2 and 1335.4, except as further modified and expanded upon by this Item and/or submission under 1342.3.1.1.
- .3 All steel plates shall be pressed or machined flat prior to manufacture of the bearings.
- .4 The bottom portion of the bearing (the pot), which contains the elastomer, shall be machined from a solid piece of steel.
- .5 Tabs for bolting the pot to the masonry plate shall be machined from the same plate as the pot.
 - .1 Welding of the tabs for attachment of the tabs to the pot will not be permitted.
- .6 Structural steel components of the bearings shall have a minimum dimension in any direction of 25 mm.
- .7 The Contractor shall ensure that all bearings shall be installed in the Bridge under the direct supervision of a Qualified Technical Representative of the bearing manufacturer.
- .8 The bearings shall be shipped and stored in accordance with the manufacturer's recommendations.
 - .1 As a minimum the bearings shall be stored at the site in weatherproof shelters and kept out of direct sunlight.

1342.4.3

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Grouting of Bearings

- .1 Prior to the grouting, the bearing base plates shall be carefully levelled within a tolerance of 1 in 200 and locked by means of the levelling and top nuts provided on the anchor bolts.
 - .1 All concrete surfaces to be grouted are to be roughened to an amplitude of ± 5 mm and all dirt, rust, oil, grease, and other such contaminants are to be removed from the grout area prior to the commencement of grouting.
- .2 The annular space between the anchor bolts and sleeves shall be grouted with grout of flowable consistency mixed and placed in accordance with the manufacturer's instruction.
- .3 The space between the bearing base plates and top of concrete shall be filled with the "dry pack" grout mixed in accordance with the manufacturer's instructions.
 - .1 Following dry packing, the grout shall be covered for 4 Days with wet burlap.
 - .2 Grout shall be maintained at a temperature of at least 10°C during the curing period.

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.1 No grouting shall be done when the concrete or steel is below freezing.

.4 Superstructure components shall not be placed on the bearings until the grout has obtained a minimum strength of 80% of the specified 28-day strength.

1342.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment for the fabrication, supply and installation of all confined elastomer (pot) Bridge bearings in accordance with this Item shall be the number of pot bearings supplied and installed in accordance with this Item.

1342.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

.2 The Owner may make partial payment for confined elastomer (pot) Bridge bearings in accordance with 1382.7.

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SEALED EXPANSION JOINT ASSEMBLIES

ITEM: 1343

1343.1 DESCRIPTION

- .1 This Item consists of the supply and installation of sealed expansion joint assemblies including modular assemblies.

1343.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 The approved expansion joint assemblies to be supplied shall be as noted in the Contract Documents.
- .3 Cast in place type anchors or inserts, steel cover plates and cap screws shall be supplied with the expansion joint assemblies.
- .4 All steel surfaces, with the exception of anchor studs, shall be sandblasted to a white metal finish and coated with an approved inorganic zinc coating conforming to CGSB 1 GP 171B Type 1 (100 μm $\pm$ 12 μm thick) or zinc metalized in accordance with CAN/CSA G189 (125 μm thick).
- .5 The support boxes for the sliding plates in modular expansion joints shall be designed such that the bottom plate transfers the load to the side plates, assuming no support from the thin layer of concrete beneath the support boxes.
- .6 All centre beams (separation beams) and edge beams shall be solid or voided steel extrusions or machined shapes and shall not be built-up welded members.
- .7 The design loading for sealed expansion joint assemblies and for centre beams shall be CL-625 plus the dynamic load allowance and all stresses shall be within the limits specified in CSA S6.
- .8 The round bar anchorages and cover plates shall conform to CAN/CSA G40.21 Grade 260 W.
- .9 All steel used for extrusions, edge beams and support bars shall conform to the minimum requirements of CAN/CSA G40.21 Grade 350A or ASTM A588, unless grades of higher yield strength are required to satisfy the stresses resulting from the loading specified.
- .1 All other steel components shall conform to the minimum requirements of CAN/CSA G40.21 - Grade 300 W.
- .10 Welded anchor studs, when required, shall be the size indicated in the Contract Documents and shall be made from steel meeting the requirements of ASTM A 108.
- .11 Cover plates are to be galvanized by hot dipping in accordance with ASTM A123/A123M, to a minimum thickness of 175 μm and/or a minimum application rate of 720 g/m².
- .12 Anchors for cover plates shall be Richmond Insert Type LFW (closed ferrule) or approved equivalent, a minimum of 70 mm long sized for 13 mm diameter x 32 mm long threaded cap screws with Allen socket head or approved equivalent.

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- .13 Sealed expansion joint assemblies shall be stored at least 150 mm off the ground in a manner to maintain the cross slope and avoid permanent distortion.

1343.3 SUBMITTALS

- .1 The Contractor shall submit the shop drawings for the sealed expansion joint assembly in accordance with Item 1383.
- .2 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.
- .1 Welders shall be certified with the Canadian Welding Bureau for the processes and positions related to the various metal fabrication elements
- .2 Welding to the permanent Structure shall only be carried out if specifically indicated in the Contract Documents or authorized, in writing, by the Engineer.
- .3 Fabrication shall be performed by companies certified by the CWB in accordance with CSA W47.1, Division 1.
- .3 The Contractor shall submit, at least 7 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements. Mill test certificate reports shall be provided in accordance with 1383.2.
- .1 Steel with boron content exceeding 0.0008% shall not be permitted.

1343.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 A representative from the expansion joint assembly(s) manufacturer or supplier shall be present when modular expansion joints are installed.
- .1 All materials, anchor bolt spacing and the recesses formed to receive the assemblies shall meet the representative's approval before the Contractor may place the assemblies.
- .3 The inserts for attaching the steel cover plates at curb(s), sidewalk(s) and/or barrier wall(s), are to be cast in the concrete and the steel plates are to be fastened for final installation after the concrete has attained a minimum 24 hour set.
- .4 All welding shall conform to the requirements of CAN/CSA W59.
- .5 Cover plates are to be anchored on the approaching traffic side of the joint.
- .6 The steel portions of the expansion joint assemblies shall be fabricated in one piece in the fabricating shop, unless otherwise specified.
- .7 Portions of inorganic zinc coating, damaged in the field, shall be mechanically cleaned and recoated in the field.

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- .8 Spacing hardware shall be released within 2 hours maximum of the placing of the adjacent concrete.
- .9 The steel portions of the expansion joint assemblies shall be fabricated to the dimensions indicated in the Contract Documents and are subject to the tolerances indicated in Table 1343-1.

**Table 1343-1
Expansion Joint Fabrication Tolerances**

Dimensions	Face of curb to back of curb	± 6 mm
	Face to face of curbs	± 6 mm
Crown		± 1 mm in 1 m

- 1343.4 .10 The expansion joint assemblies shall be installed in the position indicated in the Contract Documents and are subject to the tolerances indicated in Table 1343-2.

**Table 1343-2
Expansion Joint Installation Tolerances**

Elevation	- 3 mm
This tolerance shall not be considered additive with the tolerances presented in Table 1343-1	
Joint Opening	± 3 mm

1343.5 MEASUREMENT FOR PAYMENT

- .1 The supply and installation of the complete sealed expansion joint assemblies in accordance with this Item shall be by the lineal metre.

1343.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price bid for each type of sealed expansion joint assembly, as identified under the Contract.
- .2 The Owner may make partial payment for sealed expansion joint assemblies in accordance with 1382.7.

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ASPHALTIC EXPANSION JOINTS

ITEM: 1344

1344.1 DESCRIPTION

- .1 This Item consists of the supply and installation of asphaltic expansion joints.

1344.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 Backer rods shall be 50 mm diameter, closed-cell, heat-resistant ethafoam rod and shall meet the requirements of ASTM D5249.
- .3 Locating pins shall be 16D galvanized common nails.
- .4 Bridging plats shall be 3 mm thick, 200 mm wide steel plate to G40.21 Grade 260W and shall have 5 mm diameter centering holes spaced at 50 mm centre-to-centre. Plates shall be cut to suit on site and shall be butt together at their ends.
- .5 Binder shall be selected based on a max./min temperature range of 58/-28 Degrees Celcius and shall conform to the specifications set forth in Table 1344-1.
- .6 Pre-blended aggregates shall be formed from igneous rocks, double washed and dried and shall conform to the gradation requirements set forth in Table 1344-2.
- .7 Surface aggregate shall conform to the gradation requirements set forth in Table 1344-3.

**Table 1344-1
Binder Specifications**

Softening Point	ASTM D36	83°C
Tensile Adhesion (min.)	ASTM D5329	---
Ductility @ 25°C (min.)	ASTM D113	400 mm
Cone Penetration @ 25°C (max.)	ASTM 5329	9.0 mm
Low Temperature Cone Penetration @ -18°C (min.)	ASTM D6297, Sec. 9.1	2.0 mm
Flow @ 60°C, 5 hr. (max.)	ASTM D5329	3.0 mm
Resilience @ 25°C	ASTM D5329	40 – 70%
Asphalt Compatibility	ASTM D5329	Pass
Recommended Installation Temperature	---	193°C
Maximum Heating Temperature	---	204°C
Bond, 50% extension, 25mm, 3 cycles	ASTM D53329	-34°C
Flexibility	ASTM D5329	-40°C

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**Table 1344-2
Pre-Blended Aggregate Gradation**

Screen Size	% Passing
25 mm	95 – 100%
19 mm	95 – 100%
12.5 mm	50 – 70%
9.5 mm	25 - 40%
6.25 mm	0 – 15%

**Table 1344-3
Surface Aggregate Gradation**

Screen Size	% Passing
4.75 mm	100%
1.15 mm	100%
600 µm	25 – 40%
300 µm	0 - 10%

1344.3 SUBMITTALS

- .1 The Contractor shall submit material data sheets and specifications to the department for review and files prior to work commencing on the joint installation.

1344.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 Transversely saw cut the surface asphalt layer full depth to the deck surface on each side of the joint. Width between cuts shall be 500 to 600 mm (20 to 24 inches) and shall be centred over the joint gap. Minimum saw cut depth shall be 50 mm (2 inches).
- .3 Remove all material between the saw cuts including any waterproofing membrane on the concrete deck surface.
- .4 Clean area thoroughly and dry with a hot-air lance or handheld propane heater.
- .5 Place ethafoam backer rod into the joint gap to the required depth.
- .6 Fill the expansion gap with the appropriate grade of heated binder mix and overfill onto the deck.
- .7 Place bridging plates into the hot-mix binder and centre over the expansion joint gap using centring pins. Butt the plates at their ends.

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- .8 Coat all vertical and horizontal surfaces, including bridging plate, with hot binder material.
- .9 Heat the blended aggregate to 135 – 190°C (275 – 375°F) in an appropriate rotating drum mixer. Heat binder material to 193 - 210°C (380 - 410°F) in a double jacketed melter.
- .10 Add the appropriate amount of hot binder to the hot aggregate and blend in the mixer to thoroughly coat the aggregate. Mix temperature should be between 120 - 175°C (250 - 350°F).
- .11 Place the hot aggregate-binder mixture into the joint cut-out in 19 – 38 mm (3/4 and 1 ½ inch) thick lifts. Rake mixture level in the cut-out.
- .12 If necessary, flood the levelled mixture with heated binder material in order to fill the voids prior to the next lift being placed.
- .13 For final lift, slightly over fill the joint by 6 to 12 mm (1/4 – ½ inch) and compact to surface level.
- .14 Carefully heat the top surface with hot-air lance or hand-held propane torch and spread a thin layer of heated binder over the surface of the joint.
- .15 Immediately apply a layer of surface aggregate onto the hot binder material and compact the aggregate into the surface.
- .16 Allow joint to cool, clean up any excess surface aggregate and open joint to traffic.

1344.5 MEASUREMENT FOR PAYMENT

- .1 The supply and installation of the complete asphaltic plug type joint in accordance with this Item shall be measure by the lineal metre.

1344.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price Bid for lineal metre of joint installed.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

GUIDE RAIL SYSTEMS - STRUCTURES

ITEM: 1346

1346.1 DESCRIPTION

- .1 This Item consists of the supply and installation of an aluminum guide rail system on a Highway Structure.

1346.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.

1346.3 SUBMITTALS

- .1 The Contractor shall submit shop drawings for the aluminum guide rail system in accordance with Item 1383.

1346.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall be responsible for the placing and alignment of the anchor bolts in the formwork and concrete at the stage of the Work when this placement must occur.
- .3 The Contractor shall install all posts and railing(s) and these shall be secured firmly in place.
- .4 All contacting aluminum and concrete surfaces shall be separated by a fabric pad.
- .5 Aluminum posts shall be separated from steel bolts by nylon or plastic bushings.
- 6 Rail posts bases bearing unevenly on concrete surfaces shall be brought to bear in alignment as specified by grouting under the base plate of the rail post with an approved epoxy grout.
- .1 The grout shall provide a smooth bearing surface under the full base plate area and shall form a waterproof seal.

1346.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of linear metres of aluminum guide rail system on a Highway Structure supplied and installed in accordance with this Item.
- .2 The measured Quantity shall be the direct straight-line measurement along the centerline of the guide rail system, measured from end cap to end cap of each section and on both sides of the Structure.

1346.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of aluminum guide rail system on a Highway Structure, as identified under the Contract.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

SERVICE DUCTS - STRUCTURES

ITEM: 1348

1348.1 DESCRIPTION

- .1 This Item consists of the supply and installation of all service ducts in Structures.

1348.2 MATERIALS**1348.2 .1 General**

- .1 All materials shall be supplied by the Contractor.

1348.2 .2 Fibreglass Duct

- .1 Fibreglass duct, couplings, bends and end caps shall be made of fibreglass reinforced epoxy (FRE) and shall conform to CAN/CSA C22.2.

1348.2 .3 Polyvinyl Chloride Duct

- .1 All PVC duct, bends, couplings and caps shall conform to Bell Canada's Specifications "Semi Rigid Plastic Duct" CT20 286 and shall be Type II (Thick Wall).
- .2 Each section of PVC duct shall have the following information printed on the duct surface and at intervals not exceeding 1.5 m:
- .1 Manufacturer's name and trademark;
- .2 Inside diameter in millimetres; and
- .3 Type designation.

1348.2 .4 Steel Supports

- .1 Steel in supports and sleeves shall conform to CAN/CSA G40.21 Grade 300.
- .2 All steelworks shall be galvanized in accordance with ASTM A123 min. 610 g/m².

1348.2 .5 Fish Rope

- .1 The fish rope shall be polypropylene not less than 5 mm in diameter and shall be one piece in each duct.

1348.2 .6 Storage

- .1 Materials are to be stored in an organized fashion at least 100 mm off the ground with individual pieces contained or strapped.

1348.3 SUBMITTALS

- .1 The Contractor shall submit to the Engineer, upon request, the manufacturer's certification that the materials meet or exceed the specified grade.

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1348.4 CONSTRUCTION**1348.4 .1 General**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall ensure that an inspection of the Work has been completed and the Work is accepted, in writing by the Engineer, prior to the placement of any concrete surrounding and encasing the Work.

1348.4 .2 FRE Duct

- .1 The duct shall be of the bell and spigot type with all joints fully seated together.
- .2 The duct shall be tied with wire to the reinforcing steel at intervals not exceeding 1.5 m.
- .3 Where external supporting steelworks is detailed in the Contract Documents, the Contractor shall supply and install this Structure at the stage of the Contract most beneficial to complete the Work.
- .4 A minimum of 3 days notice prior to placing concrete on the duct shall be given to the Engineer to allow inspection of the FRE service ducts.
- .5 Expansion sleeves shall be provided at each expansion joint in the Bridge Superstructure and shall be of the type indicated in the Contract Documents.

1348.4 .3 PVC Duct

- .1 Joints shall be fitted with push fit type couplings and the duct shall be fully seated into the coupling.
- .2 The duct shall be tied with wire to the reinforcing steel at intervals not exceeding 1.5 m.
- .3 Expansion sleeves shall be provided at each expansion joint in the Bridge Superstructure and shall be of the type indicated on the Contract Documents.
- .4 Each duct run shall be equipped with two (1 m) 45° bends in each abutment and shall be as shown in the Contract Documents or as directed by the Engineer.
- .5 A 300 mm long galvanized steel pipe sleeve shall be provided on each PVC duct where it leaves the end of the abutment wingwalls or Sidewalks.
 - .1 The galvanized steel sleeve shall be embedded 200 mm in the abutment wingwall or Sidewalk and shall extend 100 mm beyond the concrete surfaces.
 - .2 The exposed 100 mm of the galvanized steel pipe sleeve shall be threaded on the outside.

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1348.4 .4 Testing

1348.4.4 .1 General

- .1 After the installation is complete, a mandrel with a diameter of at least 90% of the diameter of the installed duct and a minimum length of 250 mm, shall be passed through the length of the duct system in the presence of the Engineer.
- .2 The Contractor shall be responsible for clearing and/or replacing any ducts that do not pass the mandrel test.
- .3 After completion of testing, the Contractor shall thread each duct with a fish rope and terminate at each end in a "screw eye" inserted in the recess provided in the duct cap.
 - .1 A surplus of approximately 1 m of fish rope shall be provided at each duct end.
- .4 Caps shall be affixed to each end of the duct with an appropriate solvent welding cement to the galvanized steel pipe sleeves at the ends of abutment wingwalls or Sidewalks.

1348.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of linear metres of duct supplied and installed in accordance with this Item.
- .2 The linear measurement shall be taken from end to end on each duct and shall be measured along the continuous direct run of the duct.

1348.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each size of duct, as identified under the Contract.
- .2 The Owner may make partial payment for duct in accordance with 1382.7

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

STEEL COATINGS

ITEM: 1350

1350.1 DESCRIPTION

- .1 This Item consists of the surface preparation as well as the supply, application and inspection of coatings to the steel structure. This item is applicable to coatings applied in the shop and/or in the field.

1350.2 MATERIALS

1350.2 .1 General

- .1 All materials shall be supplied by the Contractor.

1350.2 .2 Coatings

.1 General

- .1 The coating to be applied to the structural steel shall be in accordance with the following coating systems:
 - .1 System "A": Inorganic zinc primer (Primer) plus high build modified aluminum epoxy mastic coating (Mid-Coat) plus high build aliphatic polyurethane coating (Topcoat).
 - .1 Topcoat colour shall be as specified in the Contract Documents.
 - .2 System "B": Inorganic zinc primer (Primer) plus two coats of high build modified aluminum epoxy mastic coating (Mid-Coats).
 - .1 The Mid-Coat is to be the colour of leafed aluminum, as approved by the Engineer.
 - .3 System "C": Bare steel – uncoated except for 3 metres from the end of the Structure, at the abutments, and 3 metres on each side of continuous expansion joints, which will be coated by "System A" with colour to match weathering steel.
 - .4 System "D": One coat of inorganic zinc primer (Primer) to be applied to the interior surfaces of box girders.
- .2 The primer and topcoat must be compatible with each other and must be manufactured by the same company.
- .3 The coatings indicated in Table 1350-1 are approved by the Engineer for use in the Work.

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**Table 1350-1
Approved Coating(s) for System C**

Supplier	Material	Product
PPG Protective and Marine Coatings	Inorganic Zinc Primer	Dimetcote 9
	High Build Aluminium Epoxy Mastic	Amerlock 400L
	Gloss Aliphatic Polyurethane	Amershield
Carboline	Inorganic Zinc Primer	Carbozinc 11
	High Build Aluminium Epoxy Mastic	Carbomastic 15
	Aliphatic Polyurethane Highbuild Satin Finish	Carbothane 133HB

- .4 The paint system consisting of the inorganic zinc primer and the topcoats of paint other than those indicated in Table 1350-1 and/or in the Contract Documents shall be approved by the Engineer, and
 - .1 the Contractor must demonstrate to the Engineer's satisfaction that the proposed paint system meets the requirements of either System A or System B, and
 - .2 the Contractor must provide the Engineer with proven case histories of Bridges or similar Structures, with similar exposure conditions, where the proposed system has been previously employed.
- .5 The Owner may decide not to entertain substitution during the period of the Contract.

1350.3 SUBMITTALS

1350.3 .1 Coating System

- .1 The contractor shall submit the coating supplier's current printed instructions for application 14 days prior to commencement of the work.
- .2 If repair of damage or deficient coatings is required, the Contractor shall submit a repair procedure to the Engineer for approval prior to commencing the Work, in accordance with 1350.4.6.
- .3 A sample of the proposed paint colour shall be submitted to the Engineer for review 14 days prior to the commencement of the Work.
- .4 A complete quality control documentation package shall be kept by the Contractor and submitted to the Engineer within 14 days of completion of the coating Work and shall include, but not be limited to:
 - .1 Conditions at the time of coating application, including the ambient temperature, steel temperature, humidity and dew points.
 - .2 Material information including lot and batch numbers, thinners, etc..
 - .3 Equipment used.

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- .4 Daily curing conditions including temperature and humidity.
- .5 Average dry film thickness (DFT) for each coat.

1350.4 CONSTRUCTION

1350.4 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

1350.4. .2 Inorganic Zinc Coating (Primer)

- .1 The inorganic zinc coating shall be mixed, applied to the near-white metal surface prepared in accordance with SSPC SP10 "Near-White Blast Cleaning", and cured in the shop at the proper temperature in accordance with the coating supplier's recommendations.
 - .1 Mixing of partial kits shall not be permitted.
- .2 All surfaces shall be completely free of dust and dirt prior to the application of the Primer in accordance with 1335.4.2.14.
- .3 The Primer shall be applied to the metal surface with airless spray equipment as recommended by the Primer supplier.
- .4 The Primer is to be applied to all surfaces of all structural steel to be coated. The top surface of the top flanges of all composite deck girders and floor beams that are embedded in concrete, are to be unpainted, with the exception of a 25 mm strip along each edge.
- .5 The uncoated top surface of the top flanges shall receive a commercial blast finish in accordance with Steel Structures Painting Council specification SSPC SP6 No. 6 "Commercial Blast Cleaning" and shall be protected from any overspray.
- .6 All coated surfaces shall receive a dry film thickness of $75 \mu\text{m} \pm 10 \mu\text{m}$ (one coat) with the exception of the interior of box girders.
- .7 All interior surfaces of the box girders shall receive a dry film thickness of $100 \pm 10 \mu\text{m}$ (one coat) and will not require a field coat.
 - .1 Surfaces include the top interior surface of the bottom flanges, the inside of all web plates, the top 25 mm strip along the top flanges, the interior bottom surfaces and interior edges of the top flanges, all interior stiffeners and bracing, all interior diaphragms and all faces of deck support angles.
- .8 Primer applied to areas that are to be welded shall be a weldable Primer, as approved by the Engineer.

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1350.4. .3 High Build Modified Aluminum Epoxy Mastic Coating (Mid-Coat)

- .1 The Mid-Coat shall be mixed, applied to the zinc rich primed surface and cured in the shop at the proper temperature in accordance with the manufacturer's recommendations.
 - .1 Mixing of partial kits shall not be permitted.
- .2 All surfaces shall be free of dust, dirt, moisture, oil or grease prior to the application of the high build, modified aluminum epoxy mastic coating.
 - .1 Oil and grease shall be removed with a solvent as recommended by the supplier of the coating system.
- .3 All corners, crevices, rivets, bolts, welds and sharp edges shall be stipe coated with the high build modified aluminum epoxy coating prior to application of the Mid-Coat.
- .4 Each field coat shall have a dry film thickness of $125 \pm 20 \mu\text{m}$.
- .5 The top surfaces of the girder and floor beam top flanges that are to be embedded in concrete, shall receive the first coat of the Mid-Coat within a distance of 25 mm from the exterior edges.
 - .1 The Contractor shall employ such measures as necessary to ensure the Mid-Coat is confined to the above 25 mm width along the top flanges and that the remaining top surfaces of the top girder flanges that are to be embedded in concrete, including shear studs, be protected from overspray.
 - .2 If System "B" is used, the second coat of high build modified aluminum epoxy mastic is to be applied in the same manner as the first.
- .6 Connection locations shall be masked out to ensure there is no Mid-Coat applied to faying surfaces, under splice plates, bolts, nuts, and washers. Subsequent coats shall have these previously masked areas 'stepped back" 50 mm to permit blending of field coats after erection and completion of connections.
- .7 The Mid-Coat shall not be applied to the interior of box girders.

1350.4 .4 High Build Aliphatic Polyurethane Coating (Top-Coat)

- .1 The Top-Coat shall be mixed, applied to the zinc rich primed surface and cured in the shop at the proper temperature in accordance with the coating supplier's recommendations.
 - .1 Mixing of partial kits shall not be permitted.
- .2 All surfaces shall be free of dust, dirt, moisture, oil and grease prior to the application of the coating.
- .3 Oil and grease shall be removed with a solvent as recommended by the supplier of the coating system.
- .4 The Top-Coat shall have a dry film thickness per the coating supplier's specifications.

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- .5 The top surfaces of the girder and floor beam top flanges that are to be embedded in concrete, shall receive the first coat of the Top-Coat within a distance of 25 mm from the exterior edges.
 - .1 The Contractor shall employ such measures as necessary to ensure the Top-Coat is confined to the above 25 mm width along the top flanges and that the remaining top surfaces of the top girder flanges that are to be embedded in concrete, including shear studs, be protected from overspray
- .6 Connection locations shall be masked out to ensure there is no Top-Coat applied to faying surfaces, under splice plates, bolts, nuts, and washers. Subsequent coats shall have these previously masked areas 'stepped back" 50 mm to permit blending of field coats after erection and completion of connections.
- .7 The Top-Coat shall not be applied to the interior of box girders.

1350.4 .5 Surface Condition of Bolted Parts

- .1 All bolted connections are friction type connections and are designed for standard size bolts.
- .2 The surface condition for bolted friction connections for painted Structures with coated joints shall be blast cleaned and coated with Class B inorganic zinc silicate coating conforming to the requirements of CSA S6 Table 10.8 for Class B Contact Surface of Bolted Parts.
- .3 The faying surfaces of connections designed as Class A, B, or C, shall be prepared as follows;
 - .1 For clean mill scale, the surfaces shall be free of oil, paint, lacquer, or any other coating for all areas within the bolt pattern and for a distance beyond the edge of the bolt hole that is the greater of 25 mm or the bolt diameter.
 - .2 For Classes A and B, the surfaces shall have the same blast cleaning and coating application as used in the tests to determine the mean slip coefficient.
 - .1 Coated joints shall not be assembled before the coating has cured for the minimum time used in the tests to determine the mean slip coefficient.
 - .3 For Class C, the surfaces shall be hot-dip galvanized in accordance with ASTM A 123 and the surface subsequently roughened by means of hand wire brushing.
 - .1 Power wire brushing is not permitted.

1350.4 .6 Field Painting, Repairs and Touch-up of Paint

- .1 General
 - .1 Field painting shall not be carried out between September 15th and May 15th without written approval from the Engineer.

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- .2 All field painting and sandblasting operations shall be isolated from the environment and substructure by full enclosure consisting of vertically hung, overlapping tarpaulins or permeable sheeting on all sides with over cover and ground sheets.
 - .3 Field coating shall be applied to the steel surface with airless spray Equipment as recommended by the manufacturer of the paint.
 - .4 The Contractor shall take due care to protect passing vehicles, etc., from overspray in all field painting operations.
 - .1 The Contractor shall be fully responsible and assume full liability for the result of her/his actions in the event that overspray should occur to any public or private property.
 - .2 The Contractor shall be responsible for removing and clean any such over sprayed surface to the satisfaction of the Engineer
- 1350.4 .6 .2 Field Splices, Bolted Connections and Masked Out Areas
- .1 Field coating of splices, bolted connections, and masked out areas shall be in accordance with these specifications, the coating supplier's instructions, SSPC PA-1, and any directions by the Engineer.
 - .2 Airless spray application shall be used for coating splices, bolted connections, and masked out areas in the field, as recommended by the coating supplier, and/or as directed by the Engineer.
 - .3 Coating of splices, bolted connections, and masked out areas shall be applied in the field after the steel erection.
 - .4 Coating thicknesses for Mid-Coat and Top-Coat applications shall be per 1350.4.3 and 1350.4.4, respectively.
- 1350.4 .6 .3 Field Touch-Ups and Repairs
- .1 If a section is damaged or deemed unacceptable by the Engineer, the Contractor shall submit a repair procedure to the Engineer for approval prior to commencing repair Work.
 - .2 Any required Work, including sandblasting and painting of all required coats, shall be in accordance with the Contract Documents, the coating supplier's instructions, SSPC PA-1, and any directions by the Engineer.
- 1350.4 .7 Quality Control and Quality Assurance
- .1 Responsibility
 - .1 It is the Contractor's responsibility to supply the material, execute, complete, and maintain the Work in strict accordance with the terms of the Contract; inspection by the Engineer shall not relieve the Contractor of any of his obligations.

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.2 Quality Assurance Inspection

- .1 Inspection by the Engineer may extend to all or any part of the Work and to the preparation, fabrication, or manufacture of any of the materials, in accordance with the General Conditions "B" 21.336.4.7.2.2 The Contractor shall provide the Engineer with all information as is required to make a complete and detailed inspection.

1350.4 .7 .3 Engineer's Representative

- .1 If deemed necessary by the Engineer, an Engineer's representative may be assigned to the project to report to the Engineer on the progress of the Work as a whole and the manner in which it is being performed, to ensure adherence to the requirements of the Contract, to report on any noted failure by the Contractor to fulfil the requirements of the Contract, and to direct the Contractor's attention to such failure.

- .1 The Engineer's representative may be an employee of the Prince Edward Island Department of Transportation and Infrastructure or a hired consultant.

- .2 The Engineer's representative(s) shall, within the limits of the written authorization given to them by the Engineer, have authority to reject material or Work that does not conform to the requirements of the Contract, but no representative of the Engineer shall have authority to revoke, alter, enlarge, relax, or release any requirement of the Contract.

- .3 No representative of the Engineer shall perform any duty or management on the Contractor's behalf.

- .4 The Contractor shall provide regular and practically located office space at the fabrication plant to accommodate the Engineer.

- .1 The office space shall be ventilated, climate controlled to 20°C, lighted and clean, and shall be furnished with a suitable standard office desk and chair.

- .2 Convenient internet, photocopy, and mail shall be provided.

- .5 Quality control records and other documents shall be made available to the Engineer's representative at any time, in accordance with 336.3.

1350.4 .7 .4 Samples and Testing

- .1 The Engineer shall have the right to call for any additional samples, specimens, and tests that are, in his opinion, necessary to secure proper quality assurance of the material and the Work.

- .2 The Contractor shall bear all costs for the provision, preparation, and testing of samples and specimens, including the costs of re-inspection and retesting as associated with Work not meeting the requirements of the Contract Documents.

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- 1350.4.7 .5 Inspection of Coating System
- .1 The Contractor shall be responsible for all quality control inspection and testing.
 - .2 The Contractor's inspector shall have a NACE (National Association of Corrosion Engineers) Level 2 certification.
 - .3 Inspection of the completed coatings shall be based upon magnetic detector readings per SSPC PA 2.
 - .4 Blast cleaned faces, scheduled for painting, are to be approved by the Engineer before the start of the Primer application.
 - .5 Each coating application is to be verified by the Engineer prior to the application of a subsequent coat.
 - .6 Each Day's Work shall be inspected by the Engineer not later than the Day following application of the coatings.
 - .7 Inspection by the Engineer shall not relieve the Contractor of the responsibility for furnishing the qualified labour, equipment, staging etc. necessary to meet the requirements of this specification, or the accessibility of the Work piece for the purposes of inspection.
 - .8 Detection of inadequately coated sections shall be indicated upon inspection by circling the area to be recoated with chalk or other appropriate means.
 - .1 If such areas are close together, the Engineer may require re-coating of the entire surface within the affected portion(s).
 - .2 Re inspection of the replaced portion(s) shall be satisfactory to the Engineer.
 - .3 The cost of repairing and re-inspecting the coating shall be at the Contractor's own expense.

1350.5 MEASUREMENT FOR PAYMENT

- .1 The labour, Equipment, and materials required for, but not limited to, the surface preparation, coating, quality control inspection, and access to the steel structure in accordance with this Item shall be on a lump sum basis.

1350.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Lump Sum Price.

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WATERPROOFING

ITEM: 1351

1351.1 DESCRIPTION

- .1 This Item consists of the supply and installation of waterproofing systems on Structures.

1351.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .1 The waterproofing system "A" shall be a manufactured waterproofing membrane system consisting of a primer, a membrane, a mastic and a protection board and shall be used as specified in the Contract Documents.
- .1 Protection board shall be Vibraflex Type 70 or IKO 1/8" Protecto Board or approved equivalent and having a maximum absorption of 3%.
- .2 The waterproofing system "B" shall be a manufactured waterproofing membrane system consisting of a primer, a membrane and a mastic and shall be used as specified in the Contract Documents.
- .3 The approved waterproofing system shall be Hydrotech MM 6125 system or approved equivalent for system "A" and Mel-Dek by W.R. Meadows or approved equivalent for system "B".
- .2 Materials shall be stored at least 100 mm off the ground in a weatherproof enclosure.

1351.3 SUBMITTALS

- .1 The Contractor shall submit to the Engineer, 7 Days in advance of the commencement of the Work, the proposed type of waterproofing system including the following:
- .1 The manufacturer's recommended procedures for installation and instructions for handling the waterproofing system and its components.
- .2 The manufacturer's specified minimum temperature for asphalt concrete during placement on the waterproofing system.
- .3 The Contractor shall select a product appropriate for the application and field conditions in accordance with the manufacturer's specifications.
- .4 The waterproofing and asphalt concrete shall perform as a waterproofing system.

1351.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

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- .2 All concrete surfaces shall be dry and free of foreign materials prior to priming.
 - .1 Any primed surfaces left overnight shall be re-primed prior to membrane application.
 - .2 Decks that support traffic over winter season (IE. prior to application of waterproofing and wearing surface) shall be pressure washed to remove all deleterious material; such as, dirt, salt, debris, etc. prior to application of waterproofing membrane.
- .3 The Contractor shall prepare the area and install the waterproofing system in accordance with the manufacturer's installation specifications and instructions.
- 1351.4 .4 For all waterproofing applications the following shall apply:
 - .1 The membrane shall be protected, when so noted in the Contract Documents, with the specified protection board, adhered to the waterproofed surface.
 - .2 Any protection board which is to be left exposed for more than 48 hours shall be protected from sunlight exposure in accordance with the manufacturer's instructions.
 - .3 All exposed edge terminations shall receive a trowelled bead of mastic.
- .5 For Bridge decks, the edge details shall be constructed as shown on Standard Drawing 1351-1.
 - .1 Solvent based materials shall be cured for appropriate time period prior to the placing of the waterproofing membrane.
- .6 For concrete box Culverts, the following conditions shall apply:
 - .1 The membrane shall be applied in strips perpendicular to the long axis of the Culvert.
 - .2 The membrane shall be installed in accordance with Standard Drawing 1351-2.
 - .3 The protection board shall be applied over the top of the waterproofing system, on both the top and sides and adhered to the membrane by placing gobs of the mastic at 600 mm centres between the two surfaces.
 - .4 The protection boards shall be butted tightly and shall be orientated vertically when coverage of the sides is specified and in all cases shall completely cover the applied waterproofing system.
- .7 The Contractor shall pave a Bridge deck within 3 Days of the installation of the deck slab waterproofing.

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1351.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of square metres of waterproofing system supplied and installed in accordance with this Item.
- .1 Starter strips, flashing, overlapped joints, double plied areas, patches and seams shall be measured as a single layer of the waterproofing system.

1351.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of waterproofing system, as identified under the Contract.
- .2 The Owner may make partial payment for the waterproofing system in accordance with 1382.7.

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SHORING

ITEM: 1361

1361.1 DESCRIPTION

- .1 This Item consists of the design, supply, construction and removal of the materials necessary to shore excavations.

1361.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 Timber and lumber used in the construction of shoring shall be graded and stamped with the grade mark used by the Canadian Lumber Manufacturing Association and agencies authorized to mark lumber in Canada and/or lumber approved by the Engineer.
- .3 Timber piles used in shoring shall meet the requirements of CAN/CSA 056.
- .4 Steel sheeting shall be free from kinks and bends.
- .5 Steel members with reduced cross-sectional areas due to holes, cuts, and other discontinuities differing from those shown in the design submission and/or in the Contract Documents which reduce the design capacity of the members shall not be used.
- .6 When the grade of the steel members is not known and/or certified, the Designer of the shoring will assume that the yield point of the steel is 200 MPa.

1361.3 SUBMITTALS

- .1 The Contractor shall be responsible for the design of the shoring and associated bracing and shall submit the design in accordance with Item 1383. The design shall be sealed by a Professional Engineer, registered or Licensed-to-Practice with Engineers PEI.
- .1 Shoring shall also be designed by the Contractor to meet the requirements of Sections 12, 18 and 19 of the P.E.I. Occupational Health and Safety Regulations.
- .2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

1361.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer and/or as may be required due to Work Site conditions as the Work progresses.
- .2 The Contractor shall design and construct all shoring to withstand the anticipated design loadings and this shall be clearly identified on the design drawings in 1361.3.1.
- .3 The Contractor shall be responsible for the adequacy of the shoring and the safety of the workmen and the Work Area, continuously from the time of placement of the shoring until such time as the shoring is removed.

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SHORING

ITEM: 1361

- .4 The Contractor shall remove the shoring and all materials shall remain the property of the Contractor and he shall dispose of them outside the Work Site.

1361.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of square metres of shoring designed, constructed and removed in accordance with this Item.
- .2 The area to be measured for payment shall be the extent of the shoring exposed from the base of the excavation to a point vertically upward 300 mm below the surrounding natural grade and horizontally along the edge of the base of the excavation.

1361.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price Bid for all shoring that is design, constructed, dismantled and disposed of.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ENGINEERED FILL

ITEM: 1365

1365.1 DESCRIPTION

- .1 This Item consists of the supply and placement of engineered fill.

1365.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 Engineered fill shall consist of clean hard sound durable crushed rock, crushed gravel or pit run gravel, composed of clean, uncoated particles, free of mud, mudstone, siltstone or other unconsolidated rock material, organic materials and other deleterious material, and when tested in accordance with ASTM C117 and/or C136, shall conform to the grading limits as indicated in Table 1365-1.

**Table 1365-1
Engineered Fill Gradation Limits**

ASTM Sieve Size	Percent Passing
31.5 mm	100
25 mm	95 - 100
19.0 mm	---
12.5 mm	50 - 53
9.5 mm	45 - 72
4.75 mm	30 - 60
2.36 mm	---
1.18 mm	15 - 40
600 µm	10 - 32
300 µm	5 - 22
150 µm	---
75 µm	3 - 9

- .3 Engineered fill shall not contain any friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate prone to decomposition or disintegration.
- .4 Engineered fill shall not present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the Work.
- .5 The material, when tested by the Micro-Deval test method in accordance with MTO LS-618, shall have a Micro-Deval loss not greater than 30%.
- .6 The Owner reserves the right to reject any source of supply of engineered fill solely on the basis of past field performance, documented by the records and experience of the Owner and/or the Engineer, regardless of compliance with gradation or physical requirements.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

ENGINEERED FILL

ITEM: 1365

1365.3 SUBMITTALS

- .1 The Contractor shall advise the Engineer a minimum of 7 Days prior to start of placing of any engineered fill.
- .2 Where engineered fill placement occurs between November 1st and May 1st, the Contractor shall submit, for approval, the proposed method of protection to prevent freezing of the engineered fill.

1365.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The excavation for; and the placement of; the engineered fill must be one continuous operation, from commencement of the Work up to and until the engineered fill placement is completed up to the specified elevation.
- .3 The in-situ material, on which the engineered fill is to be founded, shall be compacted to a depth of 300 mm below the placement grade in accordance with Item 209 and to a minimum of 98% of the Standard Proctor maximum dry density.
- .4 The engineered fill shall be placed on a firm, dry base and shall be placed in lifts not exceeding 300 mm and compacted in accordance with Item 209, to a minimum of 95% of the ASTM D1557 (modified Proctor) maximum dry density.
 - .1 Adjacent fill material shall be placed simultaneously and maintained at the same elevation as the engineered fill.
- .5 Neither the excavation below existing grade, nor the engineered fill as supplied or after placement, shall be permitted to freeze until after the bearing concrete has been cast.
- .6 The tolerances in elevation for the placement of the engineered fill shall meet the requirements of Table 1365-2.

**Table 1365-2
Tolerances for Placement of Engineered Fill**

Surface	Tolerance in Elevation
Base of Engineered Fill	± 5% of the nominal thickness of the engineered fill specified in the Contract Documents
Top of Engineered Fill	± 25 mm

1365.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of metric tonnes of engineered fill supplied and placed in accordance with this Item.
- .2 The measurement shall be calculated based on the approved weigh scale tickets as indicated in the Contract Documents

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ENGINEERED FILL

ITEM: 1365

1365.6

BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price.
- .2 Haulage for engineered fill shall be paid for in accordance with Item 102.12.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

FREE-DRAINING BACKFILL

ITEM: 1366

1366.1 DESCRIPTION

- .1 This Item consists of supply and placement of free-draining backfill.

1366.2 MATERIALS

- .1 The Contractor shall supply all materials.
- .2 Free-draining backfill shall be clean, sound durable crushed rock, crushed gravel or pit run gravel.
- .3 Free-draining backfill shall meet the grading requirements shown in Table 1366-1, when tested in accordance with ASTM C136.
- .1 Concrete aggregates meeting the requirements of Item 1302.2 may be approved for supply under this Item.

**Table 1366-1
Free-Draining Backfill Gradation**

ASTM Sieve Size	Percent Passing
50 mm	100
38 mm	60 - 100
31.5 mm	40 - 100
25 mm	20 - 65
19 mm	0 - 30
12.5 mm	0 - 20
4.75 mm	0 - 5

1366.3 SUBMITTALS

- .1 The Contractor shall submit the source of material for approval in advance of obtaining the free-draining backfill.
- .2 The Contractor shall submit a request in writing for approval of the use of concrete aggregates as a source of supply for this Item.

1366.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 When the water table is below the bottom of the free-draining backfill, positive drainage of the free-draining backfill shall be provided as indicated in the Contract Documents and/or on the Standard Drawing 1366-1.
- .3 Free-draining backfill shall be placed simultaneously with the placing of adjacent embankment material.
- .4 The free-draining backfill shall be placed to the dimensions as indicated in the Contract Documents and/or on the Standard Drawing 1366-1.

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FREE-DRAINING BACKFILL

ITEM: 1366

1366.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of metric tonnes of free-draining backfill supplied and placed in accordance with this Item.
- .2 The measurement shall be calculated based on the approved weigh scale tickets as indicated in the Contract Documents.

1366.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price.
- .2 Haulage for engineered fill shall be paid for in accordance with Item 102.12.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

REMOVAL OF ASPHALT CONCRETE – STRUCTURES

ITEM: 1371

1371.1 DESCRIPTION

- .1 This Item consists of the removal and disposal of the existing asphalt concrete, including the waterproofing system, from a Bridge deck.

1371.2 MATERIALS

- .1 None identified.

1371.3 SUBMITTALS

- .1 None identified.

1371.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 All removed materials shall become the property of the Contractor and shall be disposed of outside of the Work Site.
- .3 The Contractor must take care when removing the existing asphalt concrete so as not to damage the concrete Bridge deck, Roadway drains, joints, curbs and other abutting components of the Structure.
- .1 The Contractor shall be responsible, at his/her own expense, for the repair and/or replacement of such damage resulting from the Work.
- .4 All asphalt concrete shall be completely removed, including any deck waterproofing system which may be in place, to expose and leave bare the Portland cement concrete surface.
- .5 The Contractor shall not be allowed to remove the existing asphalt from the Bridge deck by cold milling.
- .6 The approach asphalt shall be removed in a stepped fashion to avoid a vertical face full depth of the asphalt at the interface of new and old asphalt.

1371.5 MEASUREMENT FOR PAYMENT

- .1 The measurement for the removal and disposal of the asphalt concrete carried out in accordance with this Item shall be on a per square metre basis.

1371.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price Bid.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

REMOVAL OF CONCRETE

ITEM: 1372

1372.1 DESCRIPTION

- .1 This Item consists of the removal and disposal of concrete from a Structure.

1372.2 MATERIALS

- .1 None identified.

1372.3 SUBMITTALS

- .1 The Contractor shall submit the proposed method and sequencing of the removal at least 14 Days prior to the commencement of the Work.

1372.4 CONSTRUCTION**1372.4 .1 General**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The removal of the asphalt concrete to bare exposed concrete surface shall be carried out under Item 1371.
- .3 All removed materials generated as a result of the Work shall be the property of the Contractor and shall be disposed of outside the Work Site.
- .4 Unless otherwise specified the railing and rail posts are to remain in place during the construction operations and the Contractor shall ensure that no damage to these articles occurs during the Work.
- .5 The Contractor shall take all care not to damage any portion of the Superstructure and supports during the Work.
- .6 The Contractor shall pay particular attention to the flow of traffic through the construction zone and any damage incurred to vehicles or their cargo or injury sustained to their occupants as direct or indirect result of the Contractor's action, procedures or negligence, shall be the sole responsibility of the Contractor.
- .1 The Contractor shall indemnify and save harmless the Owner with regards to claims arising from damages or injuries.
- .7 The Contractor shall be responsible to ensure the security of the fall area below the Structure.
- .8 The Contractor shall be required to remove all concrete rubble and other waste from piers and abutments and from the Work Site before the Contract is completed.
- .9 The Contractor shall be responsible, at his/her own expense, for any damage or loss of adjacent and abutting features.

1372.4 .2 Equipment

- .1 All Equipment used to remove concrete from the repair areas shall be subject to the approval of the Engineer.

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REMOVAL OF CONCRETE

ITEM: 1372

1372.4.2 .2 Chipping hammers

- .1 Chipping hammers shall weigh less than less than 15 kg.
- .2 Chipping hammers shall be permitted in all areas of concrete removal.

1372.4.2 .3 Jackhammers

- .1 Jackhammers shall weigh less than 40 kg.
- .2 Concrete removal utilizing a jackhammer shall not be permitted in the following areas:
 - .1 Within 100 mm of concrete that is to remain in place;
 - .2 Within 100 mm of the edges and faces of structural steel members that are to remain in place; and
 - .3 Within 25 mm of reinforcing steel that is to remain in place.

1372.4.2 .4 Rig-Mounted Breakers

- .1 Utilizing a rig-mounted breaker for concrete removal shall not be permitted in the following areas:
 - .1 For barrier walls, parapet walls and deck slabs supported by concrete girders, unless the girders are to be removed;
 - .2 For barrier walls and parapet walls supported by steel beams, unless the deck slab is to be removed;
 - .3 Within deck joint assembly;
 - .4 Located within a distance from concrete to remain in place equal to the sum of 600mm and the lap length of steel reinforcement to remain in place as specified in the Contract Documents; and
 - .5 Within 600 mm from the edge and faces of structural steel members including shear studs to remain in place.

1372.4 .3 Type A - Partial Depth Removal

- .1 This section consists of the partial depth removal and disposal of loose and unsound concrete.
- .2 The actual locations, area and extent of removal shall be determined on the site by the Engineer.
- .3 Partial depth removal shall apply to but is not limited to:
 - .1 Sidewalks and curbs;
 - .2 The top surface of decks; and
 - .3 Barrier walls, end posts and ballast walls.

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ITEM: 1372

- .4 Concrete shall be removed in such a manner as to prevent damage to adjacent concrete, other components and utilities that are to remain in place.
- .5 Reinforcing steel, prestressing tendons, shear connectors, structural steel and other components to remain in place shall not be damaged or loosened.
- .6 Hammers shall not come in contact with reinforcing bars in a manner which will cause debonding of bars in adjacent concrete areas not being repaired.
- .7 Concrete removal shall not be permitted within 1 m of newly placed concrete for a period of 72 hours and to a minimum compressive strength of 20 MPa.
- .8 The unsound and delaminated areas of the concrete deck slab, curbs and end posts, as determined by the Engineer, shall be saw cut along all edges to a depth of approximately 15 mm orientated perpendicular to the original concrete surface.
 - .1 Concrete shall be removed to a minimum of 20 mm below the bottom bar of the top mat of reinforcing steel.
 - .1 Any additional unsound concrete, beyond the minimum specified, shall also be removed from these areas.
 - .2 Removal of concrete beyond the specified limit, shall only be carried out when directed by the Engineer.
- .9 All of the exposed reinforcing steel within these repair areas shall be cleaned by sandblasting (or Engineer approved alternate method) such that it is free of scale, rust and concrete.
- .10 The maximum size of the air hammer to be used when removing concrete around reinforcing steel shall be 15 kg. All areas to be water-blasted to 70 GPa (10,000 psi) maximum pressure.
- .11 In areas where the top mat of reinforcing steel is completely exposed, the bars shall be retied at each intersection point.

1372.4 .4 Type B - Full Depth Removal

- .1 This section consists of the full depth removal and disposal of concrete.
- .2 The actual locations, area and extent of removal shall be determined on the site by the Engineer.
- .3 Full depth removal areas shall be saw cut along all edges, perpendicular to the existing concrete surface to a depth of 25 mm or to the top layer of reinforcing steel, whichever is less.
- .4 All of the exposed reinforcing steel within these repair areas shall be cleaned by sandblasting (or Engineer approved alternate method) such that they are free of scale, rust and concrete
- .5 Care shall be taken not to damage, cut or loosen the reinforcing steel.
- .6 Exposed reinforcing steel shall be retied at each intersection point.

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ITEM: 1372

- .7 The Contractor must take care during the removal of deck concrete in the curb areas so as not to damage the existing reinforcing steel, granite curbing, rail posts and railing in any way.
- .8 The Contractor shall employ methods approved by the Engineer to protect the steel Superstructure from falling concrete debris.

1372.4 .5 Type C - Complete Removal

- .1 This section consists of the complete removal and disposal of concrete above the girders/floor stringers of a Structure.
- .2 The use of explosives shall not be permitted.
- .3 The Contractor shall not drop any materials from the Bridge deck area.
- .4 The Contractor shall clearly mark, on the surface of the Bridge deck, the locations of the supporting members in advance to performing saw cutting and/or jack hammering operations in order to prevent cutting, nicking or spalling of the supporting members.
- .5 Where supporting members have shear connections or stirrups embedded in the deck slab, the Contractor shall employ concrete removal methods that will not result in damage to those embedded elements nor the supporting members.

1372.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of square metres of concrete removed and disposed of in accordance with this Item.

1372.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of removal, as identified under the Contract.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

REMOVAL OF STRUCTURES

ITEM: 1381

1381.1 DESCRIPTION

- .1 This Item consists of the removal of Structure(s) including the disposal of all debris.

1381.2 MATERIALS

- .1 None identified.

1381.3 SUBMITTALS

- .1 The Contractor shall submit drawings and design calculations in accordance with Item 1383.
- .2 The Contractor shall submit to the Engineer, upon request, at least 14 Days prior to the commencement of the Work, the proposed method and sequencing of the removal of the Structure for approval by the Engineer and the Department of Environment.
- .1 The submittal shall include the proposed method for the capture and removal of the debris from the Structure, the proposed retention system for preventing the material from falling into the wetted portion of the watercourse and techniques to be used for the removal of any material which inadvertently falls into the watercourse.

1381.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 For Structures in or over watercourses, the Contractor shall carry out the Work in accordance with Section 800 and the following:
- .1 The Structure shall be removed without releasing harmful materials or contaminants into the watercourse.
- .2 The removal of material which falls into the river shall be accomplished without stationing equipment in the wetted portion of the watercourse or disturbing the riverbed.
- .3 The Contractor shall protect public traffic from the dust and debris resulting from the Work.
- .4 Explosives will not be permitted for demolition.
- .5 All Work shall be carried out in accordance with CAN/CSA S350 - "Code of Practice for Safety in Demolition of Structures" and Part 27 of the PEI Occupational Health and Safety regulations.
- .1 The Structure shall be removed in such a manner to eliminate contact with the riverbed.
- .6 The following conditions shall apply for buried portions of the Structures:
- .1 Foundation excavation for the Work shall be carried out in accordance with Section 203.

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ITEM: 1381

.2 Backfilling of the Work Area shall be carried out in accordance with Section 206 or 207, depending on the backfill material to be placed.

.7 Unless noted otherwise, all waste and demolition debris shall become the property of the Contractor and shall be disposed of outside the Work Site at an approved Construction and Demolition Material Disposal Site.

.1 Waste and demolition debris shall be recycled where possible.

.8 Any damage to the riverbed or to portions of the Structure which are to remain in place shall be repaired by the Contractor at his/her own expense.

1381.5 MEASUREMENT FOR PAYMENT

.1 The removal of a Structure(s) in accordance with this Item shall be on a lump sum basis.

1381.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

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SUPPLY OF MATERIALS

ITEM: 1382

1382.1 DESCRIPTION

- .1 All material necessary for the proper completion of the Work, except that listed specifically as being supplied by the Owner, shall be supplied by the Contractor.

1382.2 QUALITY OF MATERIAL

- .1 All material provided by the Contractor shall be new, unless otherwise approved.
- .2 Material supplied by the Contractor shall conform to the requirements of the Contract.
- .3 As specified or as requested by the Engineer, the Contractor shall make available for inspection or testing sample(s) of any material to be provided by the Contractor.
- .4 The Contractor shall obtain for the Engineer the right to enter upon the premises of the material manufacturer or supplier to carry out such inspection, sampling and testing as specified or as requested by the Engineer.
- .5 The Contractor shall notify the Engineer in writing of the sources of supply sufficiently in advance of the material supply dates to enable the Engineer to perform the required inspection, sampling and testing.
- .1 The Owner will not be responsible for any delays to the Contractor's operations where the Contractor fails to give sufficient advance notice to the Engineer in writing to enable the Engineer to carry out the required inspection, sampling and testing before the scheduled supply dates.
- .6 The Contractor shall not change the source of supply of any material without the written authorization of the Engineer.
- .7 Material which is not specifically identified in the tender but subsequently required in the Work, shall be of a quality best suited for its intended use.

1382.3 REJECTED MATERIAL

- .1 Rejected material shall be expeditiously removed from the Work Site after notification from the Engineer.
- .2 Where the Contractor fails to comply with such notice, the Engineer may require that the rejected material be removed and disposed of outside the Work Site and the Contractor shall pay the costs of removal and disposal of the rejected materials.

1382.4 SUBSTITUTIONS

- .1 Where the Specifications require the Contractor to supply a specified material/product, the Unit/Lump Sum Price shall be based upon the supply of the material/product so specified, which shall be regarded as the standard of quality required by the Item.
- .2 After the award of the Contract, the Contractor may apply, in writing, to the Engineer to substitute another material/product other than the material/product specified in the Contract Documents.

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- .1 The submission shall be complete including all technical data and case history applications for the proposed material/product.
- .2 The Engineer may decide not to entertain substitution during the period of the Contract.
- .3 Substitution of material(s)/product(s) shall not be made without the prior written approval of the Engineer.
- .4 No proposed substitution(s) will be approved prior to the award of the Contract.

1382.5

FREE ISSUE OF MATERIAL

- .1 The Owner shall make available specific materials, as identified in the Contract Documents, for the Work as free issue.
- .2 The Contractor shall be responsible for loading, transporting, unloading, storing and distributing materials from TI's Bridge Maintenance Yard in Charlottetown.
- .3 The Contractor shall be responsible for all materials and for any damage or loss that may occur from the time of receipt of the materials from the Owner's stock until such time that the materials have been accepted in the Work by the Engineer.
 - .1 Any replacement due to loss or damage shall be the responsibility of the Contractor, at his/her own expense.
- .4 Care of Material
 - .1 The Contractor shall, in advance of receipt of shipments of material supplied by the Owner, provide adequate and proper storage facilities acceptable to the Engineer; and on the receipt of such material shall promptly place the material in storage except where it is to be incorporated forthwith into the Work.
 - .2 The Contractor shall provide the Engineer, immediately upon receipt of such shipment, copies of bills of lading, or such other documentation the Engineer may be required to substantiate and reconcile the quantities of material received.
 - .3 The Contractor shall be responsible for acceptance of free issue material at the specified delivery point and for its safe handling and storage.
 - .1 If such material is damaged while under the control of the Contractor it shall be replaced or repaired by the Contractor, at no cost to the Owner.
 - .2 If such material is rejected by the Engineer due to the quality of material as a result of the manufacture of the material, the material shall remain the responsibility of the Contractor until its disposition has been determined by the Engineer.

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SUPPLY OF MATERIALS

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- .4 Where material supplied and delivered to the Work Area by the Owner arrives at the delivery point in a damaged condition or where there are discrepancies between the quantities received and the quantities shown on the bills of lading, the Contractor shall immediately report in writing such damage or discrepancies to the Engineer who shall arrange for an inspection of the shipment and provide the Contractor with a written release from responsibility for such damage or deficiencies.
 - .1 Where any damage or deficiencies are reported thereafter it shall be the responsibility of the Contractor to repair or replace the materials, at her/his own expense.
- .5 The Contractor shall account for the full amount of material supplied by the Owner in each shipment and the Contractor shall be responsible and liable for such free issue material after taking delivery.
 - .1 Such material shall not, except with the written permission of the Engineer, be used by the Contractor for purposes other than the performance of the Work under the Contract.
- .6 When containers, reels, crates and other types of packaging from free issue material are no longer required for their original purpose, they shall become the property of the Contractor, who shall dispose of them, outside the Work Site, unless otherwise specified in the Contract Documents.
- .7 Where material supplied by the Owner is ordered and stockpiled prior to the award of the Contract, the Contractor shall, immediately upon commencement of operations, check the material, report any damage or deficiencies to the Engineer and take charge of the material at the stockpile site.
- .8 Where any damage or deficiencies are reported thereafter it shall be the responsibility of the Contractor to repair or replace the materials, at his/her own expense.

1382.5 .5 Return of Excess Material

- .1 Where material is made available to the Contractor in excess of the amount required to complete the Work, such excess material shall remain the property of the Owner on completion of the Work.

1382.6 DEMURRAGE AND DAMAGES

- .1 The Contractor shall be responsible for the prompt loading, unloading and delivery of all materials for the Work and shall be responsible for any demurrage and storage charges.
- .2 In the event of demurrage or damage charges being paid by the Owner, that amount shall be deducted from money owing to the Contractor.

1382.7 PARTIAL PAYMENT FOR MATERIALS

- .1 Upon written request by the Contractor and in accordance with section 4(2) of the Terms of Payment, the Owner may make partial payment to the Contractor for

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ITEM: 1382

materials identified in the Basis of Payment of an Item and manufactured specifically for the Contract, delivered to the Work Site and stored in a condition, location and manner acceptable to the Engineer.

- .1 The Owner may make partial payment for the materials prior to delivery, if the materials are acceptably stored at the supplier's yard.
- .2 The partial payment will be a provisional unit price for the materials determined by dividing the purchase price (materials and freight per the supplier's invoice as provided to the Engineer) by the unit of measure for the Item or by calculating the percentage of the lump sum price of the Item equivalent to the purchase price. In the case of payment for materials stored per 1382.7.1.1, the calculation would exclude the freight cost.
- .2 In accordance with section 13(3) of the General Conditions, the Contractor shall be fully responsible for the care of the materials until placed and accepted in the Work, including repair or replacement at her/his own expense of any materials damaged or lost between the period of the partial payment and the incorporation of the materials into the Work.
- .3 Partial payment may only be made in the fiscal year the material is to be incorporated in the Work for the specified Items as follows:
 - 1 Items 1302, 1304, 1335, 1341, 1342, 1343, 1344, 1345, 1348, and 1351.

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DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

DESIGN AND CONSTRUCTION DOCUMENTS

ITEM: 1383

1383.1 GENERAL

- .1 The Contractor shall supply the Engineer with design drawings, design calculations, and construction drawings in digital format (PDF) for items including, but not limited to, the following:
 - .1 Reinforcement (steel or GFRP) Placement Drawings;
 - .2 Cofferdam including bracing;
 - .3 Plant Precast Structural Concrete;
 - .4 Shop Drawings for prestressed concrete beams;
 - .5 Mechanically Stabilized Earth (MSE) Walls;
 - .6 Shop Drawings of all metalwork;
 - .7 Corrugated Metal Structures (with associated storage drawings)
 - .8 HDPE Structures (with associated storage drawings)
 - .9 Bridge bearings;
 - .10 Bridge expansion joints;
 - .11 Shoring;
 - .12 Removal of Obsolete Bridge Structures;
 - .13 Formwork;
 - .14 Falsework;
 - .15 Temporary bypass or detour Structures;
 - .16 Overhead sign structures;
 - .17 Temporary stand-alone structures to support construction equipment, and;
 - .18 Reinforcement of existing bridge structure to support construction equipment.
- .2 If the Contractor elects NOT to submit in Digital format, then four (4) copies of the drawings and two (2) copies of the design calculations, stamped and signed by a Professional Engineer registered with Engineers PEI, shall be submitted to the Engineer at least 14 Days in advance of the scheduled construction, demolition and/or fabrication of any of, but not exclusively limited to, the above-listed items.
 - .1 The Engineer shall, in writing to the Contractor, acknowledge receipt of drawings and design calculations.
- .3 Drawings and design calculations shall be specific to the project for which they are submitted.
- .4 The Contractor shall review all drawings prior to submission to the Engineer.
 - .1 The Contractor represents by this review that:
 - .1 The Contractor has determined and verified all field measurements and field construction conditions, or will do so,
 - .2 The product requirements, catalogue numbers and similar data meet or exceed the specified requirements, and
 - .3 That the Contractor has checked and coordinated each drawing with the requirements of the Work and the Contract Documents.
 - .2 The Contractor shall confirm this review of each drawing by date, and signature of the person responsible.

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- .3 At the time of submission, the Contractor shall notify the Engineer in writing of any deviations in the drawings from the requirements of the Contract Documents.
- .5 No fabrication and/or construction shall commence on any aspect of the Work for which drawings and design calculations are required until drawings are received and returned by the Engineer, as per 1383.1.2, 1383.1.3 and 1383.1.4 unless approved otherwise by the Engineer.
- .6 In addition to the above noted drawings, Contractors supplying precast prestressed concrete beams shall supply the Engineer with beam layout drawings.
- .7 The Contractor shall not be relieved of responsibility for results obtained by the use of these drawings.
 - .1 The Owner makes no commitment to review the submitted shop drawings or calculations for conformance to the Contract Documents, either in part or in whole.
 - .2 Identification of any discrepancies from the requirements of the Contract Documents does not imply that the Owner is providing a comprehensive identification of such discrepancies.
- .8 Drawings shall show clearly the size and spacing of all members and their connections as well as the grades and/or species of all materials.
- .9 Welding done on any of the above items shall conform to the requirements of CSA W59.
 - .1 Welding within the Province of Prince Edward Island shall be performed by a welder holding a valid Qualified Welder's Certificate issued by the Canadian Welding Bureau in accordance with CSA W59.
 - .2 Welders shall be certified with the Canadian Welding Bureau for the weld type and positions related to the various metal fabrication elements
 - .3 Welding to the permanent Structure shall only be carried out if specifically indicated in the Contract Documents or authorized, in writing, by the Engineer.
 - .4 Fabrication shall be performed by companies certified by the CWB in accordance with CSA W47.1. Refer to Section 1311, 1312, 1335, 1336, 1341, 1342 or 1343 for appropriate Division requirements.
- .10 The provisions defined under 1383.4.6, 1383.4.7 and 1383.4.8 relating to the Owner's soils information are also applicable to 1383.1.1.
- .11 Drawings bearing the seal and signature of a Professional Engineer, as defined under 1383.1.2, and being those submitted and received by the Engineer, shall be made available at the site, by the Contractor, prior to the commencement of the Work detailed, and shall be maintained at the site until the completion of the Work.

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1383.2 MILL TEST CERTIFICATED FOR STRUCTURAL STEEL, STEEL REINFORCEMENT
AND MISC. METALS

- .1 Provide Mill Test Certificates for all steel fabricated components, steel soil reinforcement, steel concrete reinforcement, connections and associated hardware in English.
 - .1 Mill test certificates shall, as a minimum, include: heat number, date, location of product, compliance with production standards, chemical analysis, mechanical properties, including galvanizing process.
 - .2 Mill test certificates shall be authenticated by the manufacturer.
- .2 Where mill test reports originate from a mill outside of Canada or the United States of America, the Contractor shall conduct the following:
 - .1 Mill test certificates shall be verified by a certified laboratory in Canada by testing the material to the specified material standards and shall include testing for boron content.
 - .2 Testing laboratories shall be certified to ISO/IEC 17025 by an organization accredited by the Standards Council of Canada for tests required.
 - .3 Samples collected for testing shall be collected by personnel employed by the certified testing laboratory.
 - .4 A verification letter shall be provided by the certified laboratory that includes, at a minimum, the applicable mill test certificate reports, testing standards, date of verification testing, and declaration of material compliance with the appropriate standards and the Contract documents.
 - .5 The verification letter shall be signed by an authorized officer of the certified laboratory.

1383.3 DESIGN REQUIREMENTS

- .1 The Contractor shall submit design notes and calculations to the Department at least three weeks prior to the commencement of fabrication.
- .2 Drawings and calculations shall be sealed and signed by a Professional Engineer registered with Engineers PEI.
- .3 The Contractor shall submit to the Department a copy of the design company's Certificate of Authorization (COA) as granted by Engineers PEI.
- .4 Design notes shall be presented in a legible and logical format and clearly identify material properties and have sufficient detail provided so that cross reference checks can be easily made between the design notes and the shop drawings.
- .5 The design notes and design drawings shall be reviewed only to ascertain general conformance with relative code documents and these specifications. Any review by the department or their representatives shall not be considered as relieving the

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Contractor or their engineers of the responsibility for completing the Work in accordance with the pertinent Code provisions or Contract requirements.

- .6 The Contractor shall submit to the Department a Certificate of Insurance verifying that the structure design company has professional liability (errors and omissions) insurance with a minimum of two million dollars (\$ 2,000,000.00) coverage per occurrence.

1383.4

TEMPORARY ACCESS/DETOUR STRUCTURES

- .1 The Contractor's drawings for temporary access Structures shall be prepared by a Professional Engineer registered with Engineers PEI.
- .2 The Contractor shall notify the Engineer in writing of the name and license or registration number of the Professional Engineer(s) who will be responsible for the design and construction of the Work, at least one month in advance of the construction of the temporary access structure.
- .3 The Contractor shall submit drawings, upon request, for temporary access Structures.
- .4 The Contractor shall have the sole responsibility for the design, erection, operation, maintenance, and removal of temporary supports, Structures, and facilities and the design and execution of construction methods required in their use.
- .5 The Contractor shall also be responsible to the Owner to make good any damage which befalls any property of the Owner due to the design, construction, maintenance, suitability and/or adequacy of any temporary access structure.
- .6 The Contractor shall be permitted access to the Owner's soil boring data and any applicable further soils studies or reports which may have been prepared by the Owner or its consultants on the express understanding that these data and information have been prepared and used by the Owner in connection with the design of the permanent Structure(s) only, and for no other purpose.
 - .1 The data and information may not be applicable to the precise locations where the Contractor may erect temporary access Structures, and the Contractor shall be solely responsible for obtaining any further data and information required for his/her purposes.
 - .2 The Contractor hereby waives any claim she/he may have against the Owner with respect to the suitability, adequacy and/or accuracy for the purposes of the Contractor of any soil boring data, studies, reports, or other information available from the Owner and used by the Contractor.
 - .3 The use of the Owner's soil boring data and information by the Contractor, shall in no way diminish or derogate in any way from the responsibilities of the Contractor noted in 1383.2.3, 1383.2.4 and 1383.2.5.
- .7 Any subsurface information available is based on the investigation made at the specific locations indicated. The Owner makes no guarantees, representations, warranties, either expressed or implied, with respect to any such information and

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further cautions the Bidder/Contractor that these conditions are not necessarily typical and may have changed since the field data were collected.

- .8 The Owner further makes no guarantees, representations or warranties, either expressed or implied, that the presence or absence of water on the site and any subsurface explorations when made, will be representative of the actual conditions at the time of construction.
- .9 The Contractor, prior to the loading of the temporary access Structures, shall provide to the Engineer written certification signed by the designated Professional Engineer, identified in 1383.2.2, that:
 - .1 The structure has been constructed in accordance with the Contractor's Plans;
 - .2 The structure has been constructed of sound materials consistent with the design parameters; and
 - .3 The structure is ready to support the loads for which it was designed.

1383.5

DESIGN REQUIREMENTS FOR TEMPORARY ACCESS/DETOUR STRUCTURES

- .1 Structural members incorporated into temporary detour Structures shall be designed to meet the requirements of CSA S6.
- .2 Timber, lumber and timber piles incorporated into temporary works other than temporary detour Structures shall be designed to meet the requirements of CSA S269.1.
 - .1 Where timber and lumber do not bear a valid and legible grading stamp, permissible design stresses for Joint and Plank Grades shall not exceed those permitted for S-P-F Grade No. 2.
 - .2 Where timber and lumber do not bear a valid and legible grading stamp, permissible design stresses for Beam and Stringer Grades shall not exceed those permitted for S-P-F Grade No. 1.
- .3 Structural steel members incorporated into temporary works other than temporary detour Structures may be designed to meet the requirements of one of the following:
 - .1 CSA S16 for members subject to static loads;
 - .2 CSA Standard S16 for moving loads, such as cranes, trucks, etc. provided an impact allowance of 30% on live loading is used and the distribution of wheel loads to stringers and floor beams is as specified in CSA S6; or
 - .3 CSA S6.
- .4 Temporary concrete footings or piers supporting falsework or other such elements shall be designed to meet the requirements of CSA S6 or ACI Standard 318.

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1383.6 GRADING AND MATERIAL REQUIREMENTS

- .1 Timber and lumber used in the construction of falsework, formwork, shall be graded and stamped with the grade mark used by the Canadian Lumber Manufacturing association or agencies authorized to mark lumber in Canada and/or lumber approved by the Engineer.
- .2 Timber piles used in the falsework shall meet the requirements of CSA 056.
- .3 Structural steel shall meet the requirements of the specified material, or, as a minimum, ASTM A36 or CSA G40.21M Grade 260W.
 - .1 Steel shall be free of kinks and bends and shall have no welds across the tension flanges.
 - .2 Steel members with reduced cross-sectional areas, due to holes, cuts, which reduces the design capacity of the members shall not be used.
 - .3 Where the grade of the steel members is not specified, the Engineer shall assume that the yield point of the steel is 200 MPa.

1383.7 PROPRIETARY SHORING, FORMS AND ACCESSORIES

- .1 At the time of the construction drawing submission, the manufacturer's technical literature presenting allowable loads, shall be submitted for any proprietary element or component proposed to be incorporated into the Work.

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FORMWORK

ITEM: 1384

1384.1 GENERAL

- .1 The Contractor shall be responsible for all formwork design and construction and shall carry out the Work in accordance with Item 1383 and with Part 19 of the PEI Occupational Health and Safety Regulations.
- .2 The Contractor shall furnish, construct, erect, maintain and subsequently remove and dispose of all formwork required for the erection of the Work.
 - .1 The Contractor shall have total control of the Work and shall effectively direct and supervise the Work so as to ensure it conforms to the formwork requirements.
 - .2 The Contractor shall be solely responsible for the design, construction means, methods, techniques, sequences, and procedures and for coordinating the various parts of the Work.
- .3 The Contractor shall certify that no permanent stresses or other detrimental effects on the completed Structure result from the formwork design.
- .4 The Contractor shall carry out the Work such that no permanent stresses or other detrimental effects on the completed Structure result from the formwork.
 - .1 The Contractor shall not weld any form hangers, chairs, bar supports, etc. to the flanges or webs of steel girders.
- .5 Formwork design shall be in conformance with CAN/CSA S269.3 and as specified herein.
- .6 The following conditions are the minimum requirement for all formwork design and construction:
 - .1 Formwork shall be designed and constructed to provide the necessary rigidity and to support all dead and live loads.
 - .2 Bracing required to maintain the rigidity of the formwork under all loading conditions shall be clearly shown on the formwork drawings.
 - .3 Fluid pressure as lateral thrust on vertical forms shall be correlated to the capacity and type of placing Equipment, the planned rate of placing concrete and the slump and temperature of the concrete.
 - .4 In no case, shall wall forms, over 1200 mm in height, be designed for less than 1200 mm fluid head of concrete and in no case shall column forms over 2000 mm in height be designed for less than a 2000 mm head.
 - .5 Forms for exposed concrete surfaces shall be designed and constructed so that the formed surface of the concrete does not undulate excessively in any direction between studs, joists, form stiffeners, form fasteners or wales.
 - .1 Undulations shall not exceed 1/270 of the centre-to-centre distance between studs, joists, form fasteners, form stiffeners or wales, or 2 mm, whichever is smaller.

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- .2 Should any form or forming system, even though previously approved for use, produce a concrete surface with excessive undulations, its use shall be discontinued until modifications, satisfactory to the Engineer have been made.
- .6 On steel girder structures, overhang brackets shall extend to the bottom flange and all contact surfaces shall bear on neoprene pads supplied by the contractor, as detailed on Standard Drawing 1384-1.

1384.2

FORMS

- .1 Forms shall be smooth, mortar tight, true to the required lines and grades and of sufficient strength to resist springing out of shape during placing of concrete.
- .2 Materials to be used for forms shall be thoroughly cleaned of all mortar and foreign material before being used.
- .3 Surfaces of and within forms shall be cleaned of dirt, chips, sawdust, nails and other foreign materials before concrete is placed.
- .4 Formwork shall be thoroughly coated with a commercial quality form coating, which will permit the ready release of the forms and will not discolour the concrete.
 - .1 The type of form coating to be used shall be submitted to the Engineer for written approval and shall be applied in accordance with the manufacturer's instructions.
- .5 Plywood or steel forms shall be used for exposed concrete surfaces except where the Engineer permits the use of lumber in small and intricate portions of the Work.
- .6 Plywood shall be of a grade and quality satisfactory to the Engineer.
 - .1 Plywood shall be placed with the grain of the outer plies perpendicular to the studding or joists.
 - .2 Form panels shall be placed in a neat and symmetrical pattern.
 - .3 Horizontal joints shall be level and continuous and vertical joints shall be staggered.
- .7 Forms for concrete columns, cap beams and all portions of abutments on overpass and underpass Structures exposed to view shall be either faced with an exterior grade plywood (G1S) with the sanded face placed against the concrete or shall be a commercial grade steel form capable of giving a true and high quality surface finish.
 - .1 Plywood forms for rectangular columns shall be made up of the full 2400 mm long sheets placed vertically. All columns with the side dimensions equal to or less than 1200 mm shall be formed with no vertical joints within the face width.
 - .2 Rectangular columns with the side dimensions greater than 1200 mm shall be formed with equal width pieces of plywood.

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- .8 The Contractor may use boards to construct the forms for concealed surfaces subject to the approval of the Engineer.
 - .1 Edge contact between boards shall be sufficient to make forms impervious to mortar.
- .9 Forms shall be constructed so that form marks will conform to the general lines of the structure.
 - .1 Column form marks shall be symmetrically spaced.
- .10 Exposed sharp edges shall be chamfered with 20 mm by 20 mm triangular fillets.
 - .1 Where wood triangular fillets or chamfer strips are employed, they shall be milled from clear, straight grain lumber and shall be planed on the side exposed to concrete.
- .11 Anchor devices, of a type approved by the Engineer, may be cast into the concrete for use in supporting forms or for lifting precast members.
 - .1 The use of driven types of anchorages for fastening form or form supports to concrete will not be permitted.
- .12 Anchoring devices, cast-in-place or driven, shall be approved by the Engineer.
 - .1 Specified cover over embedded metal anchors shall be maintained.
 - .2 Re-moveable anchoring devices shall be removed without causing damage to the adjacent/surrounding hardened or partially hardened concrete.
- .13 No forms shall be left in place.
- .14 Duraforms® or similar products shall be prohibited from use.

1384.3

FORM TIES AND BRACING

- .1 Internal form ties shall be GFRP and of a type approved by the Engineer.
- .2 Rods, bolts or prefabricated units shall be capable of maintaining the correct concrete thickness and so arranged that the slack or spring in the form framing will be eliminated when tightened.
- .3 Use Sigma Concrete Form Tie Systems by Sigma DG Fibreglass systems or approved equivalent. Any material remaining in the concrete shall be non-metallic to prevent corrosion.
- .4 Use light grey concrete plugs on all exposed concrete surfaces (applied before concrete sealers and costings).
- .5 Snap-off ties or ties consisting of twisted wire loops shall not be permitted.
- .6 Forms for outside surfaces shall be constructed with stiff wales at right angles to the studs and form ties shall extend through and fasten these wales.

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- .7 Bracing shall be capable of maintaining the correct form alignment and stability.

1384.4 CORROSION PREVENTION

- .1 Tie wires, form ties, bolts, hardware and other embedded metal items shall extend to within the specified cover minus 10 mm from the concrete surface.

1384.5 DECK FORMWORK HANGERS

- .1 Hangers for deck formwork shall be of a type which can be completely removed or removed a minimum of 50 mm below the surface. Galvanized hangers must be removed a minimum of 19 mm below the surface. GFRP hangers can be cut flush and ground smooth.
- .2 In the event that the contractor's formwork design does not provide the above indicated minimum cover over the hangers, a concrete haunch extension may be utilized provided it extends continuously from one end of the span to the other. No payment will be made for the concrete require.
- .3 If hanger removal leaves a hole of 13 mm or less it may be cleaned and patched utilizing concrete mortar consistent with the parent concrete and containing latex.

1384.6 INSPECTION OPENINGS

- .1 Temporary openings shall be provided at the bottom of deep units, such as columns and walls, to facilitate cleaning and inspection.
- .1 In restrictive areas, openings shall be located so that water can be used to wash out the debris.
- .2 Openings shall be closed with patches, flush with the inside surface of adjacent panels.
- .2 Where deep sections of concrete are reduced in cross section, as in stepped footings, and where concrete is to be placed continuously, the effect of fluid pressure on the lower portions of the step or Slope shall be addressed by providing partial form tops that will contain the concrete and prevent upward bulge or flow.
- .1 Where top forms are complete or large enough to trap air, slots or holes shall be provided to vent air or to permit vibrating of concrete.

1384.7 LINES AND GRADES

- .1 Forms for girders and slabs shall be cambered to achieve the final lines and grades.
- .2 Freely suspended check wires shall be stretched at reasonable intervals from which form alignment can be verified.
- .3 Checking and corrective wedging or shoring shall be carried out horizontally and vertically as required before concrete is in place.
- .1 All wedges shall be hardwood.

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1384.8 FORMWORK TOLERANCES

- .1 Unless otherwise required in the Contract Documents, the maximum deviations from line, grade and dimension shall be as shown in Table 1384-1.
- .2 Measurement of concrete in Structures, calculated on the dimensions shown in the Contract Documents, will not be affected by the formwork tolerances listed in Table 1384-1

**Table 1384-1
Formwork Tolerance Limits**

Position in Structure	Tolerance
Finished Bridge Deck Grades Variation from tolerance	± 3 mm ≤ 3 mm in any 3 m section
Concrete Bridge Bearing Block or Seat Grades Variation from tolerance	± 3 mm ± 2 mm in any direction
Columns, piers, walls, beams and similar parts Variations from true line Variation in cross sectional dimensions	≤ 5 mm in any 3m section - 5 mm, + 10 mm
Misplacement or eccentricity in piers, cap beam and Bridge seats	± 10 mm
Variation in slab thickness	- 3 mm, + 5 mm
Footings plan dimensions misplacement or eccentricity	- 10 mm, + 50 mm $\pm 1\%$ of footing dimension in direction of misplacement but < 50 mm
Variation in sizes and location of slab and wall openings	± 10 mm

1384.9 FORMWORK CERTIFICATION

- .1 The Contractor shall provide, prior to the placement of concrete or the application of any loading, certification by either a Professional Engineer registered or licensed to practice in the Province of Prince Edward Island or a person designated by a Professional Engineer, in writing and bearing the seal and signature of a Professional Engineer, to be competent to certify that the formwork has been constructed:
 - .1 In accordance with the formwork design submitted in accordance with 1384.1.5 and 1384.1.6; and
 - .2 Of sound materials consistent with the design parameters.

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FALSEWORK

ITEM: 1385

1385.1

GENERAL

- .1 The Contractor shall be responsible for all falsework design and construction and shall carry out the Work in accordance with Item 1383.
- .2 The Contractor shall furnish, construct, erect, maintain and subsequently remove and dispose of all falsework required for the erection of the Work.
 - .1 The Contractor shall have total control of the Work and shall effectively direct and supervise the Work so as to ensure it conforms to the falsework requirements.
 - .2 The Contractor shall be solely responsible for the design, construction means, methods, techniques, sequences, and procedures and for coordinating the various parts of the Work.
- .3 Falsework shall include all temporary supports and foundations and shall be properly designed and substantially constructed and maintained to sustain the loads which will come upon it.
- .4 The Contractor shall verify that no permanent stresses or other detrimental effects on the complete structure result from the falsework design.
- .5 The Contractor shall carry out the Work such that no permanent stresses or other detrimental effects on the complete structure result from the falsework.
- .6 Falsework design shall conform to CAN/CSA S269.1 and as specified herein.
- .7 The following conditions are the minimum requirement for all falsework design and construction:
 - .1 Falsework shall be designed and constructed to provide the necessary rigidity and to support all dead and live loads.
 - .2 Bracing required to maintain the rigidity of the falsework under all loading conditions shall be clearly shown on the falsework drawings.
 - .3 Connection points of bracing members shall be designed to develop the strength required by computed design loads but not less than 50% of the effective strength of the members.
 - .4 Timber cap beams shall be connected to timber piles by drift pins or equivalent.
 - .5 The minimum size of bolts used in the connection points of bracing members shall be 19.0 mm in diameter.
 - .6 Falsework for the supports of the Superstructure shall be designed and constructed to support loads that would be imposed were the entire Superstructure (except portions of the deck and slab) placed at one time.
 - .7 Falsework shall be constructed to produce a finished Structure true to lines and grades as indicated in the Contract Documents.

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- .8 The falsework drawings shall clearly show the amount of calculated deflection of bending members under total dead loads.
- .9 Suitable methods shall be used to set the forms to the required grade or camber and to take up any settlement in the falsework which may occur before or during placement and until initial set of the concrete has been achieved.
- .10 Anticipated total settlements of falsework and forms shall be indicated by the Contractor on the falsework drawings
 - .1 These shall include falsework footing settlement and joint take-up
 - .2 Anticipated settlements over 15 mm shall not be allowed unless otherwise permitted by the Engineer.
 - .1 Deck slab forms between girders shall be constructed with no allowance for settlement relative to girders.
- .11 Pre-manufactured bridge overhang brackets shall be used in the construction of the bridge deck overhangs.
 - .1 Overhang brackets shall be configured such that a portion of the construction loads are distributed to the web or bottom flange of the prestressed beams.
 - .2 Overhang brackets shall be configured such that the construction loads are distributed to the bottom flange of steel beams.
- .12 Plywood for constructing deck slab soffits may be placed with the grain in the outer plies parallel to the joists provided it is clearly noted on the drawings and reflected in the design calculations.
 - .1 Plywood must be continuous over 3 joists.

1385.2

PILES AND FOUNDATIONS

- .1 Falsework shall be founded on solid rock or supported on driven timber or steel piles.
- .2 Mudsills shall only be permitted if approved, in writing, by the Engineer.
 - .1 Mudsills shall only be supported on a compacted foundation grade
 - .2 The soil bearing pressure under mudsills shall not exceed 150 kPa; however, the Contractor may submit an alternate bearing pressure value supported by engineering analysis and based on soil design parameters determined by field testing methods, subject to the approval of the Engineer.
 - .3 Soil bearing pressure shall be evenly distributed over the entire mudsill area.
- .3 Piles shall be driven to the bearing capacity as submitted in the falsework design.

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- .1 The Contractor shall provide verification of the capacity to the Engineer. The maximum calculated service load on a timber pile shall not exceed 225 kN.
- .4 When steel scaffolding type falsework is used by the Contractor, the base plates on all jack screws shall provide full and even force against mudsills and ledger beams.

1385.3

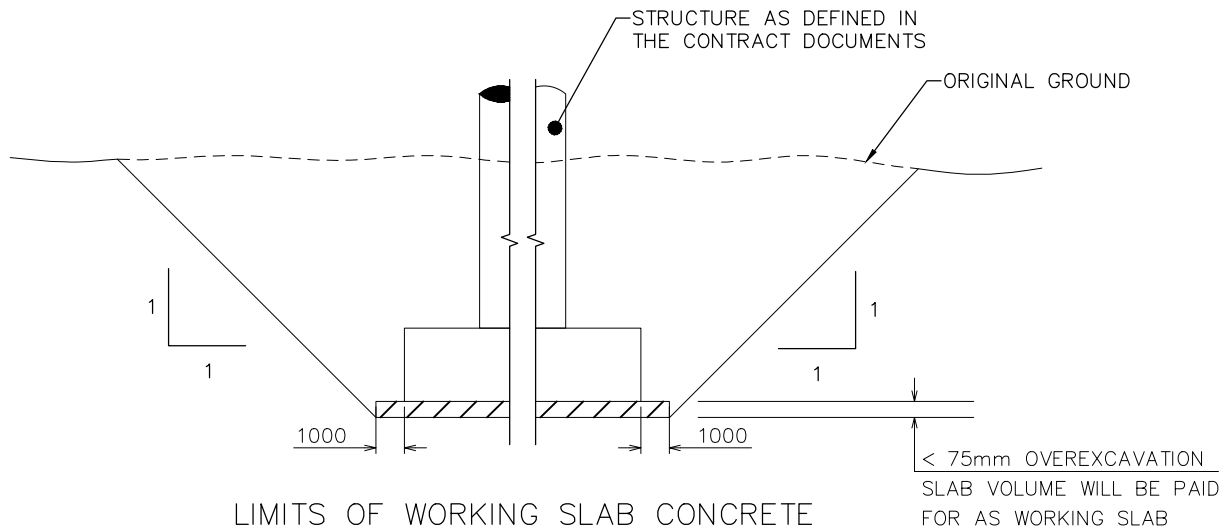
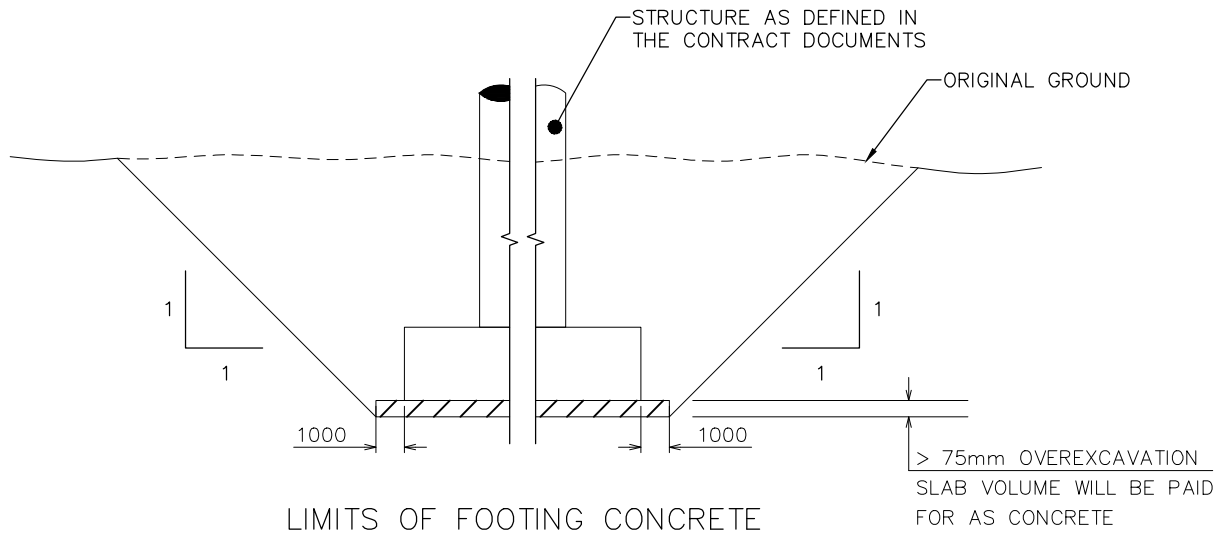
REMOVALS

- .1 The release and/or removal of temporary supports, bracing, temporary members and guys must be carried out in a staged manner and under no circumstances will a sudden release of support be permissible.
- .2 Falsework shall not be removed until the compressive strength of the last placed concrete, including concrete above the bridge deck, reached 80% of the specified 28-day compressive strength.
- .3 Falsework supporting a continuous or rigid frame structure shall not be removed from any span until the concrete in all spans of the continuous unit has reached 80% of the specified 28-day compressive strength.
- .4 Falsework shall be removed uniformly and gradually beginning at the centre of the span and working towards the supports.
- .5 Falsework for cast-in-place prestressed portions of the structure shall not be released until after the prestressing steel has been tensioned.
- .6 Falsework piling shall be removed.
 - .1 Falsework piling for the support of structures over land shall be removed to a minimum of 600 mm below the surface of the original ground or the finished slopes, whichever is lower.

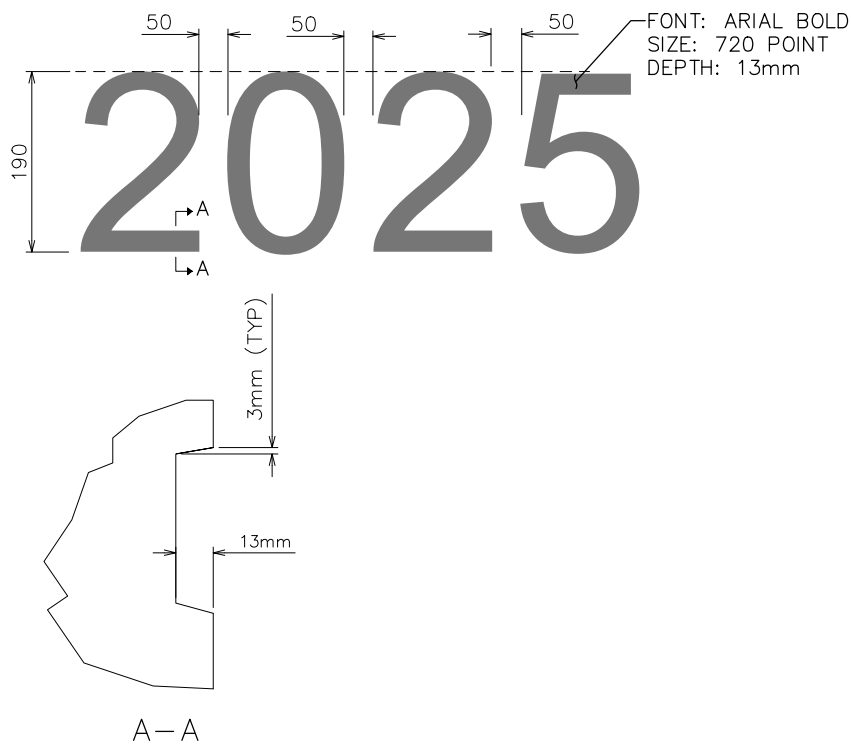
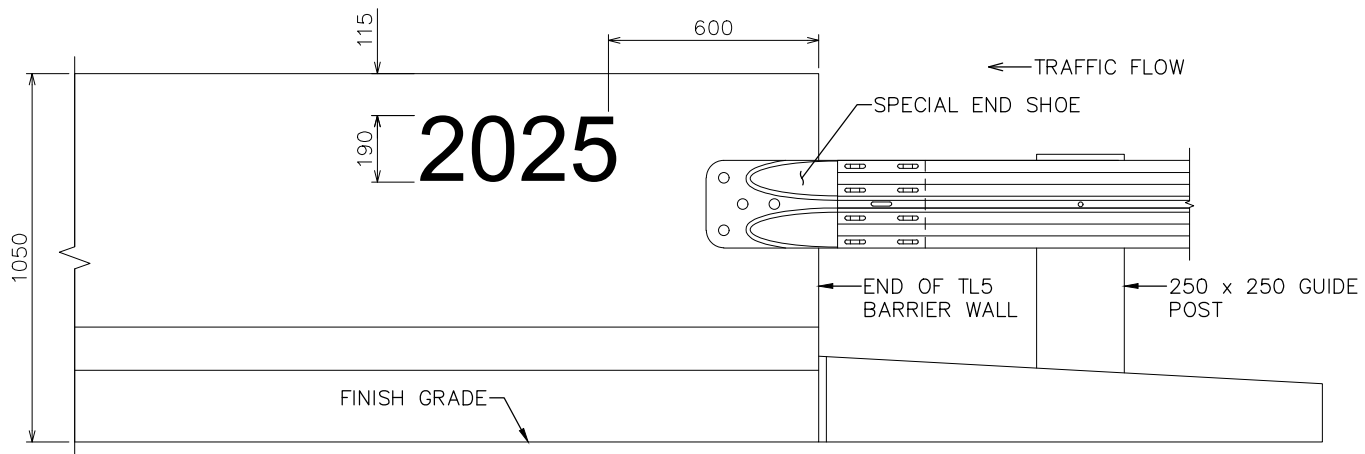
1385.9

FALSEWORK CERTIFICATION

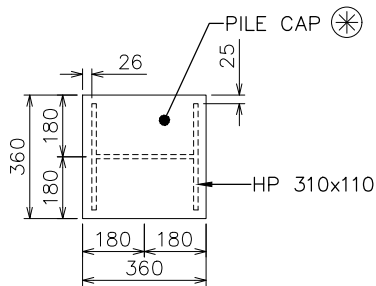
- .1 The Contractor shall provide, prior to the placement of concrete or the application of any loading, certification by either a Professional Engineer registered or licensed to practice in the Province of Prince Edward Island or a person designated by a Professional Engineer, in writing and bearing the seal and signature of a Professional Engineer, to be competent to certify that the falsework has been constructed:
 - .1 In accordance with the falsework design submitted in accordance with 1385.1.5 and 1385.1.6; and
 - .2 Of sound materials consistent with the design parameters.



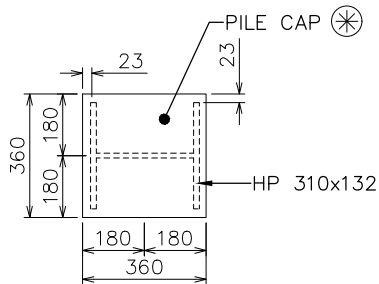
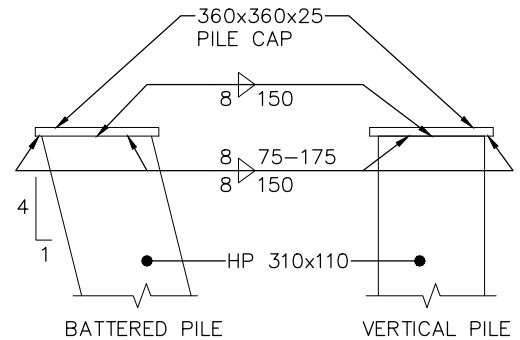
CONCRETE LIMITS FOR FOUNDATION OVEREXCAVATION



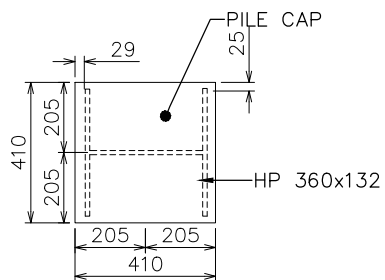
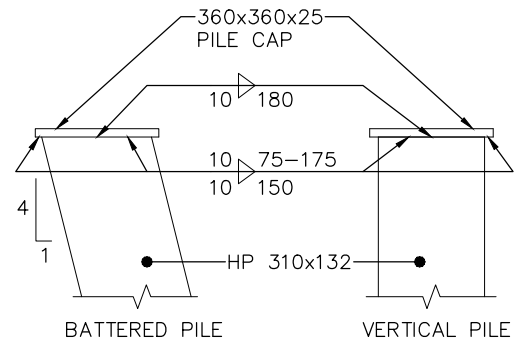
DATE LOCATION FOR STRUCTURES



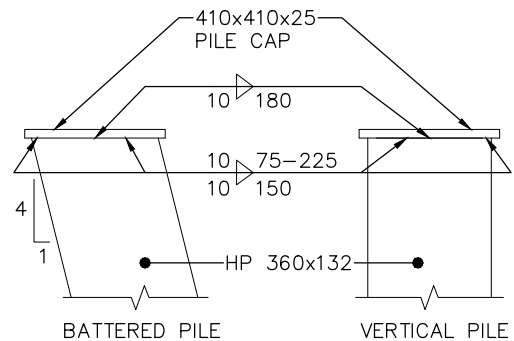
PILE CAP DETAILS FOR HP 310x110



PILE CAP DETAILS FOR HP 310x132

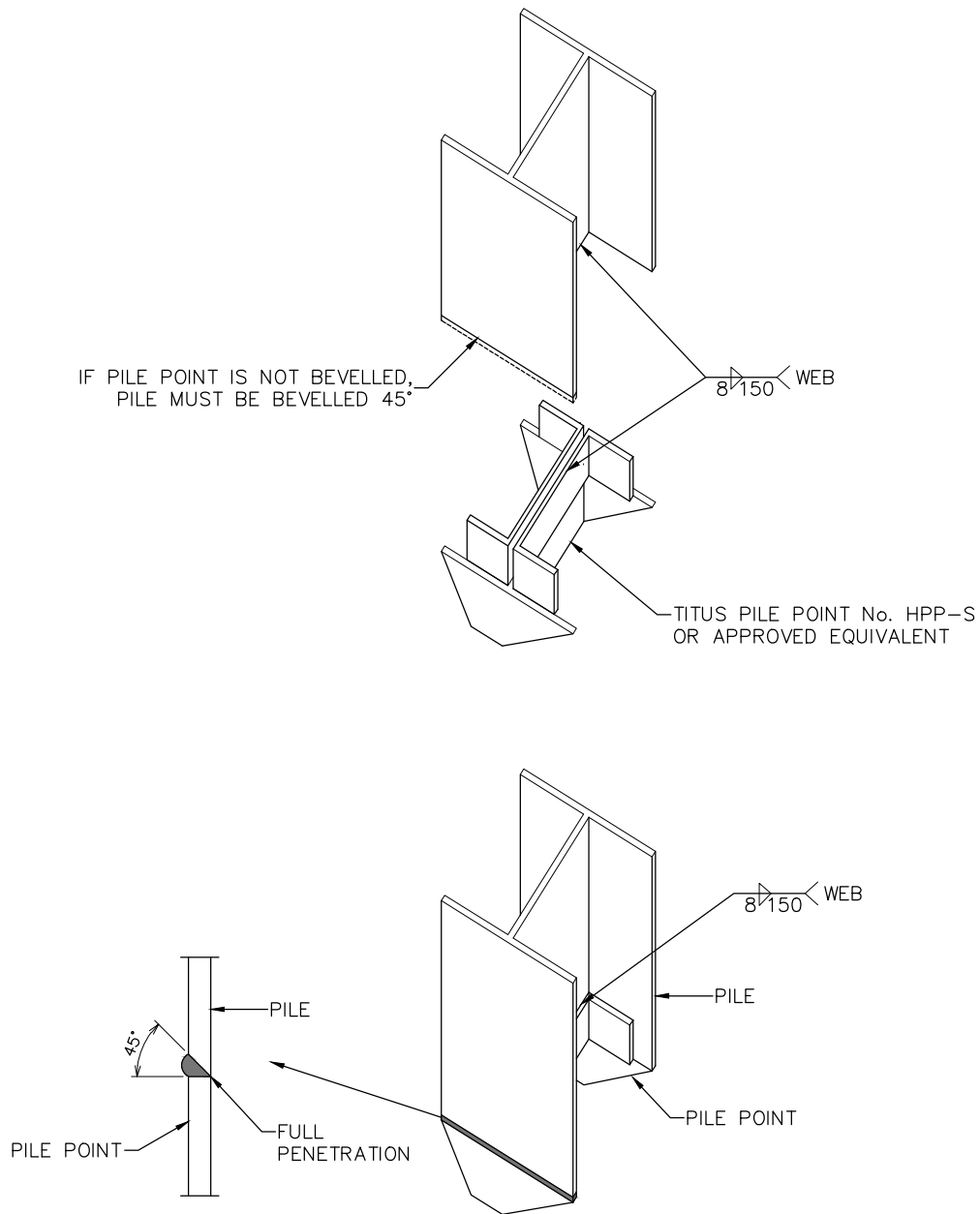


PILE CAP DETAILS FOR HP 360x132

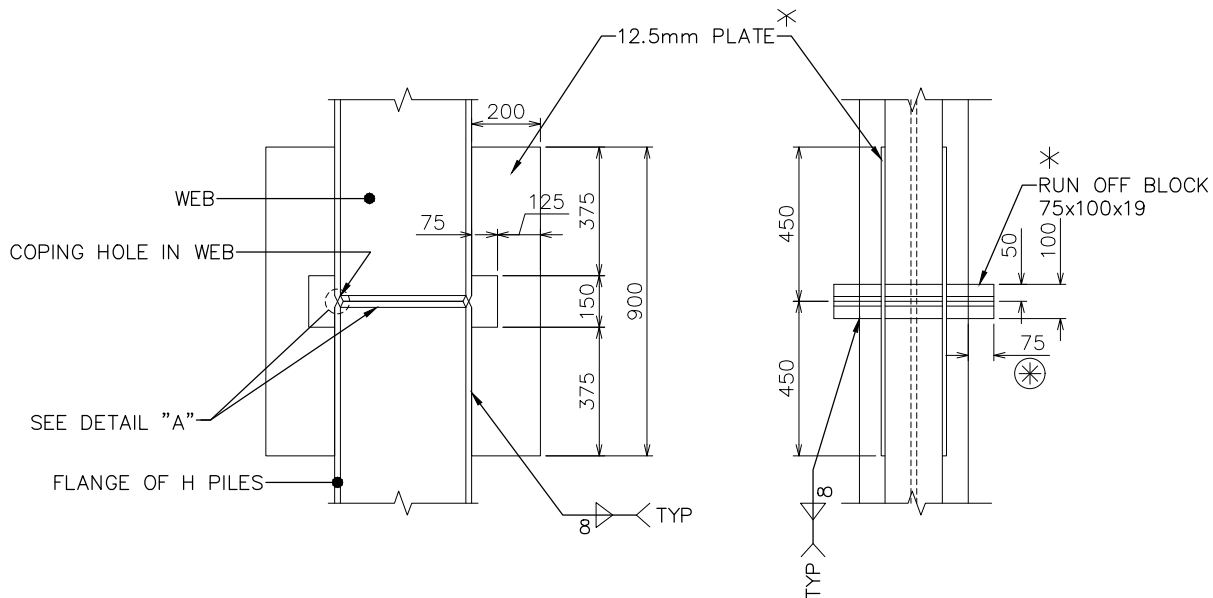


(✱) PILE CAP PLATE SIZED BASED ON NOMINAL PILE DIMENSIONS

STEEL H PILES PILE CAP DETAILS

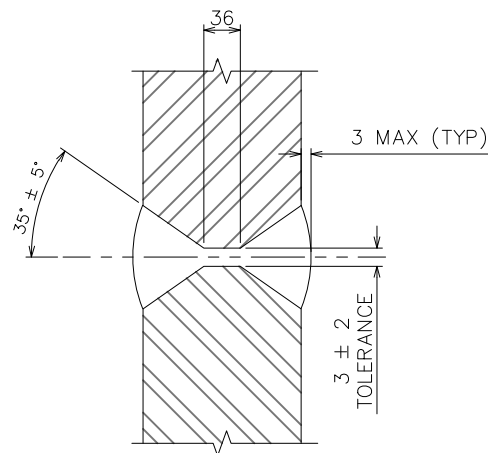


STEEL H PILES PILE POINT DETAILS



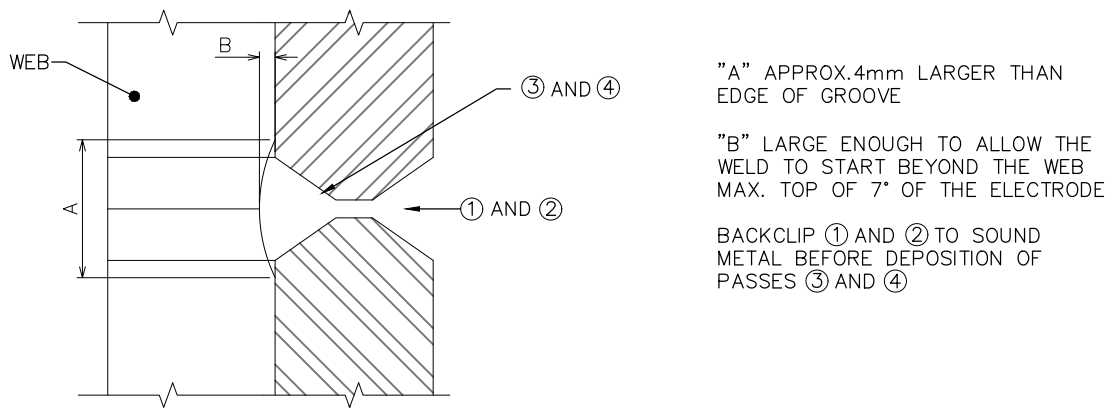
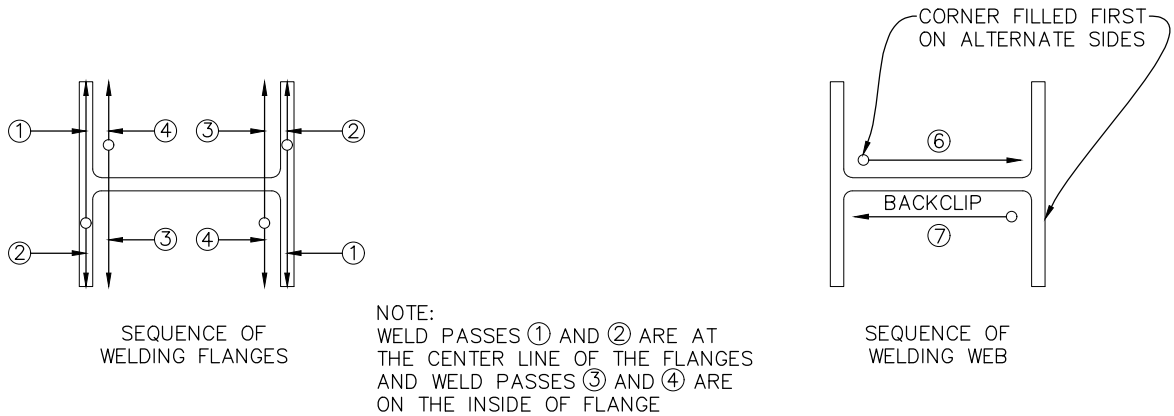
⊗ MAY BE REDUCED TO 50 WHEN SPLICES ARE CHECKED BY NON-DESTRUCTIVE TEST METHOD.
* REMOVE AFTER SPLICE IS FINISHED AND GRIND FLUSH.

VERTICAL ALIGNMENT FOR H PILE SPLICING



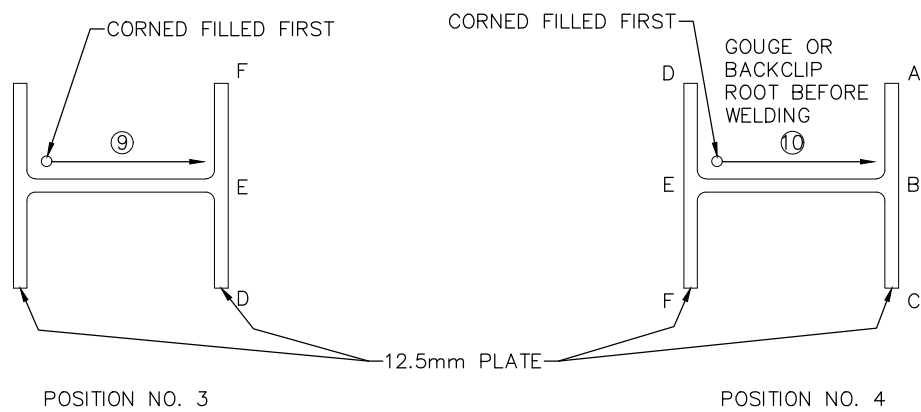
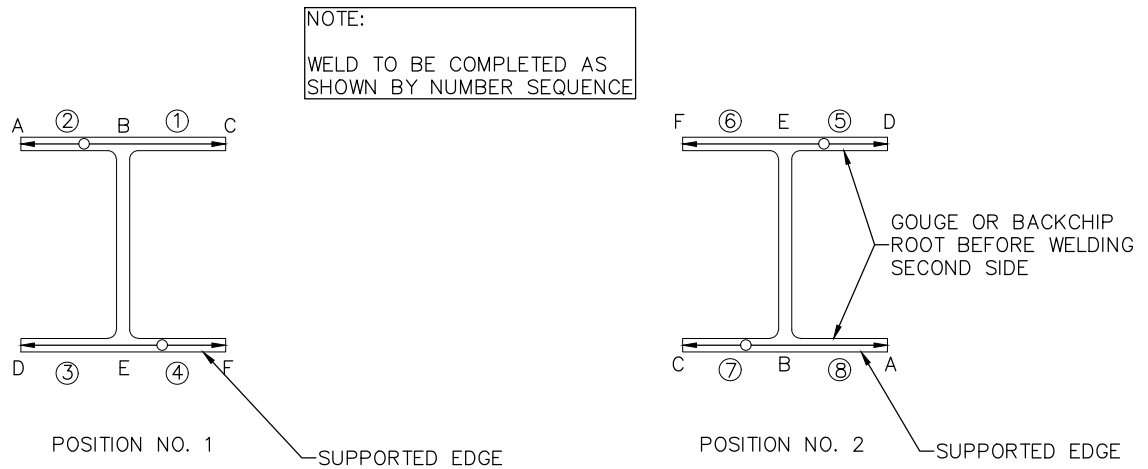
DETAIL "A"

STEEL H PILES SPLICE DETAILS

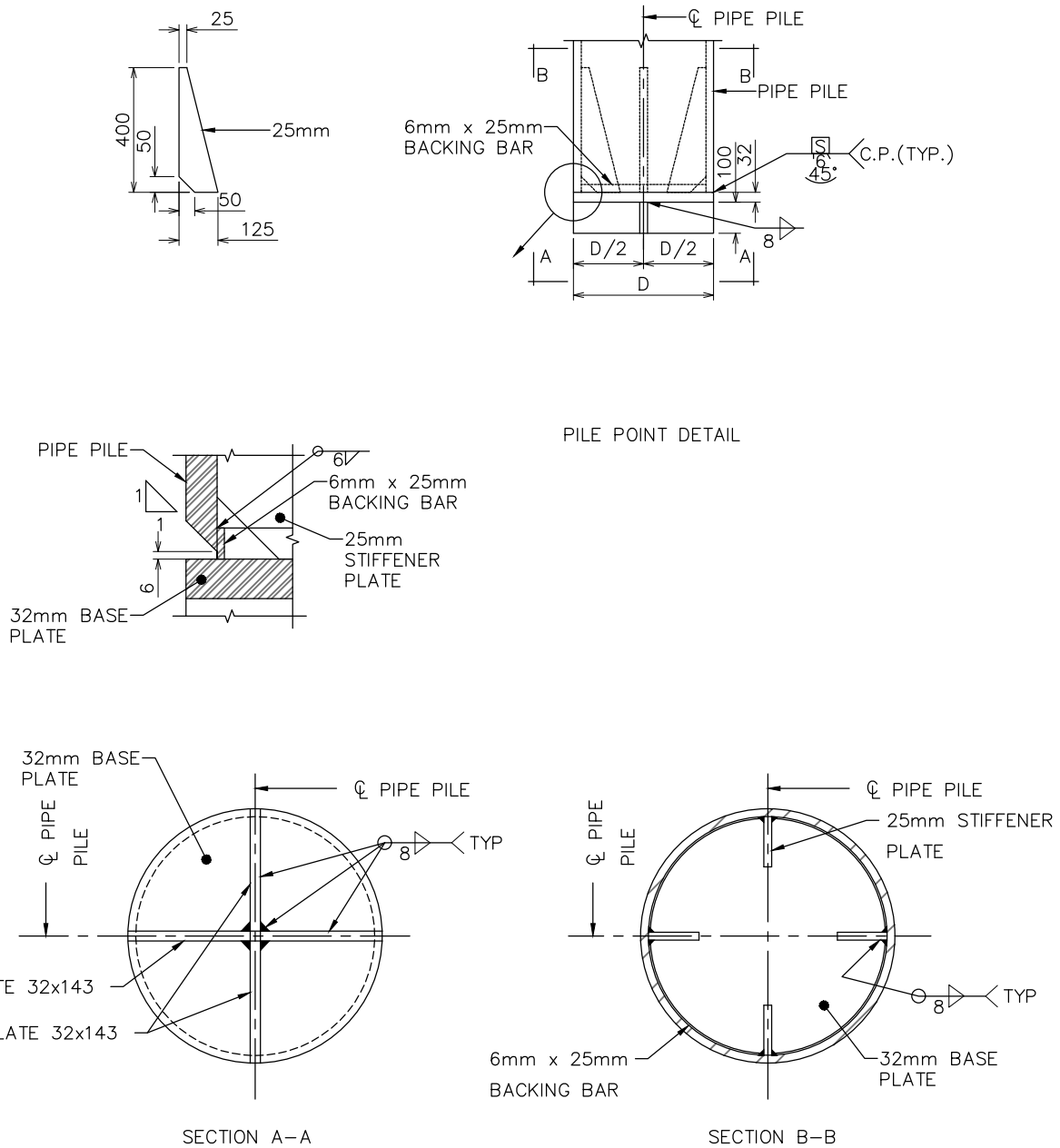


COPING HOLE DETAIL

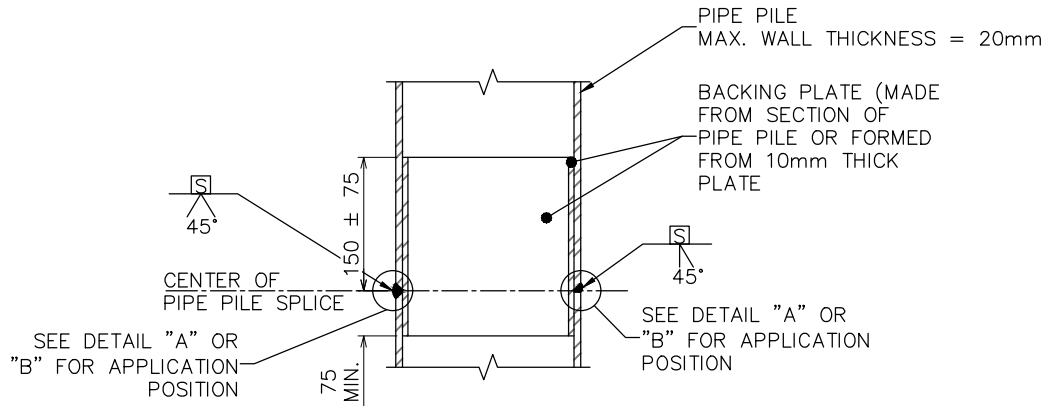
STEEL H PILES SEQUENCES FOR WELDS FOR HORIZONTAL POSITION



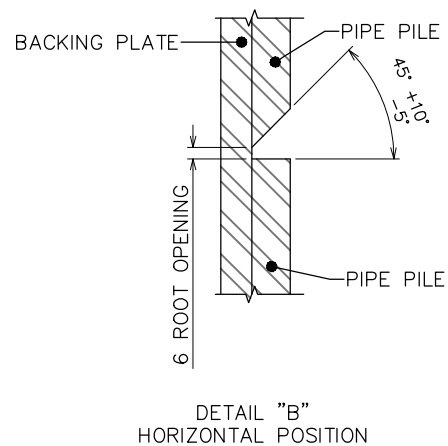
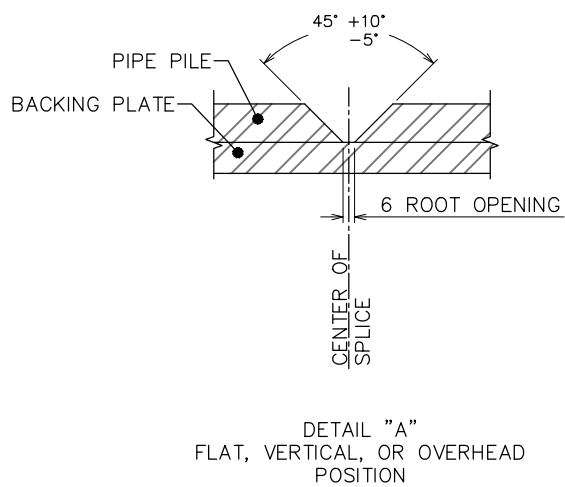
STEEL H PILES SEQUENCES FOR WELDS FOR FLAT POSITION



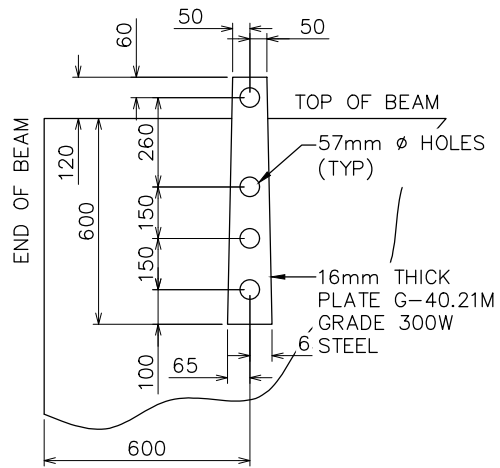
STEEL PIPE PILES PILE POINT DETAILS



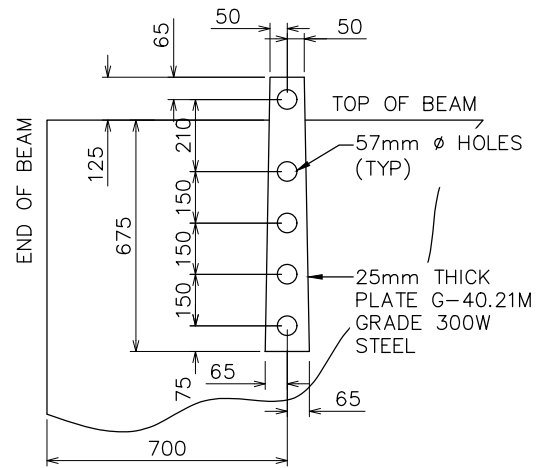
SECTION OF PILE



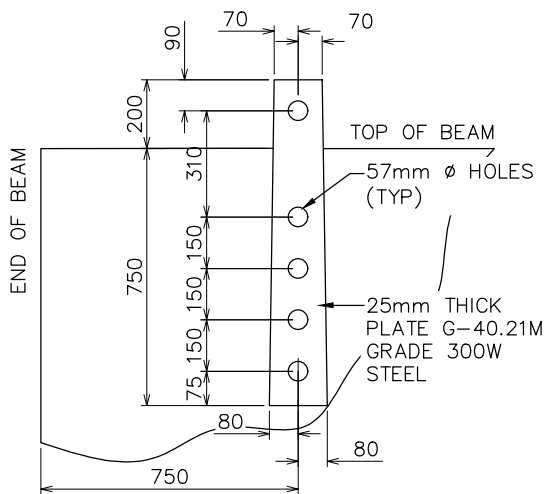
STEEL PIPE PILES SPLICE DETAILS



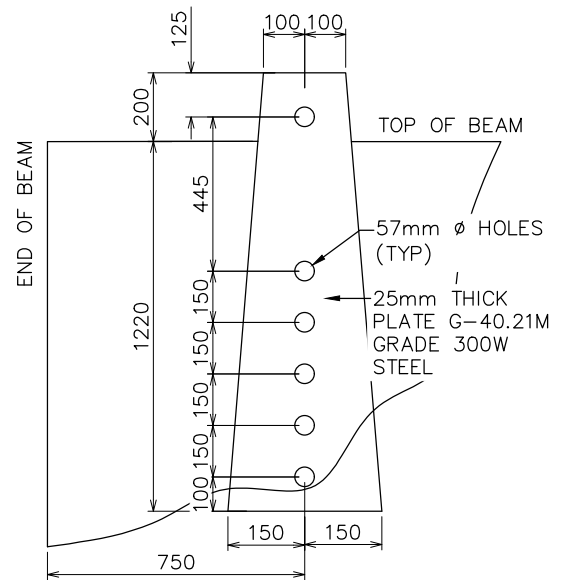
AASHTO TYPE II BEAM



AASHTO TYPE III BEAM



AASHTO TYPE IV BEAM
NBDOT TYPE I BEAM



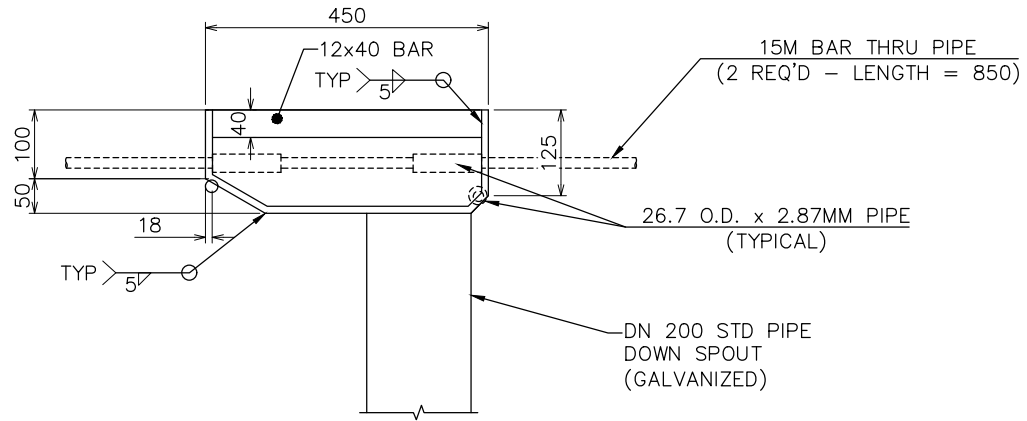
BULB-TEE BEAM

PRESTRESSED BEAM LIFTING DEVICE DETAILS VERTICAL ONLY

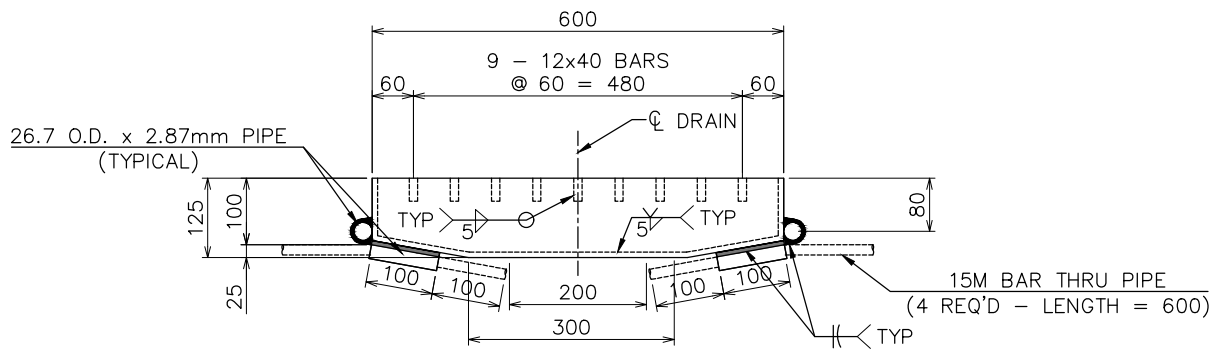
1399



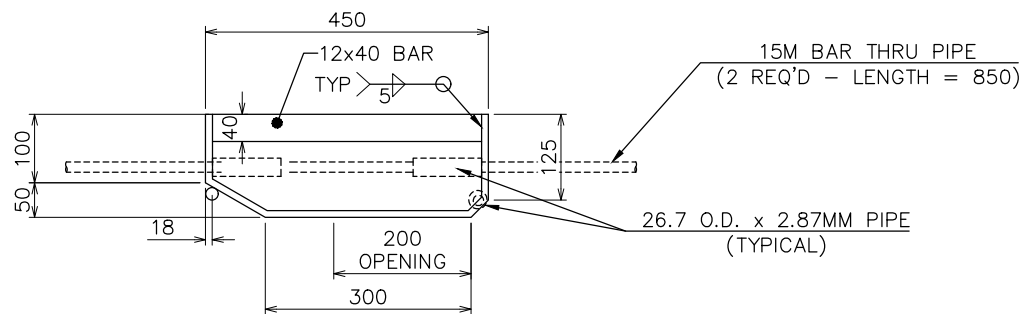
- ## ROADWAY DRAIN FOR STRUCTURES



DOWN SPOUT DETAIL



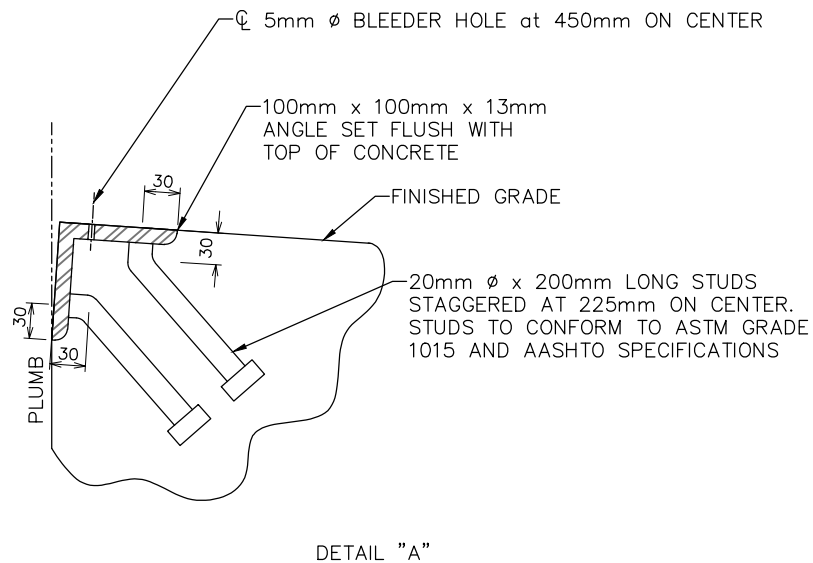
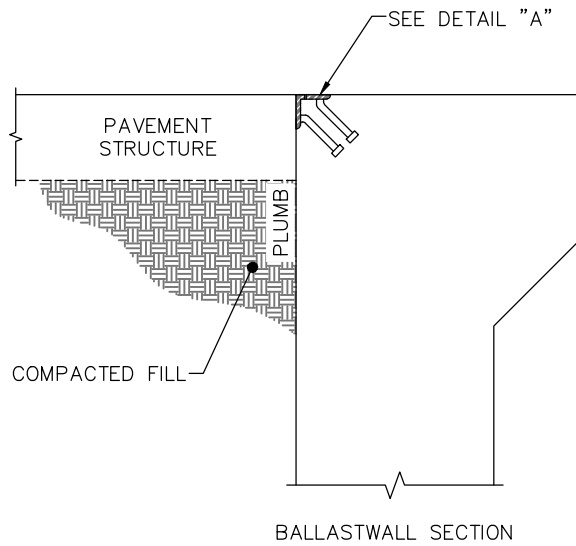
SECTION A-A



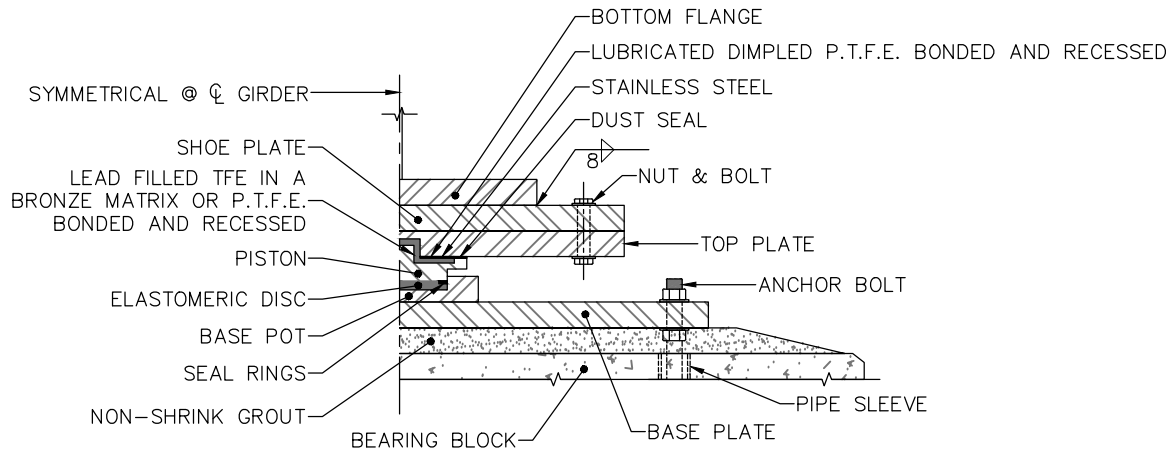
SECTION B-B

PLAN/VIEW x ON STANDARD DRAWING 1336

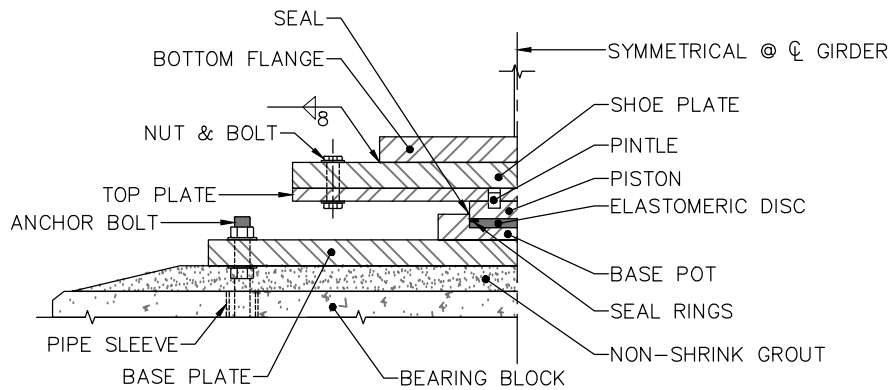
ROADWAY DRAIN DETAILS



BALLASTWALL PROTECTION DETAILS

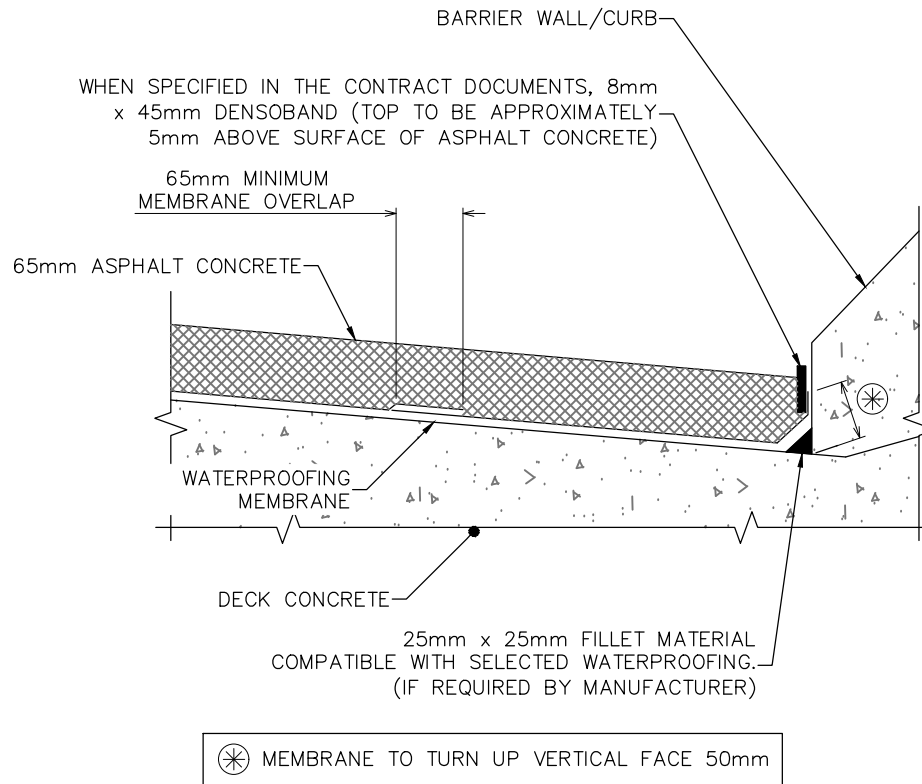


CONSTRAINED SLIDING BEARING



FIXED BEARING

BRIDGE POT BEARING NOMENCLATURE



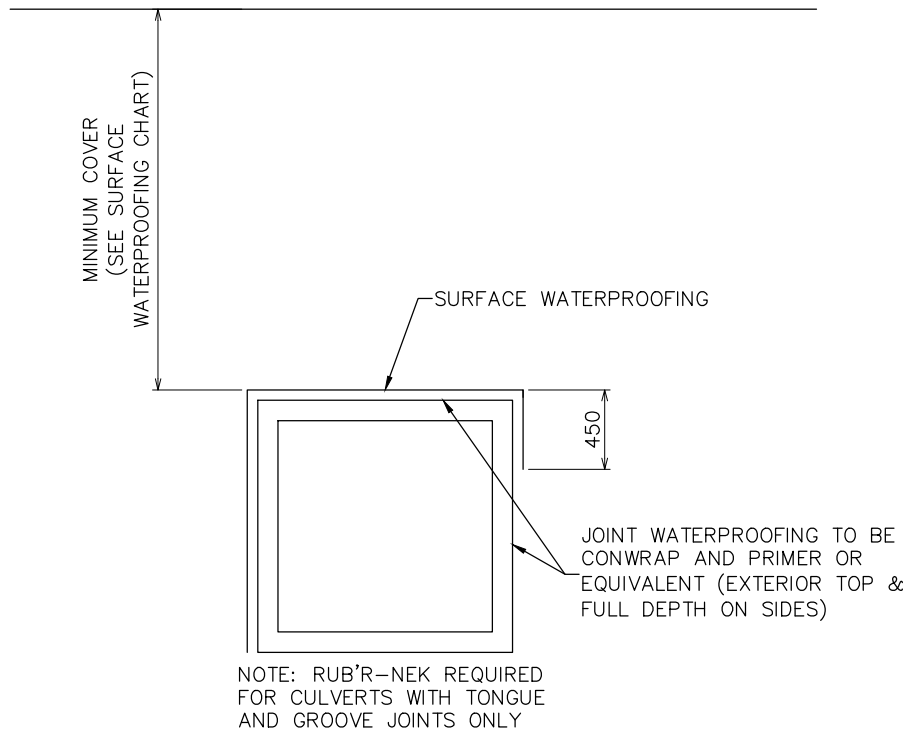
SECTION THROUGH DECK AT BARRIER WALL/CURB SHOWING WATERPROOFING
SYSTEM

NOTES:

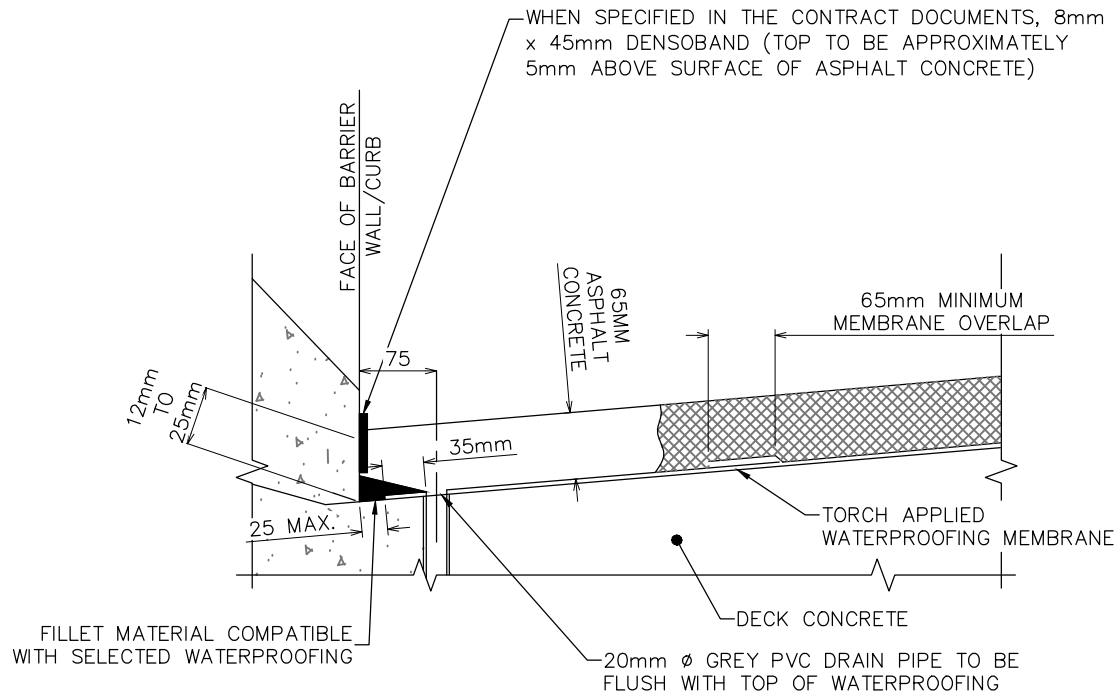
- OVERLAP MEMBRANCE IN PRINCIPLE DIRECTION OF WATER FLOW AND IN DIRECTION OF ASPHALT CONCRETE PLACEMENT.
- FOR NORMAL CROWN - INSTALL STARTER STRIP FIRST.
- FOR SUPERELEVATION - INSTALL STARTER STRIP ON HIGH SIDE LAST

DECK AT BARRIER WALL/CURB WATERPROOFING DETAILS

SURFACE WATERPROOFING CHART			
CASE	MINIMUM COVER	REQUIRED WATERPROOFING	TYPE
1	0m to 150mm	TOP AND FULL DEPTH ON SIDES	A
2	150m to 3.5m	TOP AND FULL DEPTH ON SIDES	B
3	OVER 3.5m	NO WATERPROOFING	—



WATERPROOFING REQUIREMENTS ON BOX CULVERTS OR RIGID FRAME

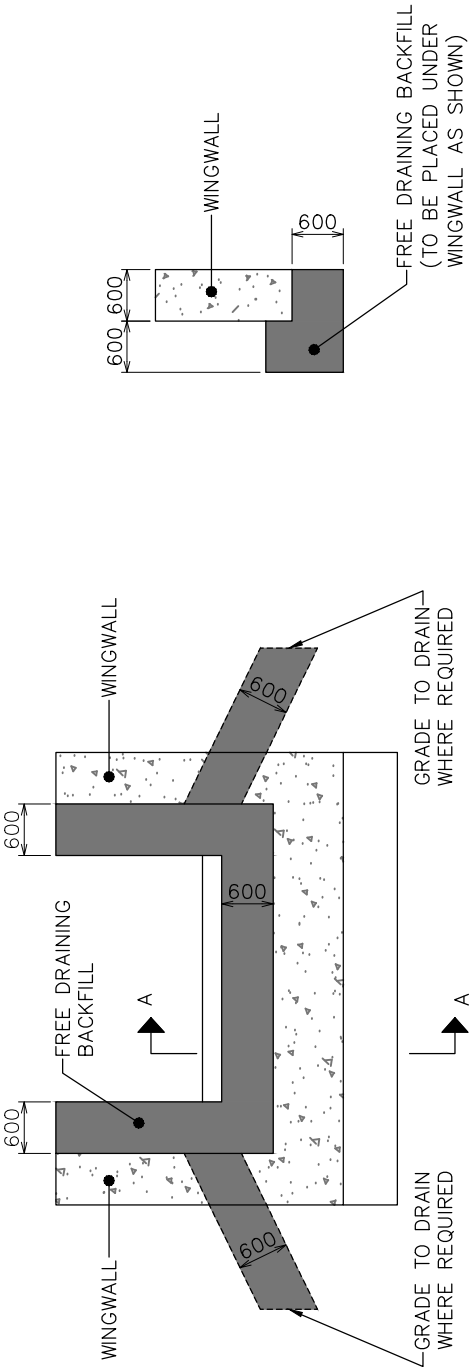


SECTION THROUGH DECK AT BARRIER WALL/CURB SHOWING TORCH APPLIED WATERPROOFING SYSTEM

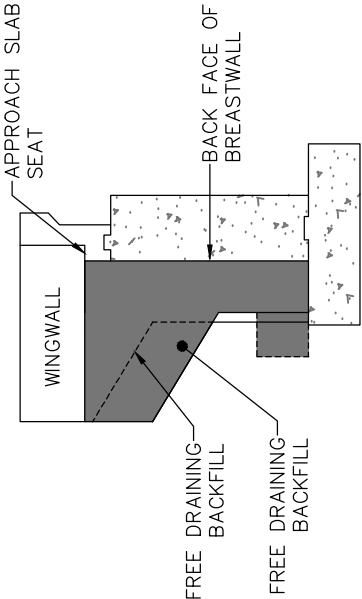
NOTE:

OVERLAP MEMBRANE IN PRINCIPLE DIRECTION OF WATER FLOW AND IN DIRECTION OF ASPHALT CONCRETE PLACEMENT.

DECK AT BARRIER WALL/CURB – TORCH APPLIED WATERPROOFING DETAIL

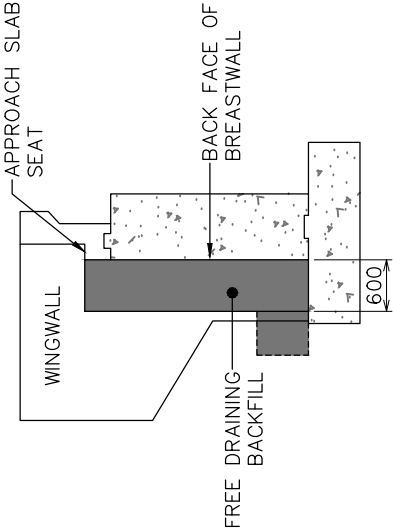


SECTION B-B



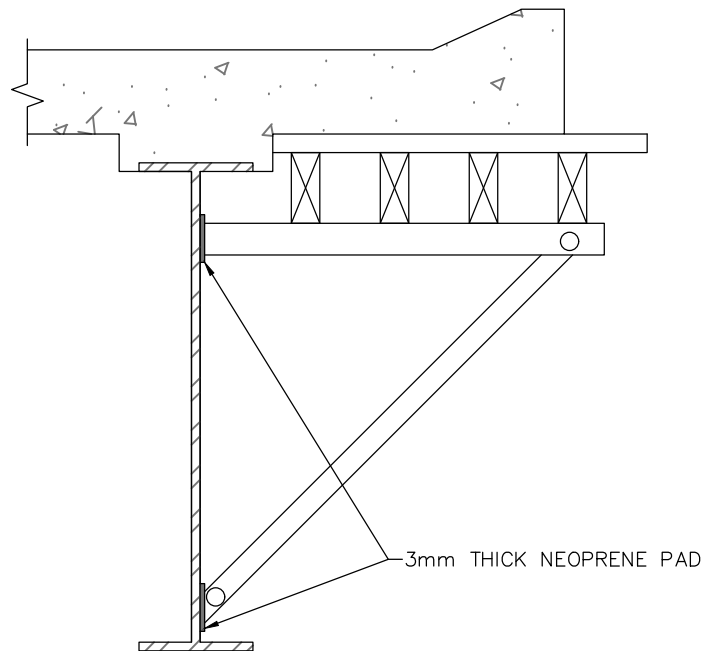
ELEVATION OF INSIDE FACE OF WINGWALL

PLAN OF ABUTMENT AT APPROACH SLAB SEAT



SECTION A-A

FREE DRAINING BACKFILL PLACEMENT DETAILS



NOTE:

AVOID VERTICAL STIFFENER PLATES

DECK OVERHANG BRACKET STEEL GIRDER

**GENERAL PROVISIONS AND CONTRACT SPECIFICATIONS
FOR HIGHWAY & BRIDGE CONSTRUCTION**

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE

SUPPLEMENTAL SPECIFICATIONS

1400

APPENDIX 1- SAMPLE TENDER DOCUMENT

APPENDIX 2- ENVIRONMENT WORKPLACE TRAFFIC CONTROL MANUAL

APPENDIX 3- TEMPORARY WORKPLACE TRAFFIC CONTROL MANUAL

APPENDIX 4- WEIGHT SCALE PROCEDURES

DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE
Province of Prince Edward Island
Revision 0, January 27th, 2025

TENDER FORM

THIS TENDER FORM made by....., herein called the Bidder, the Party of the First Part, signifies their intent to enter into a Contract with The Government of Prince Edward Island as represented by the Minister of Transportation and Infrastructure, the Party of the Second Part.

WITNESS, AS FOLLOWS:

1. Definitions

The definition of terms used in this Tender Form and appended Agreement shall conform in all respects to the definition of terms contained in the document entitled "General Provisions and Contract Specifications for Highway and Bridge Construction," published by the Department of Transportation and Infrastructure of the Province of Prince Edward Island as amended on the date of closing of Tenders pursuant to this Agreement.

2. General Covenant

The Bidder hereby covenants and agrees with the Minister as herein provided in connection with the following work, namely:

Route Xxx – *(Insert Community Name, Year)*
Section Xxxx, Station X+xxx – X+xxx

For a total distance of Xxx metres.

This project is located at.....*(insert project location details)*

The work Includes:.....*(insert project details here)*

TENDER CLOSES:
2:00 p.m., Thursday, August 8, 2024
Tender Closing Location: Tenders shall be received at the Queens County Highway
Depot, 355 Brackley Point Road, Charlottetown PE.

3. No Implied Contract

It is hereby understood and agreed between the parties hereto that no implied contract of any kind whatsoever, by, or on behalf, of the Minister shall arise or be implied from anything contained in this Contract, or from any position or situation of the parties at any time, and that this Contract made by the Minister is, and shall be, the only Contract upon which any rights against the Minister are to be founded.

4. How Party of the First Part is Read

Whenever this agreement is entered into by more than one party or parties of the first part, the word "Bidder" shall be read "Bidders," and pronouns in the contract referring to the Bidders shall be read as plural and whenever a corporation is the Party of the First Part, the said pronouns shall be read accordingly.

5. Consideration of Clauses as Covenants

Wherever it is stipulated that anything shall be done or performed by either of the Parties hereto, it shall have the same effect and be constructed as if such Party had entered into a covenant with the other Party to do or perform the same, and as if such covenant had been expressly made on the part of the Contractor, not only on the Contractor's own behalf, but also on the behalf of the Contractor's legal representative, successors or assigns; and as if any such covenant on the part of the Minister has been made on behalf of the Minister, and the Minister's successors in office.

6. Bidders Submission Respecting the Agreement

The Bidder shall, as part of their Tender Submission respecting this agreement, complete the attached Schedule B: Identification of Principals; and Schedule C: Schedule of Tendered Unit Prices to be used on the work.

The agreement including all appended schedules shall be completed in complete conformity with the instructions to bidders contained in the document entitled "General Provisions and Contract Specification for Highway and Bridge Construction."

In presenting their Tender Submission for consideration by the Minister, the Bidder understands that until, and unless, the agreement is endorsed by the Minister, no agreement between the parties shall exist and the Minister shall not be bound to endorse any agreement.

7. Performance by Contractor

The Bidder agrees that, if successful, they shall, at their own expense, except as herein otherwise specifically provided, furnish and provide all and every kind of labour and superintendence, services, tools, implements, machinery, plant materials, articles and whatsoever is necessary for the due execution of the work. The Successful Bidder shall fully construct and erect the work in the most thorough, professional and substantial manner, in every respect to the satisfaction and approval of the Engineer. The Successful Bidder shall complete the work within the time specified herein and deliver it to the Minister in the manner and upon the terms and conditions of the Contract Documents.

8. Bid Security

The Bidder hereby and herewith deposits with and delivers to the Minister, as security of the due fulfilment of the Contract, one of the following, which shall remain in effect for a minimum of 30 days after tender closing:

- OR
- a) a certified cheque for the amount stipulated in Schedule A - Schedule of Special Provisions.
- OR
- b) a bank draft in the amount stipulated in Schedule A - Schedule of Special Provisions.
- OR
- c) a bid format irrevocable standby letter of credit on a government approved form in the amount stipulated in Schedule A - Schedule of Special Provisions.
- d) a bid bond in the amount stipulated in Schedule A - Schedule of Special Provisions. The bond shall be from a surety company authorized to carry on business in Canada guaranteeing to supply a performance bond equal to 50% of the Contract value, excluding HST and a labour and material bond equal to 25% of the Contract value, excluding HST.

Performance security must be filed by the Successful Bidder with the Department before work on the project commences. This security shall be held and retained by the Minister for the due and faithful performance, observance and fulfilment by the Contractor of all the covenants, provisos, agreements, conditions and reservations in this Contract contained on the part of the Contractors to be observed, performed and complied with shall be in the form of:

- OR
- e) a certified cheque in the amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year after contract expiry date) has elapsed.
- OR
- f) a bank draft in the amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year after contract expiry date) has elapsed.
- OR
- g) a performance format irrevocable standby letter of credit on a government approved form in the amount of ten percent (10%) of the Contract value, excluding HST, which shall be retained until the warranty period (one (1) year after contract expiry date) has elapsed.
- h) a performance bond equal to 50% of the Contract value, excluding HST and a labour and materials bond equal to 25% of the Contract value, excluding HST which shall be retained until the warranty period (one (1) year after contract expiry date) has elapsed.

All performance security which has an expiry date which precedes the end of warranty date must be renewed prior to the time that the security would expire. The bidder will forfeit security to the Minister if the bidder fails to enter into or carry out the Contract when called upon to do so.

It is understood and agreed that the Contractor assumes risk and must bear any loss in respect to the performance security as aforesaid, occasioned by the failure or insolvency of the banks on which any cheque was drawn or in which any deposit was made in connection with the security aforesaid.

If at any time hereafter the said Contractor should make default under the said Contract, or if the Minister acting under the powers reserved in the said Contract shall determine that the said works, or any portion thereof remaining to be done, should be taken out of the hands of the Contractor and be completed in any manner or way whatsoever than by the Contractor, or if the Contractor refuses or neglects to pay for work done or materials supplied by any person in connection with the said work, the Minister may, in either case dispose of said security for the carrying out of the construction and completion of the work of the Contract or for paying any salaries or wages for work done, or any accounts for materials supplied for the said works that may be left unpaid by the said Contractor.

In the event of any breach, default or non-performance being made or suffered by the Contractor in or in respect of any of the terms and conditions, covenants, provisions, agreements, or restrictions herein contained, which on the part of the said Contractor should be observed, performed or complied with, the said security so delivered to or deposited with the Minister or by the Minister received in respect thereof, shall by the Contractor, be forfeited absolutely to the Minister.

Upon the due and faithful performance, observance and fulfilment by the Contractor of all the terms, provisions, covenants, agreements, conditions, reservations, hereinbefore contained, on the part of the Contractor to be observed, performed and complied with, the Minister shall surrender the performance security.

9. Minister Covenants to Pay

In consideration of the faithful performance by the Contractor of all and singular covenants, agreements and provisions of the Contract, the Minister hereby covenants and agrees with the Contractor that, on the full completion by the Contractor of all the work as specified in the Contract, within the time specified and limited for the final completion thereof, and to the entire satisfaction of the Engineer to be evidenced by the certificate of the Engineer in writing, the said Minister will well and truly pay, or cause to be paid, to the said Contractor the amount of the Contract price, representing the actual quantities in the several items in the Schedule of Prices, identified as Schedule C to this agreement, at the unit prices or lump sum prices quoted by the Contractor. This amount paid to the Contractor as above, shall include all and every kind of work, labour, superintendence, services, tools, implements, machinery, plant materials, articles and things whatsoever necessary for the full execution and completion of the work to the entire satisfaction of the Engineer.

10. Final Payment

It is hereby agreed by the parties hereto that the payment of the final amount due under the Contract, and the adjustment and payment of any bills that may be rendered for work done, in accordance with any alteration in or addition to the same, shall release the Minister from any and all claims or liability on account of work performed under the said Contract or any alteration in or

addition to the same.

11. No Waiver

It is hereby agreed that no condoning, excusing, or overlooking by the Minister, or any person acting on the Minister's behalf on previous occasions of breaches or defaults similar to that for which any action is taken or power is exercised, or forfeiture is claimed or enforced against the Contractor, shall be taken as a waiver of any provisions of the Contract, or as defeating, affecting or prejudicing in any way the right of the Minister under the Contract.

12. Components of the Contract

Any and all plans or drawings prepared by the Department, the document titled General Provisions and Contract Specifications for Highway and Bridge Construction, the advertisement, the Tender Form , Construction Services Agreement with Schedule A: Schedule of Special Provisions; Schedule B: Identification of Principals; Schedule C: Schedule of Tendered Unit Prices; Schedule D: Schedule of Equipment; and Schedule E: Appended Items; as well as any addenda which may be issued by the Department pursuant to this Contract shall hereby be a part of this Agreement as fully and to the same effect as if the same had been set forth at length in the body of the agreement.

13. Completion of Work

The Contractor agrees to complete the work on or before **March 31st, 2027**.

14. Confidentiality and Freedom of Information (Effective November 1, 2002)

1. By submitting your bid, you agree to the disclosure of the information supplied, subject to the provisions of the Freedom of Information and Protection of Privacy Act (FOIPP).
2. Anything submitted in your bid that you consider to be "confidential information" because of its proprietary nature should be marked as "confidential" and will be subject to appropriate consideration under the Freedom of Information and Protection of Privacy Act.
3. During the delivery and installation of goods and/or services, you may have access to confidential or personal information. Should this occur, you must ensure that such information is not released to any third party or unauthorized individual.
4. Any information provided on this contract may be subject to release under the Freedom of Information and Protection of Privacy Act. You will be consulted prior to the release of any information.

Xxxx...*(Insert Project Name, Year)*

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Rev. 0

January 27th, 2025

IN WITNESS WHEREOF the parties hereto have hereby caused these presents to be signed and witnessed on the dates stated.

SIGNED AND DELIVERED

by the bidder on the [] day
of [], 2025.

.....

BIDDER

In the presence of:

.....

Xxxx...*(Insert Project Name, Year)*

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January 27th, 2025

SCHEDULE A

SCHEDULE OF SPECIAL PROVISIONS

SCHEDULE B
IDENTIFICATION OF PRINCIPALS

Name of Bidder:

Mailing Address:

Telephone:

Email:

Principal's Name:

Title:

Mailing Address:

If Bidder is a corporation in which province of Canada is the corporation registered:

Xxxx...*(Insert Project Name, Year)*
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January 27th, 2025

SCHEDULE C
SCHEDULE OF PRICES

Xxxx...*(Insert Project Name, Year)*

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January 27th, 2025

SCHEDULE D

SCHEDULE OF EQUIPMENT TO BE USED

Xxxx...*(Insert Project Name, Year)*

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SCHEDULE E
SCHEDULE OF SUB-CONTRACTORS

APPENDIX 2

ENVIRONMENTAL REQUIREMENTS

Department of Transportation and Infrastructure
Province of Prince Edward Island

- Environmental Management Section -

ENVIRONMENTAL REQUIREMENTS

TABLE OF CONTENTS

1. Description
2. Conditions of Approval
3. Compliance and Delays
4. Prevention of the Transportation / Introduction of Invasive Species
5. Pollution Control
6. Water and Runoff Control
7. Release of Fuel and Other Hazardous Substances
8. Accidental Events and Environmental Emergencies

ENVIRONMENTAL REQUIREMENTS

1. DESCRIPTION

1. The Contractor shall carry out the work on the Contract according to the Plans and Specifications and in such a manner so as to be in compliance with various Acts and Regulations of the Province of Prince Edward Island and/or the Government of Canada which concerns the protection of the environment, and any approvals or permits issued to the Owner or the Contractor in accordance therewith.
2. The installation of environmental controls shall be coordinated with the County Environmental Officer and the Engineer. Environmental protection measures shall be installed whenever possible prior to the commencement of the work.

If not possible to provide the environmental protection prior to the commencement of the work, the Contractor shall, as a minimum, have all materials required for the environmental protection available on site prior to the commencement of any work and shall install the environmental measures as soon as practical in the work progression.

3. If, during the work, any suspected artifacts of historical or archaeological value are uncovered or any endangered plant or animal species or any contaminated soil(s) is identified, the Contractor shall cease work until the site has been reviewed by representatives of the appropriate agencies and the Engineer has approved resumption of the work.
4. The Contractor shall follow sound environmental construction practices. Guidance in this practice to the application of his work shall be derived from, but not limited exclusively to, the following documents:
 - < Division 800 of the Specifications Manual - Environment
 - < Environmental Requirements, Appendix 2.
 - < P.E.I. TIE's Environmental Protection Plan

2. CONDITIONS OF APPROVAL

1. The Contractor shall complete the work in accordance with the following conditions:
 - < All sediment and erosion control measures shall be carried out as detailed on the Plans and as included in the Specifications.
 - < Measures determined by the appropriate regulatory authorities (i.e. Provincial Environment Department, Fisheries and Oceans Canada, etc) as necessary for the protection of watercourses/wetlands affected directly or indirectly by the Work.
 - < Conditions outlined in the associated Approval-to-Proceed issued by TIE's Environmental Management Section.
2. Any debris and excavated material within the work area shall be removed from the watercourse and adjacent areas for disposal or placement in a manner such that it cannot be returned to the watercourse.
 - < Removal of debris, whether natural or left behind by others, will be measured for payment in accordance with provision 103.03, Extra Work.
 - < Removal and disposal of excavated material will be measured for payment under the appropriate excavation item(s).

3. All necessary precautions shall be taken by the Contractor to prevent discharge or loss of any harmful material into a watercourse including, but not limited to, creosote, fuels, hydrocarbons, biocides, fertilizers, cement, lime, paint or fresh concrete.
4. No work, including but not limited to grubbing, excavation, embankment construction or installation of drainage structures shall take place within 30m of a watercourse or wetland without an EMS Approval to Proceed.
 - < The installation and maintenance of these structures shall be in accordance with Section 800.
5. In dewatering an excavation, whether a roadway cut, foundation excavation, a pit or a quarry, the Contractor shall ensure that any turbid water pumped out or released is released into either: a) a grassed riparian area a minimum of 15m outside any watercourse or wetland area, or, b) a collection area created for the purpose of filtering sediment-laden water. The area where the pumped water will be released must be approved by the County Environmental Officer and may require additional sediment/erosion controls.
 - < It shall be the Contractor's responsibility to install and maintain, at his cost, to the satisfaction of the Provincial Environment Department, any erosion control measures for pits and quarries that may be required, and to obtain permission to pump or release any turbid water onto properties abutting and beyond.
 - < The Contractor shall be responsible at his cost for any and all damage resulting from the dewatering.
6. Slopes for soil fill materials over natural watercourses shall be stabilized immediately upon completion of culvert installation or, as a minimum, at the end of each days' embankment construction as follows:
 - < Random R5 riprap or larger shall be placed to a 300 mm depth over geotechnical fabric from toe of slope to a minimum of 1 m above the top of the culvert (pipe or box). This riprap apron shall extend to a minimum of 3 m on either side of the culvert, and shall be wider at the Engineer's discretion.
 - < To a minimum distance of 10 m on either side of the culvert (pipe or box), the remaining disturbed fill slope areas (not riprapped) shall be mulched from toe of slope to top of slope. This includes the slope area above the riprap to the top of the slope. At the discretion of the Engineer, slopes with larger erosion potential shall have the mulch covered by jute mat or replaced by straw blanket.
 - < All mulch and erosion control mats shall be removed from slopes prior to final grading and seeding. After slopes have been graded to the satisfaction of the Engineer, and the disturbed areas have been hydro seeded, then all areas shall be re-mulched and any erosion control mats shall be re-installed.
7. The Contractor shall not place an earth or rock causeway in the watercourse for the purposes of creating a temporary access structure without specific approval of the Engineer and the appropriate regulatory authority(ies), in writing.
8. All in-stream work shall be carried out between June 1 and September 30, or as otherwise directed in the permit(s). The Contractor shall notify the Engineer, in writing, at least seven days in advance of the anticipated date of commencement of in-stream work.
 - < Watercourse culvert installation guidelines must be followed
 - < In-stream work shall be kept to a minimum by either: installing the pipe in-the-dry and diverting the flow into it upon completion; by constructing a temporary plastic-lined diversion channel in-the-dry; and/or by pumping the stream flow around the work area.

- < If it is necessary to isolate the stream from the work area, the Contractor shall construct cofferdams consisting of sandbags wrapped in 6mm plastic.
 - < The Engineer, upon receiving notice from the Contractor as to when construction shall actually commence, will arrange an on-site meeting with representatives from each of the Department's Environment Section, Provincial Environment Department, Fisheries and Oceans Canada, and the Contractor, prior to commencement of the in-stream work.
 - < No in-stream work shall commence until the Engineer verifies with the regulatory agencies having jurisdiction, that the work site is approved for the commencement of in-stream work.
9. Erosion control measures shall be as detailed in the Contract Documents and, if additional measures are required in addition to those indicated, the Engineer shall order and approve such work under the appropriate items.
 10. Any natural materials produced and/or supplied by excavation either from pits and/or quarries shall not contain any friable, soluble or reactive minerals or other deleterious materials or conditions that would make the material prone to decomposition or disintegration, or present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the work.
 11. Additional conditions of approval, as specified in environmental permit(s) issued to the Owner for the work, and/or as detailed in the Contract Documents, shall be carried out by the Contractor.

3. COMPLIANCE AND DELAYS

1. For each maintenance or construction project, a project assessment/registration application must be submitted by the proponent (typically the project manager or supervisor representing PEITIE) to the Environmental Management Section for review and approval. Once the project application is received, the Environmental Management Section will coordinate all aspects of its review and assessment, issuance of associated permits and approvals from the Section or other regulatory agencies.
2. The proponent is responsible to ensure that all project-related permits and approvals are posted in a visible location at the project work area at all times.
3. Failure by the Contractor to carry out the work in accordance with the requirements of this Section will result in the Contractor being liable for any fines, levies, or penalties made under environment-related Acts or Regulations of the Province of Prince Edward Island and the Government of Canada.
4. The Engineer will be responsible for the day-to-day field monitoring and for ensuring that the specifications are implemented by the Contractor. TIE's Environmental Management Section shall assist to ensure that all environmental protection measures which are part of the Contract are adhered to by the Contractor.
5. The Department will have Environment Officers who will act as a liaison between the Department and other Provincial and Federal regulatory bodies responsible for environmental protection. The Environment Officer will also liaise with the Engineer and assist in ensuring that environmental compliance is being enforced.

6. The Department's Environment Officers shall make recommendations to remedy insufficient environmental protection measures on projects. The Environmental Management Section (Manager or Environmental Coordinator) may coordinate, with the Engineer, to have the project work suspended until the Contractor remedies the environmental protection measures as per the specifications in the Department's General Provisions and Contract Specifications for Highway Construction, the TIE Environmental Protection Plan and all regulatory permits and approvals.
7. In circumstances where the insufficient environmental protection poses no immediate threat to the environment, the Contractor shall implement the necessary remedies to the satisfaction of the Department within a specified timeframe.
8. In circumstances where insufficient environmental protection, ongoing work activities, or site conditions do pose an immediate threat to the environment, either the project work can be suspended immediately, or immediate action by the Contractor to remedy the situation can be ordered, whichever is appropriate, as per Section 3.6.
9. Any delays to the Contractor's work operation resulting from suspension of work for failure to follow the requirements of this Section will not be considered as a basis of claim for extra costs, nor for any extension of the contract completion date.

4. PREVENTION OF THE TRANSPORTATION / INTRODUCTION OF INVASIVE SPECIES

1. Environmental Concerns

Waters of Atlantic Canada are experiencing the effects of invasive aquatic plant and animal species from around the world. Once these non-native or invasive species have established themselves in a new ecosystem (absent of their natural predators) they can harm native species, possibly causing entire ecosystems to be disrupted due to habitat destruction or food chain alteration (i.e. preying on native species, transmitting disease, etc.).

The principal invasive species in the Gulf of St. Lawrence and the Canadian Atlantic coast are Tunicates (*Styela clava*), Green Crab (*Carcinus maenas*) and Green Alga's (i.e. Oyster Thief (*Codium fragile tomentosoides*)). Up to date information on the present distribution of these species in the Northumberland Strait can be obtained by calling the Habitat Management Branch of Fisheries and Oceans Canada at (902) 863-5670. Information on the Gulf of St. Lawrence can also be found at www.glf.dfo-mpo.gc.ca and for the Canadian Atlantic coasts at www.northeastANS.org.

2. Pathways

Non-native and invasive species may be unintentionally introduced into a marine environment via various marine construction and improvement projects. These species have the potential to alter the native ecosystems and have negative impacts on the commercial fishing and aquaculture industries. Potential pathways for spreading these species include, but are not limited to, the following:

- < Species or their water borne larva travelling in bilge and ballast water of various marine construction equipment (i.e., barges, scows, etc.).
- < Marine sediments remaining in excavation equipment, barges or trucks.
- < Species being attached to or carried in the bottom/hull of various boats or barges.

3. Environmental Protection Procedures

The following protection procedures are intended to reduce the potential risk of transporting and introducing invasive marine/terrestrial species:

- < All dredging equipment including excavators/cranes, floating plant, scows, barges and work boats are to be free of all marine growth prior to mobilization to the site.
- < The Contractor will make all equipment available for inspection by regulatory authorities (i.e. Provincial Environment Department, Federal Department of Environment and the Habitat Management Branch of Fisheries and Oceans Canada, or other agencies) if requested. Any growth identified is to be completely removed from the equipment in an environmentally acceptable manner and using methods approved by the regulatory authority.
- < The Contractor is to coordinate removal and cleaning operations to ensure they abide by all requirements of the Provincial Environment Department, Federal Department of Environment, the Habitat Management Branch of Fisheries and Oceans Canada and any other applicable agencies.
- < The Contractor shall ensure that all costs associated with the requirements of this section are included in the bid price.

4. The Contractor is required to:

- < Be familiar with Invasive Species Management Plans, Codes of Practice, or other documents that relate to the control and spread of aquatic invasive species, and acquire any special regulatory permits or approvals associated with the use of their equipment in or near a marine environment, other than the typical permits and approvals acquired by the Department or proponent to conduct the work.
- < Produce independent documentation (eg. Divers inspection reports and video of inspection, etc. of boats, barges or scows) as to when and how they had conducted the above mentioned mitigation measures, at the request of the Department or a regulatory agency, at any time.

5. POLLUTION CONTROL

1. The Contractor shall not dump, spill or dispose of any overburden, trees, brush, petroleum products, or other debris into any watercourse, or other natural water basin, or into any area which may ultimately cause pollution to water drainage or storage systems and/or ground water.
2. It shall be the Contractor's responsibility to familiarize himself with the applicable legislation and regulations and to obtain all necessary permits and approvals for his operations.

6. WATER AND RUNOFF CONTROL

1. The Contractor shall perform his work in a manner so as to not obstruct the flow of surface drainage or natural watercourses.
2. The Contractor shall direct or discharge water resulting from the work in a manner not detrimental to public and private property, or any portion of the work completed or under construction.

7. RELEASE OF FUEL AND OTHER HAZARDOUS SUBSTANCES

1. The Contractor, including any subcontractors and/or any agent(s) of the Contractor involved in any aspect of the Contract, shall be responsible for all containment and cleanup of any release of fuel and/or other hazardous materials, regardless of the cause of the release. All fuel, lubricants, or other toxic chemicals shall be stored a minimum of 30m from a watercourse or wetland. A two-man system for proper refueling of equipment when within 30metres of a watercourse or wetland area must be in place.
2. This Section shall include the work site, all lands being used by the Contractor and under the control of the Owner, and/or any Crown Land being utilized for the work under the Contract.

8. ACCIDENTAL EVENTS AND ENVIRONMENTAL EMERGENCIES

1. Response Procedures for Accidental Events - Contingency plans and response procedures to be followed for unplanned environmental events are provided in the TIE Environmental Protection Plan, Section 9.0 Contingency Plans for Unplanned Events.
2. Key Contact List - Key organizations and/or individuals that may be contacted (a) during environmental emergency situations, or (b) to assist with routine environmental issues are provided in the TIE Environmental Protection Plan, Section 10.0 Key Contact List. In general, the person managing the work, should:
 - < For an environmental emergency, directly contact Emergency Response Personnel using the names and numbers provided.
 - < For routine, or non-emergency issues, contact Provincial Personnel using the names and numbers provided.

9. WATERCOURSE CULVERT INSTALLATION GUIDELINES

(full guidelines available at http://www.gov.pe.ca/photos/original/eef_wet_alter_3.pdf)

1. A pre-construction stream survey must be completed prior to watercourse culvert replacements or new installations. This survey must include the following information:
 - , (a) first upstream (of existing structure or planned structure location) riffle elevation
 - , (b) first downstream (of existing structure or planned structure location) riffle elevation
 - , (c) inlet bottom (top of rib/lip/edge) of culvert elevation
 - , (d) outlet bottom (top of rib/lip/edge) of culvert elevation
 - , (e) stream length - A to B
 - , (f) culvert length - C to D
 - , (g) calculation of stream slope
 - , (h) calculation of culvert slope

Ensure that a representative of the Environmental Management Section is on site during the pre-construction survey.

2. Watercourse culvert installations may only take place during the period of June 1 to September 30 of any given year and only if an EMS Approval to Proceed has been issued.
3. Watercourse culvert maximum length (under low-risk guidelines, and EMS Approval to Proceed) is 20 metres, unless otherwise approved in consultation with PEI Department of Communities, Land and Environment and the Department of Fisheries and Oceans.
4. Culvert must be embedded a minimum of 20% of its' diameter (.2D).
5. Surveyor must be onsite during culvert replacement or installation.

6. Stream must be isolated during replacement or installation through use of a coffer dam (not longer than 8 hrs) and/or cofferdam combined with pumping water through, around, or over the work area.
7. Culvert must be installed at a slope not greater than .5%.
8. Culvert diameter must not exceed 48"/4 ft under the low-risk guideline and EMS Approval to Proceed, unless otherwise approved in consultation with PEI Department of Communities, Land and Environment and the Department of Fisheries and Oceans.
9. A post construction culvert survey must be completed upon completion of the replacement/installation.

APPENDIX 3

Temporary Workplace Traffic Control Manual 2016

Department of Transportation and Infrastructure

Appendix 3 can be found online: http://www.gov.pe.ca/photos/original/trafficcont_cr.pdf

APPENDIX 4

WEIGH SCALE PROCEDURES

Department of Transportation and Infrastructure
Province of Prince Edward Island

WEIGH SCALE PROCEDURES

General

Where the contract includes tender items that require measurement for payment by weighing, the Contractor, as part of the work to be carried out under these terms, shall provide, install and maintain as necessary, weigh scales meeting the requirements of the Government of Canada Weights and Measures Act and Regulations, for the purposes for which the scales are to be used. Measurement Canada of Industry Canada (MCIC) will be available to resolve any disputes between the Department and the contractor when measurement problems are an issue. Department personnel are required to inform MCIC of any suspected noncompliance or measurement problems. In addition, the weigh scales shall meet the requirements of this Appendix.

Location

Scales shall be located at the point or origin of the material being measured unless otherwise directed by the Engineer. The scale locations to be used for the contract must be approved by the Highway Safety Personnel prior to any material being moved. When, for the above locations, in the opinion of the Engineer there is a waste or loss of material between the point of origin and the materials' intended destination on the contract, the hauling operation may be terminated by the Engineer until the contractor has, at the Contractor's own expense, provided on a site approved by the Engineer, an additional scale which is close enough to the intended destination to preclude the possibility of waste or loss.

Platform Scales

Scales must be provided which are long enough to fully support all axles of the vehicle being weighed, meeting the requirements of the Government of Canada Weights and Measures Act & Regulations.

All new scale decks purchased after January 01, 1994 should be built of steel construction.

Scale foundations shall be adequate to support without settlement the largest gross load to be carried. Scale pits shall be properly drained. Substantial retaining walls, (not necessarily concrete), shall be built at each end of the scale platform to support the entrance and exit ramps. These retaining walls shall be of sufficient strength and so placed as to support the ramp material without binding on the ends of the platform.

The approach ramp shall be constructed on a straight and level grade at the same elevation as the scale platform, for a distance at least equal to the length of the longest truck wheel base to be used on the work. Materials utilized should be of sufficient compaction to withstand vehicle weights. Ramps shall be compacted so that no settlement occurs when loaded vehicles drive over them. The ramps shall be maintained to provide a safe passage for vehicles. Vehicles shall enter and leave the platform at a speed not exceeding 10 kilometres per hour.

The scale platform and mechanism shall at all times be maintained clean and free from encumbrances such as gravel, asphalt, snow and ice. Each scale platform shall have rubber strips at each end to prevent jamming and dust/dirt buildup under the scale. All wooden decking material must be attached to the scale platform. Scale platforms shall have a barrier or curb 200 mm square along both sides to prevent vehicles from driving off the edge of the platform. The weight indicator mechanism shall be suitably enclosed in a scale house meeting the requirements of this Appendix.

Scale Houses

Scale houses shall be properly ventilated and shall be clean, dry and weather tight, with a minimum floor space of 4.5 sq. m and minimum head room of 2.1 m. They shall be equipped with windows which can be opened and closed from within and from which the weigher, while seated at the scale or console, has an unobstructed view of, the vehicle to be weighed, the scale platform and the approach ramp.

Scale houses shall also have the following:

1. A free sliding window or other suitable means for passing out weight tickets;
2. Screens for doors and windows;
3. A door located remotely from the scale platform (not facing scale platform) suitable for the occupants unobstructed exit in case of fire);
4. Suitable locking devices for doors and windows;
5. Door key for the weigher;
6. Table and two chairs so that the weigher can be seated during weighing operations in front of the scale or console;
7. Heating equipment sufficient to maintain the temperature in the scale house at 20° C.
8. Adequate lighting;
9. Fuel for heating and light supplied by the Contractor.
10. Sanitary facilities available nearby for the weigher. In case of port-a-pot, the units are to be maintained at an acceptable level.
11. Dust control shall be maintained on all ramps and roads within 30 metres of the scale house.

Scales shall be tested to the satisfaction of the Engineer:

1. after initial installation and before their use on the Contract;
2. when the scale is moved to a new location;
3. when the scale has undergone adjustments, alterations or repairs to the weighing mechanism;
4. when weighing is resumed after winter suspension.

These tests shall be performed by a scale company that is recognized by the Department as reputable. These tests must use a total of 10,000 kg of test weights certified by MCIC. The scale company must provide a written copy of the calibration report to the Department, a copy to MCIC and post a copy in the scale house.

The Engineer reserves the right to check the accuracy or test the Contractor's scales at any time. MCIC may perform unscheduled inspections of the scales and their installation during the construction season.

After a scale has been rejected and the owner has repaired it, a request will be made by the owner to the Department to contact MCIC to make an inspector available as soon as practicable. The owner of the scale must send a copy of the scale repair invoice or report to the Department. Any scale which has been rejected for measurement errors by MCIC, cannot be used until it has been inspected and certified by MCIC.

Testing of scales by the Department shall not relieve the Contractor of any responsibilities under the Canada Weights and Measures Act and Regulations proclaimed under that Act.

APPENDIX 5

ADDITIONAL BID & PERFORMANCE SECURITY INFORMATION

Department of Transportation and Infrastructure
Province of Prince Edward Island

INFORMATION REGARDING BONDS (2025)

Bonds, when used by General Contractors as Security for a contract, must designate the Obligee as follows: **“The Government of Prince Edward Island as Represented by the Minister of the Department of Transportation and Infrastructure”**

- Accepted format and content:
 - Bid Bond CCDC 220-2024 approved by the Surety Association of Canada
Source: Canadian Construction Documents Committee
 - Sample – PE – DTI Consent of Surety
Sample is attached
 - Performance Bond CCDC 221-2024 approved by the Surety Association of Canada
Source: Canadian Construction Documents Committee
 - Labour and Material Bond CCDC 222-2024 approved by the Surety Association of Canada
Source: Canadian Construction Documents Committee
- Link to the Canadian Construction Documents Committee’s website:
[» CCDC 220, 221, 222 – 2024 Bond Forms](#)

INFORMATION REGARDING IRREVOCABLE STANDBY LETTER OF CREDITS (2025)

- Accepted format and content:
 - Sample - PE – DTI – Irrevocable Letter of Credit 1 and 2
Samples attached

CONSENT OF SURETY
Sample

Surety

Logo - Address - Phone - Email

Consent of Surety / Agreement to Bond

Bond No.: _____

WHEREAS _____ (Principal) has submitted a written tender to _____ (Obligee) dated ____ day of _____, in the year _____,

concerning: _____

and the condition of this obligation being such that the Principal shall have the tender accepted within the time period prescribed in the Obligee's bid documents, or, if no time period is specified in the Obligee's bid documents, within _____ () days from the closing date of tender

we, _____, a corporation created and existing under the laws of Canada and duly authorized to transact the business of Suretyship in Prince Edward Island / Canada as Surety, agree to issue for the Principal if the Principal shall enter into a written contract with the Obligee, the following bond(s):

1. a Contract Performance Bond in favour of the Obligee for _____
conditioned for the performance of the work described herein and the contract between the Contractor and Obligee.
2. a Labour and Material payment Bond in favour of the Obligee for _____
With respect to the above-mentioned project.

This consent shall be null and void unless an application for the said bond(s) is delivered to the Surety by the Principal within thirty (30) days following the date the contract is awarded.

SIGNED, SEALED AND DATED ____ day of _____, in the year _____,

(Surety – Corporate name)

Attorney-in-Fact

IRREVOCABLE LETTER OF CREDIT
Sample 1

**BANK
LOGO**

Bank name

Bank address

Tel:

Fax:

SWIFT:

**Irrevocable
Standby Letter of Credit
No.: XXX00000XXXX**

Beneficiary:

The Government of Prince Edward Island as
Represented by the Minister of the Department of
Transportation and Infrastructure

Applicant:

XXXXXXXXXXXXXXX XXXXX
XXXXXXXXXXXXXXX
Charlottetown, PE XXX XXX
Canada

Date of Issue:

XXXXXXXX 00, 0000

Date and Place of Expiry:

XXXXXXXX 00, 0000 XXXX

Amount:

CAD 0,000,000.00 XXXXXX XXXX Canadian Dollars

We, XX Bank Name and Address XX, (the "Bank"), at the request of the Applicant, hereby issue in favor of The Government of Prince Edward Island as Represented by the Minister of the Department of Transportation and Infrastructure (the "Beneficiary") this Standby Letter of Credit No. XXX00000MXXXX (the "Standby Letter of Credit") up to an aggregate amount of CAD 0,000,000.00 (XXXXXXXX XXXXXX XXX and 00/100 Canadian Dollars) (the "Maximum Amount") in connection with Project No. 000000, Project name: XXXXXXXXXX.

This Standby Letter of Credit is available by payment upon receipt by the Bank at its above noted address of the following documents:

1. Beneficiary's dated and signed written demand, in its letterhead, addressed to us and completed as follows:

"We, hereby demand payment of the amount of _____ [Currency and Amount both in letters and numbers] under the Standby Letter of Credit No. XXX00000XXXX issued by XX Bank Name XX and certify that XXXXXXXXXX (Applicant) has failed to fulfill its obligations."

2. The original of the Standby Letter of Credit and all amendment(s), if any.

XXX00000XXXX

Page 1 of 2

**BANK
LOGO**

Bank name

Bank address

Tel:

Fax:

SWIFT:

Partial drawings and multiple presentations are permitted provided that aggregate amount of all drawings shall not exceed the Maximum Amount.

In case of partial drawings, the original of the Standby Letter of Credit will be duly endorsed by the Bank and returned it to the Beneficiary, which made the drawing request, unless it is fully utilized or expiry date has occurred.

Each drawing paid hereunder shall permanently reduce the Maximum Amount by the amount of such drawing.

This Standby Letter of Credit shall be reduced automatically, without amendment, by the amount of reduction that may be authorized by the Beneficiary, in its letterhead, any time and from time to time by their signed written request given to the Bank referring the Standby Letter of Credit number.

We hereby agree with the Beneficiary that we will honour the Beneficiary's demand for payment, presented in compliance with the terms of this Standby Letter of Credit, without enquiring whether the Beneficiary has a right as between itself and the Applicant to make such demand, and without recognizing any claim of the said Applicant.

This Standby Letter of Credit will expire on **XXXXXX 00, 0000** (the "Expiry Date") irrespective of whether this instrument is returned to us or not and demands, if any, must have been received by us on or before the Expiry Date.

This Standby Letter of Credit may be cancelled prior to the Expiry Date, upon receipt by us at the above noted address of the original Standby Letter of Credit and all amendment thereto, if any, and the Beneficiary's signed written letter, in its letterhead, addressed to us, referring to this Standby Letter of Credit No. **XXX0000XXX**, requesting cancellation of the same. Such cancellation shall be effective on the date the Bank receives the original Standby Letter of Credit and all amendments thereto, if any, and the Beneficiary's written request for cancellation.

The Beneficiary may from time to time advise us of the Beneficiary's changes of address by letter to the Bank at the address stated above, dated and signed by the Beneficiary and quoting this Standby Letter of Credit number. Any notice by the Bank to the Beneficiary regarding this Standby Letter of Credit shall be adequately given if sent by registered mail or courier to the last address so advised, or if no address has been so advised, then to the address of the Beneficiary stated above.

It is understood that the Bank is obligated under this Standby Letter of Credit for payment of monies only.

The Contract is referred to herein for reference purposes only and does not form part of the terms of the Standby Letter of Credit.

This Standby Letter of Credit is subject to the rules set out in International Standby Practices (ISP98), International Chamber of Commerce publication No.590 and engages us in accordance with the terms thereof.

Regards,

Authorized Signature

Authorized Signature

XXX00000XXXX

Page 2 of 2

IRREVOCABLE LETTER OF CREDIT
Sample 2

**BANK
LOGO**

Bank name

Bank address

Tel:

Fax:

SWIFT:

**Irrevocable
Standby Letter of Credit
No.: X000000**

Beneficiary:

The Government of Prince Edward
Island as represented by the
Minister of the Department of
Transportation and Infrastructure
11 Kent Street
2nd Floor
Charlottetown, PE C1A 7N8 Canada

Applicant:

XXXXXXXXXXXX
XXXXXXXXXX
Charlottetown, PE XXX XXX
Canada

Date of Issue:

XXXXXXXX 00, 0000

Date and Place of Expiry:

XXXXXXXX 00, 0000

Toronto, ON

Canada

Amount:

CAD 0,000,000 XXXXX Xxx Canadian Dollar

Irrevocable Standby Letter of Credit No. X0000000.

We hereby issue in your favour this Irrevocable Standby Letter of Credit which is available by payment against your written demand addressed to **XX Bank Name and Address XX**, bearing the clause: "Drawn under Standby Letter of Credit No. X00000000, issued by **XX Bank Name and Address XX**, when accompanied by the following documents:

1. Beneficiary's signed certificate specifying amount claimed and stating that the amount drawn is due and payable by **XXXXXX** (Applicant) and **XXXXXX** (Applicant) is in default of its obligations in connection with the agreement between the Applicant and the Beneficiary for **XXXXXXXXXXXXXXXXXX** Project.

2. The original of this Standby Letter of Credit for our endorsement of any payment.

X00000000

Page 1 of 2

**BANK
LOGO**

Bank name

Bank address

Tel:

Fax:

SWIFT:

Special Condition(s):

Partial drawings are permitted.

This Standby Letter of Credit will remain in effect until **Xxxxxxxx 00, 0000** ("Initial Expiry Date").

It is a condition of this Standby Letter of Credit that it shall be deemed to be automatically extended, without amendment, for one year from the present or any future expiry date hereof, unless at least thirty (30) days prior to any such expiry date, we shall send notice to you in writing by courier, that we elect not to consider this Standby Letter of Credit extended for any such additional period. Upon receipt of such notice, you may draw hereunder by means of your written demand for payment.

Request for any amendment except reduction in amount must be made directly to the Applicant who must then instruct us accordingly.

This Standby Letter of Credit may also be cancelled prior to the expiry date upon our receipt at our above-noted address of the original Standby Letter of Credit (including all amendment(s), if any) and the Beneficiary's signed letter addressed to us requesting cancellation of the Standby Letter of Credit.

We engage to honour presentation(s) submitted within the terms and conditions indicated above.

This Standby Letter of Credit is subject to the International Standby Practices (ISP98), ICC Publication Number 590.

Authorized Signature

Authorized Signature

X0000000

Page 2 of 2