
**Summary of Revisions for the January 2019 Edition of the
Department of Transportation and Infrastructure Standard
Specifications for Highway Construction**

This document is intended as a quick reference guide to changes to the Department of Transportation and Infrastructure Standard Specifications for Highway Construction January 2015 Edition to the January 2019 Edition.

A few things to keep in mind while using this document:

- It is possible that changes were missed or omitted from this document.
 - When there is a large portion of an item that has not been changed, it may be omitted from this document. A double horizontal line (as seen below) indicates that a section of an item was skipped.
 - This document is not to be used in place of the Standard Specification Manual. Always refer to the Specification Manual and the Particular Specifications.
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LIST OF REVISED / ADDED STANDARD DRAWINGS:

- 261-2 - Added
- 311-2 - Revised
- 351-1 - Revised
- 510-1 - Revised
- 510-3 - Added
- 512-2 - Revised
- 512-4 - Added
- 512-5 - Added
- 512-6 - Added
- 515-1 - Added
- 941-1 - Revised

LIST OF NEW ITEMS:

Old Particular Specification Number	Description	New Specification Manual Number
702	Wildlife Fence	178
703	Dual One-Way Ungulate Gate	179
704	Cantilever Slide Gate	180
705	Pedestrian Gate	181
750	Precast Concrete Barriers	522
763	Sodding	631
777	Hydraulic Ground Cover	632
778	Turf Reinforcement Mat	633
783	Temporary Barriers	524

ITEM 106 – COMMON EXCAVATION

106.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of cubic metres of common material excavated and placed, stockpiled and/or disposed of in accordance with this Item.
- .2 The volume shall be as measured in situ and computed by the average end area method, based on “original ground” cross-sections surveyed by the Engineer on the natural ground.
 - .1 In the areas to be grubbed, the cross-sections shall be taken before grubbing, and the volume payable under this Item shall include material in the grubbed layer removed under Item 102.
- .3 Excavation of soft spots, deleterious materials, offtakes, stream diversion channels and driveways as defined by this Item shall be measured for payment.
- .4 Compensation payable to the Owner or the Contractor, for the difference in price of fuel between the month prior to the month of tender opening for the Contract and the month of Work under this Item, will be calculated in accordance with Item 822.

ITEM 108 – SOLID ROCK EXCAVATION

108.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of cubic metres of solid rock excavated and either placed, stockpiled or disposed of in accordance with this Item.
- .2 The volume of bedrock shall be as measured in situ and computed by the average end area method, based on the top-of-rock sections surveyed by the Engineer, after the bedrock exposure noted in 108.4.3.1.
 - .1 If the Contractor fails to give notice under 108.4.3.1, then the Engineer shall determine the rock line to be used to calculate the Quantity of solid rock excavation.
 - .2 The payline for the rock undercut surface shall be the theoretical undercut line as per 108.4.3.3, to the intercept of the Foreslope as excavated.
- .3 Boulders greater than 1 m³ in volume shall be measured individually for payment.
- .4 Where, in the opinion of the Engineer, Overbreak in ditches and Backslopes has been unavoidable, the Overbreak shall be measured for payment up to but not exceeding 10% of the Quantity calculated within the lines staked by the Engineer at the stations at which the Overbreak occurs.
 - .1 This percentage may be increased at the discretion of the Engineer for stations of small cross-sectional area for which the width of Overbreak is not excessive but represents a relatively large percentage of the area of solid rock excavation staked, and if all of the Overbreak Quantity is useable material.
- .5 Compensation payable to the Owner or the Contractor, for the difference in price of fuel between the month prior to the month of tender opening for the Contract and the month of Work under this Item, will be calculated in accordance with Item 822.

ITEM 121 – BORROW

121.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment shall be the number of tonnes of Borrow supplied and placed in accordance with this Item.
- .2 If the Contractor places more Borrow than the tendered Quantity, thereby causing a waste of useable excavated materials under Items 106, 107 and/or 108, the volume of excavated material so wasted shall be calculated and that Quantity deducted from the total Quantity of Borrow.

.1 This volume of material shall be converted to tonnes using 2.0 t/m³.

- .3 Compensation payable to the Owner or the Contractor, for the difference in price of fuel between the month prior to the month of tender opening for the Contract and the month of Work under this Item, will be calculated in accordance with Item 822.
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ITEM 136 – SUBDRAIN

136.4.5.6 The upgrade end of each continuous line of subdrain shall be capped, as required.

- .1 Where the subdrain is to be connected to a precast catch basin, the Contractor shall carefully make an opening in the catch basin at the required elevation, and make the connection as indicated on Standard Drawing 136-1.
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ITEM 137 – SUBDRAIN OUTLET

137.4 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 construct the subdrain outlet Structure in advance of any placement of Aggregate Subbase.
- .3 The subdrain outlet shall be constructed as detailed in Standard Drawing 137-1.
- .4 The subdrain outlet shall ~~be installed with~~have all joints ~~being~~ constructed with couplers and 90° elbows and/or T-sections compatible with the pipe supplied and in accordance with the manufacturer's recommendations.

.1 The Contractor shall be responsible for all cutting and fitting of pipes in the Work.

.2 Where the Subdrain outlet connects at the end of a line of Subdrain pipe, the connection shall be a 90° elbow or a T-section with the lower end capped.

ITEM 140 – CONCRETE PIPE

140.2 MATERIALS

- .1 All pipe materials shall be supplied by the Contractor.
 - .2 All pipe 900 mm and larger shall be supplied with gaskets (confined “O” ring with lubricant or single offset type).
-

140.8.9 Rough edges at both ends of pipe shall be flush with all bleed-by removed.

140.3 SUBMITTALS

- .1 The Contractor shall submit, upon request, the manufacturer’s certification that the materials supplied meet the specified requirements as detailed on the Contract Documents.
 - .1 If fish weirs/baffles are specified for a Culvert, the Contractor shall submit shop drawings for each Culvert in accordance with 141.3.
 - .2 The Contractor shall submit, upon request, the proposed source of the supply of the backfill material from within the Work Site.
 - .3 If the source of the supply of the backfill material is located outside of the Work Site, the Contractor shall submit the proposed source, in writing, for the approval of the Engineer, at least 14 Days in advance of obtaining backfill material from the proposed source.
 - .4 Submittals are required in accordance with any cross-referenced Item forming part of this Item.
 - .5 Three-Edge Bearing testing, in accordance with CAN/CSA A257, shall be done a minimum of once per year for each size of pipe in the presence of the Engineer.
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140.4.15 Precast cut-off walls under this Item or cast-in-place headwalls under Item 301 shall be set at the elevations and offsets shown on the Plans and/or shop drawings, or if site conditions differ from the Plans, as directed by the Engineer.

.1 An inlet cut-off wall or headwall shall not be placed until enough culvert sections have been placed per 140.4.5 to ensure that the inlet end section line up with the wall to the satisfaction of the Engineer. If the pipe fails to line up with the wall as specified, the Contractor shall make necessary corrections at her/his expense.

140.4.15 .2 Following placement and backfilling of a precast cut-off wall, the top pre-formed surface of the wall shall be “battered” with a 25 mm layer of non-shrink grout and the culvert end section immediately set into place on it.

.3 With the end section in place, the Contractor shall core drill 30 mm diameter holes through the end section and to a nominal depth of 150 mm into the top of the cut-off wall.

.4 The 25 M dowels shall be inserted and secured into place using an epoxy or acrylic adhesive such as Epcon A7 or an approved equivalent.

ITEM 141 – CONCRETE PIPE – LARGE

141.1 DESCRIPTION

- .1 This Item consists of the design, supply and installation of all reinforced concrete pipe of a nominal inside diameter (ID) greater than 1200 mm.
-

141.2 MATERIALS

- .1 All pipe materials shall be supplied by the Contractor.
 - .2 Pipe shall meet the referenced manufacturing standards.
 - .3 All pipes shall be supplied with gaskets (confined "O" ring with lubricant, or single offset type).
 - .4 Appurtenances, which may include tension bar assemblies, tee-bases, cut-off walls, weirs (with or without steel inserts), baffles, and/or bevelled ends, shall be supplied as shown on the Contract Document and shop drawings.
 - .1 Tension bar assemblies shall be as shown in Standard Drawing 140-1.
 - .2 Tee-bases shall be fabricated such that when installed at the slope shown on the Plans, the catch basin shaft on the tee-base is vertical.
 - .3 Dowels for attaching cut-off walls to pipe shall be 25 M deformed reinforcing steel bars.
 - .4 The concrete for precast weirs, baffles and cut-off walls shall have an air content of 5 to 8%.
 - .5 The maximum spacing of reinforcing steel for cut-off walls, headwalls and weirs/baffles shall be 300 mm.
-

141.3 SUBMITTALS

- .1 For pipe with an ID of 3000mm or greater, the pipe shall be analysed in accordance with CAN/CSA-S6, CL-625-ONT, by the Direct Design Method, using the most recent software version of PIPECAR, or Eriksson Pipe version 1.1, as per the Contract Documents.
 - .1 The pipe reinforcing area and spacing for pipe with an ID of 3000 mm or greater shall conform to the governing PIPECAR or Eriksson Pipe version 1.1 output.
 - .2 If the area of reinforcing specified by the manufacturer is greater than the area of reinforcing specified in PIPECAR or Eriksson Pipe version 1.1, the area must be verified per CSA S6 Commentary Cl.7.8.8.1.1 to ensure it is less than the maximum allowable reinforcing area.
 - .3 All pipes shall be designed for actual fill plus 1 m of fill.
- .2 Pipe less than 3000 mm diameter shall be designed using the CSA A257.2 and A257.3. Special designs, outside the limits of the CSA A257 design tables, shall be designed using the PIPECAR Indirect Design Method or Eriksson Pipe Indirect Design Method.

.3 Pipe design shall be in accordance with Table 141-1

Table 141-1
Reinforced Concrete Pipe Design Requirements

<u>Pipe Diameter (mm)</u>	<u>Applicable Standards</u>	<u>Additional Standards / Requirements for Concrete</u>
<u>1350 to 2700</u>	<u>CSA A257.2, CSA A257.3</u>	<u>CSA A23.1 and A23.2, exposure class C-1; air content of 5 to 8%.</u>
<u>≥ 3000</u>	<u>CSA-S6 ASTM C1417</u>	<u>CSA A23.1 and A23.2, exposure class C-1; air content of 5 to 8%; calcium nitrite corrosion inhibitor at a rate of 15 L/m³.</u>

.4 The Contractor shall submit, in accordance with Item 956, shop drawings for each Culvert, containing but not limited to, the following information:

- .1 Station(s) of pipe(s), name(s) of watercourse(s), and DTI contract number and description;
- .2 General layout showing pipe and appurtenances;
- .3 Length and weight (mass) of individual sections;
- .4 Joint details;
- .5 Details of reinforcing steel for each individual cage, including bar spacing, bar yield strength, wire sizes for cages and stirrups;
- .6 Details of reinforcing steel for weirs, baffles and cut-off walls;
- .7 Concrete design strength, age of test and shipping strength;
- .8 Production schedule;
- .9 Method of attaching concrete weir(s) and baffle(s) to pipe;
- .10 PIPECAR or Eriksson Pipe design input and output, including printouts of outputs for load cases as indicated on the Contract Documents for ~~pipes ≥ 3000mm ID~~ pipe sizes and classes not listed in the CSA A257 design tables;
 - .1 PIPECAR or Eriksson Pipe version 1.1, design input for pipe ≥ 3000 mm ID shall be in accordance with the Supplement to Item 141 of the Contract Documents.
 - .2 PIPECAR or Eriksson Pipe, design for pipe < 3000 mm and not listed in the CSA A257 Design Tables, will require PIPECAR Three Edge Bearing input and output information.
- .11 Lap lengths and welding procedure for pipes ≥ 3000 mm ID.

~~.52~~ The Contractor shall submit, in accordance with Item 956, two sets of design calculations for the following:

- .1 All pipes 3000 mm ID and larger;
- ~~.2 All pipes less than 3000 mm ID of a class higher than 140-D; and~~
- .2 All pipe designs that are not listed in the design tables in CAN/CSA A257.
- ~~.3 Three Edge Bearing Test results shall be submitted upon request for pipes less than 3000 mm diameter.~~
- ~~.64~~ The proposed mix proportions (design), shall be submitted to the Engineer at least 14 Days before concrete production is due to start.
- ~~.75~~ The manufacturer's certification that the supplied materials meet the specified requirements of the Contract Documents shall be submitted upon request.
- ~~.86~~ The Contractor shall submit, upon request, the proposed source of the supply of the backfill material from within the Work Site.

~~.97~~ If the source of the supply of the backfill material is located outside the Work Site, the Contractor shall submit the proposed source, in writing, for the approval of the Engineer, at least 14 Days in advance of obtaining backfill material from the proposed source.

~~.108~~ Submittals are required in accordance with any cross-referenced Item forming part of this Item.

141.4 .2 Pipe ~~Design &~~ Fabrication

~~.1~~ For pipe with an ID of 3000 mm or greater, the pipe shall be analyzed in accordance with CAN/CSA-S6, by the Direct Design Method, using the most recent software version of PIPECAR, as per the Contract Documents.

~~.2~~ The pipe reinforcing area and spacing for pipe with an ID of 3000 mm or greater shall conform to the governing PIPECAR output.

~~.1~~ If the area of reinforcing specified by the manufacturer is greater than the area of reinforcing specified in PIPECAR, the area must be verified per CSA S6-06 Commentary Cl.7.8.8.1.1 to ensure it is less than the maximum allowable reinforcing area.

~~.31~~ Pipe ~~design and~~ fabrication shall be in accordance with Table 141-~~24~~ and Table 141-~~32~~, and such that specified installation tolerances are attainable.

~~.25~~ Reinforced steel cages shall extend into the bell and spigot.

Table 141-~~24~~
Reinforced Concrete Pipe ~~Design and~~ Fabrication Requirements

Pipe Diameter (mm)	Applicable Standards	Additional Standards / Requirements for Concrete	Duration of Moist Curing
1350 to 2700	CSA A257.2, CSA A257.3	CSA A23.1 and A23.2, exposure class C-1; air content of 5 to 8%.	Until min. concrete strength of 20 MPa is attained.
≥ 3000	CSA-S6 ASTM C1417	CSA A23.1 and A23.2, exposure class C-1; air content of 5 to 8%; calcium nitrite corrosion inhibitor at a rate of 15 L/m ³ .	Until min. concrete strength of 35 MPa is attained.

Table 141-~~32~~
Requirements for Reinforcing Steel Cover for Reinforced Concrete Pipes & Appurtenances

Pipe Diameter	Concrete Cover Over Reinforcing Steel		
	Circumferential Steel (Pipe)	Weirs / Baffles, Cut-off Walls / Footings	Slope of Beveled Ends
< 3000 mm	25 mm; min. 19 mm	50 mm ± 10 mm	50 mm ± 10 mm
≥ 3000 mm	40 mm ± 10 mm	50 mm ± 10 mm	50 mm ± 10 mm

141.4 .6 Pipe Less Than 3000 mm in Diameter – Fabrication & Testing

- .1 Before delivery of pipe sections, and on at least 5 Days notice to the Engineer, the manufacturer shall perform D-load testing (Three-Edge Bearing Test) in the presence of the Engineer's presence to determine the load to produce a 0.3 mm crack.
- ~~.2 For pipes up to Class 140-D the following applies:~~
- .24 The Engineer shall select at random one pipe section per size and class from among those produced for the Contract or supplied from stock. If no 0.3 mm crack has developed at the D-load specified for the size and class of pipe tested, further load shall be applied until a 0.3 mm crack develops or a load 5% greater than the specified load is reached, whichever occurs first.
- .32 The manufacturer shall clearly mark on the inside of test sections the following: on all test sections, the word "TESTED"; and on sections that failed or were tested to ultimate strength, the word "REJECT".
- 141.4.6 .43 In the event of disagreement between the manufacturer/supplier and the Engineer in verification of the 0.3 mm crack on a culvert section being tested, that section may be tested to its ultimate strength at the Contractor's expense.
- ~~.3 For pipes of a class higher than 140-D the following applies:~~
 - ~~.1 The Three-Edge Bearing Test shall be performed to determine the load to produce a 0.3 mm crack, and the ultimate load (to verify the design).~~
 - ~~.2 Three representative pipe specimens shall be tested prior to full production. If the supplier's D-loading test equipment cannot test full-length pipe sections to the specified loads, the manufacturer shall cast three shorter specimens for testing rather than cutting specimens from full-length sections.~~
 - ~~.3 The three test specimens shall be tested to D-load (development of a 0.3 mm crack), to D-load plus 5%, and to ultimate strength. All of the specimens shall meet or exceed the required limits to verify the design of the pipe.~~
 - ~~.4 If a plant has previously verified a design for a specific pipe, that plant may produce more of the same pipe from that design without undergoing the verification process again, by providing a submittal showing verification. The submission shall include, but is not limited to: reviewed shop drawings, mix design, and three Three-Edge Bearing test results that have been taken to the ultimate load~~
 - ~~.5 After the design has been verified, tests in accordance with clause 9 of CSA A257.2 shall be used to determine acceptance of the pipe.~~
 - ~~.6 All specimens tested to ultimate strength shall be marked "REJECT".~~
 - ~~.7 During production, one further test specimen shall be tested to D-load, to D-load plus 5%, and marked "TESTED".~~
 - .58 During production, quality control testing and test sampling per 302.4 shall be carried out for every 15 m³ of concrete placed.
 - .1 For concrete placements under 15 m³, a minimum of one set of cylinders and air content tests shall be carried out per half Days production.

141.4 .10 Placement

- .1 The Engineer shall provide control points in the field for vertical and horizontal control at selected locations or as otherwise required.
 - .2 The Contractor shall be responsible for the layout and maintenance of all lines and grades for the Work as shown on the Plans.
 - .3 Excavation shall be carried out in accordance with 161.4 and to the limits as indicated on Standard Drawings 161-1 to 161-5, or as specified in the Contract Documents.
 - .1 If Overexcavation occurs, the Contractor shall, at his/her own expense, repair and fill the Overexcavation with an approved backfill material, placed in accordance with Item 936, and compacted to 95% of the maximum dry density.
 - .4 Pipes shall be placed as shown on the Plans and/or shop drawings.
 - .5 Pipe sections shall be joined in a straight line using standard industry methods, proceeding up grade with bell end up grade. Each pipe section shall be set into place and positioned together as recommended by the lifting device manufacturer.
- 141.4.10
- .6 The maximum joint gap between pipe sections shall be 13 mm for pipes up to 1500 mm diameter, and 20 mm for pipes of 1800 mm diameter and larger.
 - .1 Where the joint gap exceeds the above tolerances, sections shall be removed and reset to meet the specified tolerance, at the Contractor's expense.
 - .7 Precast cut-off walls under this Item, or cast-in-place headwalls under Item 301, shall be set at the elevations and offsets shown on the Plans and/or shop drawings, or if site conditions differ from the Plans, as directed by the Engineer.
 - .1 An inlet cut-off wall or headwall shall not be placed until enough culvert sections have been placed per 141.4.108.5 to ensure that the inlet end section line up with the wall to the satisfaction of the Engineer. If the pipe fails to line up with the wall as specified, the Contractor shall make necessary corrections at his/her expense.
 - .2 Following placement and backfilling of a precast cut-off wall, the top pre-formed surface of the wall shall be "battered" with a 25 mm layer of non-shrink grout and the culvert end section immediately set into place on it.
 - .3 With the end section in place, the Contractor shall core drill 30 mm diameter holes through the end section and using the prefabricated holes as guides to a nominal depth of 150 mm into the top of the cut-off wall.
 - .4 The 25 M dowels shall be inserted and secured into place using an epoxy or acrylic adhesive such as Epcon A7 or an approved equivalent.

ITEM 142 – PRECAST CONCRETE BOX CULVERT

142.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
- .2 Concrete shall meet the requirements of CSA A23.1 and CSA A23.2.
 - .1 Exposure Class shall be C-XL.
 - .2 Air content shall be 5 to 8%.
- .3 Interior water tight joint seal shall be Rub'r-Nek, size per joint seal manufacturer's written recommendations, or approved equivalent.
- .4 Exterior joint wrap shall be 300 mm wide Conwrap, ConSeal CS-212 or approved equivalent, with primers recommended by the manufacturer.
- .5 The calcium nitrite corrosion inhibitor shall conform to the following:
 - .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.
 - .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.
- .6 Dowels for attachment of cut-off walls to ~~bevelled ends~~box Culverts shall be 25 M deformed reinforcing steel bars.
- .7 Reinforcing steel shall be rebar conforming to 304.2 and/or welded deformed steel wire fabric conforming to ASTM ~~A1064-A82, A185, A496 and A497~~.
 - .1 Welding of reinforcing steel, including tack welding, is prohibited unless otherwise indicated on the Contract Documents.
- .8 Weirs, ~~baffles~~ and headwalls shall be reinforced and secured to the Culvert by a method approved by the Engineer and moist cured for a minimum of 72 hours.
 - .1 When drilled holes and dowels are used to attach weirs/baffles to the invert, and headwalls to boxes, the holes shall be drilled to a minimum depth of 100 mm, and the dowels shall be secured with an epoxy or acrylic adhesive such as Epcon A7 or approved equivalent.
 - .2 Reinforcement shall be placed in both faces of weirs, baffles, headwalls and cut-off walls.
 - .1 The maximum spacing of reinforcing steel for weirs, baffles, headwalls and cut-off walls shall be 300 mm.

.3 The concrete for precast weirs, baffles, headwalls and cut-off walls shall have an air content of 5 to 8%.

142.2.8 .4 Weirs, baffles, headwalls and cut-off walls shall be made with the same concrete requirements as the Culvert.

142.4.1 .4 Two additional anchors shall be installed on the inside of each box at approximately one third of the height of the inside wall, mid length and on opposite sides for jacking boxes to home the joints for a tight seal.

142.4 .2 Culvert Design

.1 Box culvert design shall be in accordance with the latest editions of CAN/CSA-S6 for the worst-case loading of either 0.7 m of earth fill or finished grade plus 1.0 m of earth fill.

.1 Earth fill material shall have a design density of 2.15 t/m³ and a soil structure interaction factor of 1.15.

.2 The live loading shall conform to CL-625-ONT live loading.

142.4.7 .2 Following placement and backfilling of the cut-off wall, the top horizontal surface of the cut-off wall shall be “battered” with a 25 mm layer of non-shrink grout and the bevelled end section shall be immediately set into place on the cut-off wall.

.3 With the end section in place, the Contractor shall core drill 30 mm diameter holes through the end section and using the prefabricated holes as guides to a nominal depth of 150 mm into the top of the cut-off wall.

.4 The 25 M dowels shall be inserted and secured into place using an epoxy or acrylic adhesive such as Epcon A7 or an approved equivalent.

.5 The Contractor shall place a minimum thickness of 50 mm of bed levelling sand, compacted and raked or screeded to provide a uniform bedding surface, over the entire foundation area of the Culvert.

.6 A rigid sheet shall be installed flush with the bed levelling material surface and centred under each joint of the Culvert sections, such that when sections are joined, sand and other materials are prevented from entering and contaminating the joint.

.7 Precast concrete box Culvert sections shall be erected in the sequence indicated on the manufacturer’s shop drawings.

.1 Deviation from the manufacturer's shop drawings shall not be permitted without the written authorization of the Engineer.

.8 Culvert sections shall be joined in a straight line using industry methods, with the bell end up grade. Each Culvert section shall be set into place and positioned together as recommended by the manufacturer of the lifting device.

- .1 After final alignment of each box Culvert section by overhead means, homing shall be performed by jacking or winching with "come-alongs" attached to the inner anchors while the box Culvert section is still suspended.
 - .2 Boxes that are subsequently moved after the gasket joint seal has been compressed, will require re-installation with a replacement gasket.
- .9 The maximum joint gap between any two box Culvert sections shall be 20 mm uniformly across the joint with the sections in straight alignment.
- .1 Sections set to a joint gap greater than 20 mm shall be removed and reset to the specified gap.
 - .2 Sections which cannot be reset as 142.4.7.8 shall be rejected.
- .10 After satisfactory placement of the Culvert sections, all anchor pockets ~~the lifting hook pockets~~ shall be filled with non-shrink grout.
-

ITEM 161 – FOUNDATION EXCAVATION

~~161.4.8 — .3 — All overhaul shall be subject to the approval of the Engineer.~~

161.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of excavation, as identified under the Contract.

~~.2 — The overhaul of material, as approved by the Engineer, shall be paid for in accordance with Item(s) 806, 807 and/or 808, as applicable.~~

ITEM 201 – PRODUCTION OF HIGHWAY AGGREGATES

201.2.4 .1 Crushed Rock Base/Subbase

.1 Crushed rock base/subbase shall be produced by the crushing and processing of rock to conform to the grading limits as set out in Table 201-2, when tested in accordance with ASTM C136 and C117.

.1 Rock shall be quarried from a source that is solid in situ.

**Table 201-2
Grading Limits - Crushed Rock Base/Subbase**

ASTM Sieve Size	Aggregate Base		Aggregate Subbase	
	25 mm % passing	31.5 mm % passing	50 mm % passing	75 mm % passing
90.0 mm				100
75.0 mm				95 - 100
63.0 mm			100	85 - 100
50.0 mm			95 - 100	73 - 95
37.5 mm		100	76 - 100	58 - 87
31.5 mm	100	95 - 100		
25.0 mm	95 - 100	81 - 100	60 - 84	
19.0 mm	71 - 100	66 - 90	50 - 76	35 - 69
12.5 mm	56 - 82	50 - 77		
9.5 mm	47 - 74	41 - 70	32 - 61	25 - 54
4.75 mm	31 - 59	27 - 54	21 - 49	17 - 43
2.36 mm	21 - 46	17 - 43	15 - 40	12 - 35
1.18 mm	13 - 34	11 - 32	10 - 32	8 - 28
300 µm	5 - 18	4 - 19	4 - 18	4 - 16
75 µm	0 - 78	0 - 78	0 - 89	0 - 89

201.3 SUBMITTALS

.1 The Contractor shall notify the Engineer, in writing, identifying the source of material and shall provide 7 Days' notice of the commencement date for crushing.

.1 The Contractor shall make available all Equipment necessary for the Engineer to obtain representative samples of the material proposed for supply.

.1 Prior to sampling for source approval, the Contractor shall crush a minimum of 500 tonnes of aggregate from the proposed material location.

.2 The frequency of sampling and testing for source approval will be carried out as indicated in Table 201-8.

**Table 201 – 8
Source Approval Frequency**

<u>Initial Test Sample (8 bags required):</u> Coarse Micro-Deval (MTO LS-618) Freeze Thaw (MTO LS-614) Flat and Elongated (MTO LS-608) - quarries only Plasticity Index (AASHTO T89 & T90) Crush Count (ASTM D5821) - gravel base only Total Sulphur/Neutralizing Potential Ratio (NPR) - quarries only		<u>Follow up Test Sample (3 bags required):</u> Micro-Deval (MTO LS-618) Plasticity Index (AASHTO T89 & T90)	
<u>Total Aggregate Tonnage</u>		<u>Minimum Test Samples Required</u>	
Up to 25,000		1 initial test	-
Up to 75,000		1 initial test	1 follow up
Up to 125,000		1 initial test	2 follow up
Up to 200,000		1 initial test	3 follow up
Up to 300,000		1 initial test	4 follow up
Notes: 1) When producing more than one type of aggregate, ensure that the results meet the specifications for all products or additional tests may be required. 2) Visually detected changes in aggregate will constitute immediate testing. 3) Follow up test results will be made available 5 days after submission to the lab.			

- .2 The Engineer shall require up to 21 Days from the date the aggregate samples are received at the Owner's Central Laboratory in Fredericton to the date of notification of the evaluation of the material ~~of sampling to the date of notification of the evaluation of the material.~~

- 201.4.5 .3 Stockpiles shall be built in layers not exceeding ~~one~~1.5 metre in depth and each layer shall be completed before the next layer is begun.

201.4 .6 Sampling and Testing of Aggregates

- .1 The crushed product shall be monitored for gradation throughout the period of the Work and shall be accepted or rejected on the basis of the tests performed by the Engineer.
- .2 Sampling and testing shall be carried out as indicated in Table 201-~~98~~.
- .1 For gravel base, the frequency of testing for crushed particles will be a minimum of one test per 10 000 tonnes produced or a minimum of two tests per contract, whichever is greater.
- .2 If the source approval test results for crushed particles is less than 45% crushed, the frequency of testing will be increased to one test per 5 000 tonnes.

Table 201-~~98~~
Minimum Sampling And Testing Frequency

Procedure	Standard(s)	Minimum Frequency Per Shift	
		≤ 50 mm	≥ 75 mm
Sampling Aggregates	ASTM D75	3	2
Reduction of Sample	ASTM C702	3	2
Sieve Analysis	ASTM C117, C136	3	2

NOTES: 1) Shift is defined as one production crew's daily work period.
 2) Where production is greater than 4000 t per shift the minimum frequency of testing shall be increased as determined by the Engineer.
 3) Frequency of testing may also be reduced during low production, as determined by the Engineer.

201.4.6 .3 Sample sizes smaller than those specified in ASTM D75 and C136 may be used for quality control purposes, as indicated in Table 201-109

Table 201-109
Minimum Sieve Analysis Sample Sizes

Aggregate			Cover Material	
Type	Size (mm)	Mass (g)	Size (mm)	Mass (g)
Base	25	5000	9.5	1000
Base/Shoulder Material	31.5	7000	12.5	1200
Subbase	50	10000	16	1500
Subbase	75	15000	19	2000
Subbase	100	20000		
Subbase	Pit Run	20000		

NOTE: Field samples obtained under ASTM D75 shall be at least four times larger than the above sieve analysis sizes.

ITEM 203 – AGGREGATE BASE/SUBBASE

203.4 .3 Segregation

.1 If the Contractor's methods result in segregation of the materials, as defined by ASTM C125 and tested in accordance with ASTM C136, the Contractor shall cease Work immediately.

.1 Segregation is the separation of particles of an aggregate causing a lack of uniformity in their placement.

.2 Surface segregation is discernible when there are visible patches of excessing rock or sand.

.2 If segregation of materials occurs, then the Contractor shall submit a Work plan to scarify and remedy the Work in place, or shall remove the segregated materials from the Work.

203.4 .4 Compaction

.1 The material shall be compacted in accordance with Item 936 to a minimum of 95% of the maximum dry density.

203.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of Aggregate Base/Subbase supplied and placed, in accordance with this Item.

.2 Compensation payable to the Owner or the Contractor, for the difference in price of fuel between the month prior to the month of tender opening for the Contract and the month of Work under this Item, will be calculated in accordance with Item 822.

ITEM 204 – SHOULDER MATERIAL

204.4 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 placement of Shoulder material shall be carried out in a manner so as to avoid damage to the adjacent and surrounding Roadbed.
 - .1 The Contractor shall be responsible, at his/her own expense, to repair any damage to the adjacent and/or abutting finished surfaces resulting from this Work.
- .3 Shoulder material shall be placed by Equipment specifically designed for that purpose.
 - .1 Any Shoulder spreader considered for the Work shall be constructed so that it shall not place any Shoulder material on the Pavement.
 - .2 Shoulder material shall not be bladed onto the Subgrade Foreslope.
- .4 The Contractor shall spread the Shoulder material evenly in lifts not exceeding 150 mm uncompacted thickness and shall employ methods to limit segregation.
 - .1 Where surplus Aggregate Base has been windrowed along the Shoulder during the Work under Item 205, the Contractor shall spread, shape and compact the windrowed material on the Shoulder at his/her own expense, prior to placing any Shoulder material under this Item.
- 204.4 .5 The Shoulder material shall be compacted in accordance with Item 936 to a minimum of 95% of the maximum dry density, except as follows:
 - .1 RAP shall be compacted to the 97% of maximum density as determined by a test strip.
- .6 The Contractor shall not permit more than 4 km of each lift of newly laid asphalt concrete to be open to traffic without the Shoulder material operation being in progress.
 - .1 Regardless of the distance paved, each new lift of newly laid asphalt concrete shall not be open to traffic for a period greater than 7 Days without Shoulder material being placed.
 - .2 Where the difference in elevation between the asphalt concrete and the Shoulder exceeds 70 mm in any portion of the Work, the Shoulder material placement operation shall commence within 48 hours of the placement of the asphalt concrete.
 - .3 Where the difference between the finished Partial Depth or Full Depth Recycling and the Shoulder exceeds 70 mm in any portion of the Work, the Shoulder material placement operation shall commence within 48 hours of the completion of Partial Depth or Full Depth Recycling.
 - .1 Low shoulders shall be immediately signed as per the Work Area Traffic Control Manual.

- .7 Shoulder material shall be placed in driveways and around guide posts as directed by the Engineer.
 - .1 The Contractor shall undertake all handwork that may be necessary to complete the Work.
 - .8 Final shaping of the Shoulder material shall be consistent and continuous to the grade of the abutting Pavement surface and shall extend at the specified Slope to the line of the Foreslope and shall be blended and shaped to match the Foreslope intersection.
 - .9 The Contractor shall keep clean the adjacent Pavement surface and in all cases the Pavement surface shall be free of Shoulder material prior to opening the Work Area to traffic.
 - .1 Excess Shoulder material remaining on the Pavement surface shall be removed by sweeping.
-

ITEM 259 – BITUMINOUS TACK COAT

259.2 MATERIALS

- .1 All material shall be supplied by the Contractor.
- .2 Tack coat shall be RS-1 or CRS-1 Grade asphalt emulsion and shall conform in all respects to the provisions of ASTM D977 and D2397, respectively.
- .3 Non-tracking emulsion shall be diluted with 40% water and shall meet the requirements of Table 259-1.
 - .1 Dilution of the emulsion shall be permitted at the terminal only.

Table 259-1
Non-tracking Emulsion Requirements (Prior to Dilute)

Test Type	Specification Range	
	Minimum	Maximum
Test on Emulsion		
SF Viscosity, 25°C, SFs	<u>20</u>	
Sieve Test, 850µm, %		<u>0.1</u>
Dist. Residue, 260°C	<u>55</u>	
Oil Portion of Dist., %		<u>trace</u>
Particle Charge	<u>(-) or (+)</u>	
Test on Residue		
Penetration, 25°C, dmm	<u>20</u>	<u>55</u>
Ash Content, %		<u>1.0</u>

-
- 259.4.7 The RS-1 or CRS-1 emulsion Bituminous Tack Coat shall be applied in a uniform manner, without streaking at the rates indicated in the Contract Documents, at a rate of 0.15 to 0.25 L/m² or as directed by the Engineer.
-

ITEM 261 – ASPHALT CONCRETE – END RESULT SPECIFICATION (ERS)

261.1 DESCRIPTION

261.1 .1 General

- .1 This Item consists of the supply and placement of hot mixed asphalt concrete, recycled asphalt concrete and warm mixed asphalt concrete.
- .2 The asphalt concrete shall be identified by the following mix designations:
 - .1 Hot mixed asphalt concrete base mix - B.
 - .2 Hot mixed asphalt concrete base/surface mix - C.
 - .3 Hot mixed asphalt concrete surface mix - D.
 - .4 Hot mixed recycled asphalt concrete base mix - HRB.
 - .5 Hot mixed recycled asphalt concrete surface mix - HRD.
 - .6 Warm mixed asphalt concrete base mix - WMA-B.
 - .7 Warm mixed asphalt concrete base/surface mix - WMA-C.
 - .8 Warm mixed asphalt concrete surface mix - WMA-D.
- .3 It shall be the Contractor's responsibility to provide an acceptable product as specified.
 - .1 The Contractor shall implement and maintain a quality control system that shall provide assurance that all components, as well as end result products, submitted to the Owner for acceptance, conform to the Contract requirements.
 - .2 This responsibility is without regard to whether the products are manufactured by the Contractor or purchased from suppliers or subcontractors.
- .4 Quality assurance tests shall be performed, by the Engineer, on random samples taken either at the job site or at the supplier's plant.

261.1 .2 Definitions

.1 End Result Specification (ERS)

- .1 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.
 - .1 Work Category – the work will be classified as Work Category 1 - Blended Quality Assurance/Quality Control (Blended QA/QC), Work Category 2, ~~or~~ Work Category 3 or Work Category 4. The category defined will apply to all asphalt concrete produced. The categories are determined by the Department based on the total estimated tonnage of the Work as per the Contract Documents.

.2 Design Mix Formula (DMF)

- .1 DMF - the Laboratory determination of the precise proportions of asphalt binder and aggregates to be blended together to meet the specified properties for the asphalt concrete mix.

261.1.2 .3 Job Mix Formula (JMF)

.1 JMF - the establishment of the single definite percentage passing the 4.75 mm and 75 μm sieve fraction of aggregate and the asphalt binder content that shall produce the desired mix properties under field conditions.

.1 Percentage of constituent materials to be listed on the JMF sheet.

.4 Asphalt Binder Content

.1 Design Asphalt Binder Content - the asphalt binder content established by the DMF.

.2 Approved Asphalt Binder Content - the asphalt binder content determined by the JMF.

.3 Actual Asphalt Binder Content - the amount of asphalt binder in the mix as determined by ASTM D2172 or DTI Asphalt Concrete Quality Assurance Technician Certification Manual, Procedure # 9.

.5 Lot

.1 Lot - a portion of the Work being considered for acceptance and is further defined by the Work Category, described in the following sections:

.1 Work Category 1 – a Lot will be defined as 2400 t \pm 50 t where approved changes to the Job Mix Formula have not occurred.

.1 For loose samples, each Lot shall be divided into 3 approximately equal segments and one sample taken from each segment.

.2 For core samples, each Lot shall be divided into 5 approximately equal segments and one core sample taken from each segment.

.3 If it is the last time the mix is produced with this criterion the following shall apply:

.1 If the plant production is 800 t or less the production shall be added to the Lot.

.1 For plant production of 800 t or less, one additional random loose sample will be obtained.

.2 If the plant production is more than 800 t but less than 2400 t, the production shall be designated as a Lot.

.2 Work Category 2 and Work Category 3 – a Lot will be defined as 1500 t \pm 50 t where approved changes to the Job Mix Formula have not occurred.

.1 For loose samples, each Lot shall be divided into 3 approximately equal segments and one sample taken from each segment.

.2 For core samples, each Lot shall be divided into 4 approximately equal segments and one core sample taken from each segment.

.3 If it is the last time the mix is produced with this criterion the following shall apply:

261.1.2.5.1.2.3

.1 If the plant production is 800 t or less the production shall be added to the Lot.

.1 For plant production of 800 t or less, one additional random loose sample will be obtained.

.2 If the plant production is more than 800 t but less than 1500 t, the production shall be designated as a Lot.

.3 For Work Category 4 – a Lot will be defined as the total tonnage of each mix type placed.

.1 One loose mix sample shall be taken from each lot.

.1 The loose mix sample shall be obtained from the estimated Lot tonnage as directed by the Engineer.

.2 For core samples, each Lot shall be divided into 3 approximately equal segments and one core sample taken from each segment.

~~.43~~ A separate Lot shall be established if, in the Engineer's opinion, conditions of construction indicate that it is likely that a portion of a Lot shall be significantly different from the remainder of that Lot.

~~.54~~ The Contractor may request to end the Lot before the Lot is completed.

.1 The Engineer must obtain one QA sample and results of the QA sample(s) are binding.

.1 No appeals will be allowed.

261.1.2 .6 Stratified Random Sample

.1 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 unbiased way.

.7 Sample Mean

.1 Sample Mean - the arithmetic mean of a set of 3 or more test results constituting the sample.

.8 Mean of the Deviations

.1 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.

.9 Specified Thickness

.1 Specified Thickness - the specified application rate divided by the bulk relative density obtained from the core samples.

261.2 MATERIALS

.1 Material Properties

261.2.1 .1 Asphalt Binder

- .1 Asphalt binder shall be supplied by the Contractor.
- .2 The asphalt binder grade shall be as specified in the Contract Documents.
- .3 Performance Grade (PG) asphalt binder shall meet the requirements of AASHTO M~~332~~~~320~~, Table 1 - Performance Graded Asphalt Binder Specification. [JM1]
 - .1 When the selected WMA technology requires that additives be added to the asphalt binder, acceptance of the asphalt binder shall be based on the samples that contain the WMA additive.
 - .4 When anti-Stripping admixtures are required, the asphalt binder grade shall meet the specified requirements of 261.2.1.1.3, after the addition of the required admixtures.

.2 Coarse Aggregate

- .1 Coarse aggregate shall be supplied by the Contractor.
- .2 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.
- .3 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 261-1.
- .4 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.
- .5 Coarse aggregate may also be accepted or rejected on the basis of past performance.

.3 Fine Aggregate

- .1 Fine aggregate shall be supplied by the Contractor.
- .2 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.
- .3 Fine aggregate shall be the portion passing the 4.75 mm sieve, when tested in accordance with ASTM C117 and C136, and shall meet the physical requirements of Table 261-1.

**Table 261-1
Superpave Asphalt Concrete Mix Requirements**

Sieve Size ASTM Designation	Type B/HRB/WMA-B	Type C/WMA-C	Type D/HRD/WMA-D	
	% (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	100.0	-
	12.5 mm	60.0-87.0	88.0-98.0	100.0
	9.5 mm	51.0-75.0	68.0-90.0	76.0-98.0
	6.3 mm	41.0-66.0	54.0-77.0	60.0-84.0
Fine Aggregate	4.75 mm	34.0-60.0	46.0-69.0	52.0-70.0
	2.36 mm	22.0-50.0	28.0-58.0	36.0-65.0
	1.18 mm	12.0-42.0	20.0-50.0	25.0-55.0*
	600 µm	6.0-32.0	13.0-40.0	16.0-44.0
	300 µm	3.0-20.0	7.0-27.0	8.0-26.0
	150 µm	2.0-8.0	3.0-10.0	4.0-12.0
	75 µm	2.0-6.0 (B)	2.0-6.0	2.0-6.0
		2.0-6.5 (HRB)		

**Note: For 75 gyration mix the percent passing the 1.18 mm sieve shall be 20.0 – 55.0.*

Physical Requirements For Asphalt Concrete				
Air Voids %		3.0-5.0	3.0-5.0	3.0-5.0
VMA % (min) for 100 gyration mix		13.5	14.5	15.5
VMA % for 75 gyration mix		13.5 - 15.0	14.5 - 16.0	15.5 - 17.0
Voids Filled with Asphalt %		70.0-75.0	70.0-75.0	70.0-77.0
TSR (Average of Conditioned & Freeze/Thaw TSR values) % (min) ASTM D4867		80.0	80.0	80.0
Dust to Binder Ratio		0.6-1.2	0.6-1.2	0.6-1.2

Physical Requirements For Coarse Aggregate				
Freeze/Thaw % (max)	DTI Method			
	0.3 to < 3 million Design ESALS	16.0	14.0	14.0
	≥ 3 million Design ESALS	14.0	12.0	12.0
Micro-Deval % (max)	MTO LS - 618			
	0.3 to < 3 million Design ESALS	20.0	16.0	16.0
	≥ 3 million Design ESALS	18.0	15.0	15.0
Petrographic No. (max)*	MTO LS - 609			
	0.3 to < 3 million Design ESALS	250	200	200
	≥ 3 million Design ESALS	230	180	180
Flat & Elongated Particle %(max @4:1)	DTI Method			
	0.3 to < 3 million Design ESALS	25.0	20.0	20.0
	≥ 3 million Design ESALS	20.0	15.0	15.0
Crushed Particles	DTI Method			
	0.3 to < 3 million Design ESALS	60	70	70
	≥ 3 million Design ESALS (min % by wt., one face)	95	95	95
	≥ 3 million Design ESALS (min % by wt., two face)	80	80	80
Absorption % (max)	ASTM C 127	1.50	1.50	1.50

**Note: Not mandatory, the Owner reserves the right to obtain a Petrographic No.*

Table 261-1 continued

Physical Requirements For Fine Aggregate	Type B/HRB/WMA-B	Type C/WMA-C	Type D/HRD/WMA-D
Micro-Deval % (max) MTO LS - 619			
0.3 to < 3 million Design ESALS	22.0	18.0	18.0
≥ 3 million Design ESALS	20.0	17.0	17.0
Uncompacted Void Content % (min) ASTM C1252	45.0	45.0	45.0
NOTE: The allowable Micro-Deval surface Fine Aggregate shall be Max % Loss=19.0, if the Micro-Deval on Coarse Aggregate is ≤12.0, provided that the Coarse Aggregate is from the same source.			

- 261.2.1.3 .4 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.
- .1 Material produced as per 261.2.1.2.4 and passing the 4.75 mm sieve, may be used as fine aggregate.
- .5 Fine aggregate may also be accepted or rejected on the basis of past performance.
- .6 Washed materials shall be stockpiled for at least 24 hours to allow free water to drain from the aggregate and to allow the material to attain uniform moisture content.
- 261.2.1 .4 Blending of Aggregates
- .1 Blending of aggregates shall be allowed only to meet the grading requirements and/or to increase the percentage of crushed particles.
- .2 Blending shall be performed at the asphalt plant cold feed units to produce a consistently graded product.
- 261.2.1 .5 RAP
- .1 If applicable to the Contract:
- .1 RAP shall be supplied by the Owner in designated stockpiles or obtained by the Contractor under Item 208.
- .2 The Contractor shall be responsible for the incorporation of RAP into the asphalt concrete mix.
- .3 The Contractor shall be responsible for collecting 6 RAP samples during the milling operation, spaced equally over the portion of the milling area needed to produce the recycled mix.
- .1 The Contractor shall be responsible to deliver the RAP samples obtained for testing to the Owner's Central Laboratory in Fredericton, during normal working hours.
- 261.2.1 .6 Blending Sand
- .1 Blending sand shall be supplied by the Contractor.
- .2 Blending sand shall be used to obtain acceptable physical asphalt concrete mix properties as outlined in Table 261-1.

- 261.2.1.6 .3 The maximum mass of blending sand to be used in the total asphalt concrete mix shall not exceed 10% of the total mass.
- .4 Blending sand shall have 100% passing the 9.5 mm sieve prior to the introduction into the coldfeed at the plant.

261.2.1 .7 Anti-stripping Admixtures

- .1 Anti-stripping admixtures shall be supplied by the Contractor.
- .1 The requirement for an anti-stripping admixture is determined at the asphalt concrete mix design stage.
- .2 The Owner has approved the following anti-stripping admixtures listed below in ~~Table 261-2~~ for use in the Work.
- Redicote 82-S
 - Redicote C-3082
 - Redicote C-2914
 - Rediset LQ-1102
 - AD-here LOF 65-00
 - AD-here 7700
 - Pave Bond T Lite
 - Travcor 4505
 - Innovalt W
 - Evotherm M1
 - Cecabase RT 2N1

Table 261-2
Approved Anti-stripping Admixtures

Product
Redicote 82-S Redicote C-3082 Redicote C-2914 Rediset LQ-1102
AD-here LOF 65-00 AD-here 7700
Pave Bond T Lite
Travcor 4505
Innovalt W
Evotherm 3G
Cecabase RT 2N1

- .2 The type and dosage of all asphalt binder anti-stripping admixtures shall be noted on the delivery slip.

261.2.1 .8 WMA Materials

- .1 The Contractor shall supply all materials required for production of WMA.
- .2 The Contractor shall obtain from the supplier all information required for the proper preparation, handling, storage and use of their materials.
- .3 The Owner Engineer has approved the following Warm Mix Technologies listed below for use in the Work:
- Evotherm M13G
 - Evotherm-DAT
 - Sonne Warmmix
 - Cecabase RT

- Advera
- Gencor Ultraform GX
- Astec Double Barrel Green Foaming
- Cecabase RT 2N1
- ALmix Foaming Systems
- Meeker Foaming Systems
- Rediset LQ

261.2 .2 Composition of Asphalt Concrete Mix

.1 Asphalt Binder Content

.1 For the purpose of establishing the Unit Price for asphalt concrete the Bidder shall assume an asphalt binder content for the asphalt concrete mix as follows:

- .1 Asphalt Concrete "B": 4.8% of the total specified tonnage.
- .2 Asphalt Concrete "C": 5.7% of the total specified tonnage.
- .3 Asphalt Concrete "D": 6.0% of the total specified tonnage.
- .4 Asphalt Concrete "HRB": 3.1% of the total specified tonnage.
- .5 Asphalt Concrete "HRD": 5.0% of the total specified tonnage.
- .6 Asphalt Concrete "WMA-B": 4.8% of the total specified tonnage.
- .7 Asphalt Concrete "WMA-C": 5.7% of the total specified tonnage.
- .8 Asphalt Concrete "WMA-D": 6.0% of the total specified tonnage.

.2 Mix Design

.1 Responsibility for Design Mix Formula

.1 Preparation and submission of the asphalt DMF for the Owner's approval is the responsibility of the Contractor.

.1 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.

.2 Requirements for Design Mix Formula

.1 The asphalt concrete mix design shall follow AASHTO R35 Standard Practice for Superpave Volumetric Design for Hot-Mix Asphalt (HMA), AASHTO R30-02 Standard Practice for Mixture Conditioning of Hot-Mix Asphalt (HMA) and AASHTO T312 Standard Method for Preparing and Determining the density of Hot-Mix Asphalt (HMA) specimens by means of Superpave Gyrotory Compactor.

.1 The asphalt concrete mix design, at the Design Asphalt Content, shall meet the requirements in Table 261-1 for the Asphalt Concrete Mix Type specified.

.2 The amount of RAP in the hot mixed recycled asphalt concrete base mix shall be 30%±5% of the total weight of the combined materials.

.3 The amount of RAP in the hot mixed recycled asphalt concrete surface mix shall be 15%±5% of the total weight of the combined materials.

.3 Approval of Design Mix Formula / Aggregate Source Approval

- .1 All submissions shall include the Contract number.
- .2 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 sample location, and the type/size of the material.

261.2.2.2.3.2

- .1 Sampling of the aggregates for the DMF/aggregate source approval for the asphalt concrete mix production for the year shall not be undertaken until:
 - .1 At least 30% of each aggregate type is in stockpile, when the tendered Quantity for the mix designation is less than 10 000 t; or
 - .2 At least 2 000 t of each aggregate type is in stockpile, when the tendered Quantity for the mix designation exceeds 10 000 t.
- .2 Sampling of the aggregate shall be done by the Contractor in the presence of the Engineer and delivered to the Owner's Central Laboratory in Fredericton, during normal working hours.
 - .1 The Engineer shall require up to 21 Days from the date the aggregate samples are received at the Owner's Central Laboratory in Fredericton to the date of notification of the evaluation of the material.
- .3 The Contractor shall submit the DMF including the following information/materials to the Engineer for approval at a location(s) designated by the Engineer.
 - .1 A list of all constituent materials, including aggregate source(s), blending sand source(s), asphalt binder source(s), warm mix additive supplier and anti-stripping admixture supplier~~source(s)~~.
 - .2 The average gradation of each aggregate to be used in the asphalt concrete mix.
 - .3 The percentage by mass of each aggregate (including blending sand) to be used in the asphalt concrete mix.
 - .4 The asphalt concrete mix design gradation of the combined aggregate (including blending sand).
 - .5 Other characteristics of the combined aggregate specified in Table 261-1.
 - .6 All Superpave 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.
 - .7 Samples of the aggregate: (8)-18 kg samples of coarse aggregate, (10)-18 kg samples of fine aggregate, (2)-18 kg samples of blending sand, and 0.5 L of anti-stripping admixture, if necessary.
 - .8 A sample of the asphalt binder (4 L/mix).
 - .9 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,

(1)-18 kg sample of blending sand, and 3 L/mix of asphalt binder, shall be required to be delivered to a lab designated by the Engineer.

- .4 The Engineer shall require up to 8 Days from the time of receipt of the DMF, for evaluation by the Owner's Laboratory.
 - .1 The evaluation period shall 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).
 - .1 In case of discrepancy in the bulk relative density values of the aggregates or blending sand(s), the Engineer's results shall prevail.

261.2.2.2.3

- .5 If the DMF does not meet the requirements of Table 261-1 it shall be rejected.
 - .1 The Engineer shall provide a written explanation to the Contractor that details why the DMF failed.
 - .2 The Contractor shall then provide another complete DMF and re-submit it to the Engineer for approval.
- .6 The Engineer shall not accept any asphalt concrete mix produced prior to the Contractor receiving written approval of the DMF from the Engineer.
- .7 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.
 - .1 The Engineer shall deliver the calibration samples to the quality assurance laboratory.
 - .2 The Engineer shall complete calibration of the ignition furnace within 3 Days of approval of the DMF.
- .8 The Contractor shall be responsible to pay the Owner's associated costs if the Contractor submits for evaluation more than one asphalt concrete mix design per Contract conventional mix designation.
 - .1 Testing costs incurred by the Owner shall be charged as per DTI Standard Laboratory Rate Schedule.

261.2.2.2

- .4 Approval of Job Mix Formula
 - .1 The Contractor shall submit the JMF to the Engineer prior to beginning production. The Contractor's submission shall include the following information:
 - .1 The percentage by mass of each aggregate (including blending sand) to be used in the asphalt concrete mix.
 - .2 The percentage by mass passing the 4.75 mm and the 75 μ m sieves of the combined aggregates and blending sand
 - .3 The asphalt binder content as a percentage of the mass of the total mix.
 - .4 The asphalt binder grade and the asphalt binder supplier.

.5 The production and compaction temperature ~~for the lab briquettes~~.

.6 The type of Warm Mix and/or anti-stripping admixture.

.2 The JMF, when compared to the DMF, shall be within the following limits:

.1 $\pm 3\%$ for material passing the 4.75 mm sieve.

.2 $\pm 0.8\%$ for material passing the 75 μm sieve.

.3 $\pm 0.2\%$ for asphalt binder.

261.2.2.2 .5 JMF Adjustments During Production

.1 Adjustments to the JMF shall be submitted to the Engineer prior to the start of Lot production.

.2 The Contractor shall submit a revised DMF in accordance with 261.2.2.2 for a change in source of aggregate used in the asphalt concrete mix.

261.3 SUBMITTALS

.1 The Contractor shall submit, in writing, the proposed source(s) of supply of coarse aggregate and fine aggregate for approval by the Engineer.

.2 The Contractor shall notify the Engineer 3 Days in advance of the commencement of the production of asphalt concrete mix.

.3 The Contractor shall submit in writing, the proposed supplier of the asphalt binder.

.1 The Contractor shall supply, upon request, a sample of the asphalt binder (2 L/mix) and a sample of any proposed admixture(s), in a volume proportional to the asphalt binder sample.

.2 The Contractor shall supply, upon request, the optimum mixing and compaction temperature, for PG asphalt binders.

.3 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.

.4 If the source of supply of the asphalt binder changes during the Work, the Contractor shall submit in writing the proposed change prior to using the new asphalt binder supply in the Work.

.4 Other submittals are required for this Item and are contained within the sections applicable to the specific phase of the Work being undertaken.

.5 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

261.4 CONSTRUCTION

261.4 .1 General

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

261.4 .2 Equipment

261.4.2 .1 General

- .1 Equipment shall be designed and operated to produce an end product complying with the requirements of this Specification.
- .2 Equipment used shall be of adequate rated capacity and shall be in good working order.

261.4.2 .2 Mixing Plant

- .1 The asphalt mixing plant and its components shall meet the requirements of ASTM D 995 and the Contract Documents.

261.4.2 .3 Placing Equipment

- .1 Mechanical self-powered pavers shall be capable of spreading mixture true to line, grade and cross-Slope.
- .2 Pavers shall be equipped with hoppers and distributing screws to place mixture evenly in front of the screeds.
- .3 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.
 - .1 Screeds shall be equipped with heaters which are capable of preheating the entire screed and screed extensions.
- .4 The Contractor shall provide a 3 m straight edge with each paver.
- .5 Pavers shall be equipped with automatic screed controls.
 - .1 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.
 - .2 The Contractor shall use a minimum 12 m ski/floating beam or an approved equivalent for longitudinal grade control.
 - .1 A joint matching shoe may be used to control longitudinal grade of subsequent mats placed adjacent to the original mat.
 - .3 A calibrated Slope indicator shall be installed in a readily visible location on each paver.
- .6 Longitudinal grade control shall be used on all lifts.
- .7 Vibrating hydraulic screed extensions and vibrating bolt-on screed extensions shall be used in placing mat widths greater than 3 m.

- .1 Hydraulic strike-off extensions are only acceptable when laying mats of irregular widths outside of the driving Lanes.
- .2 Screed cut off shoes may be used when placing widths less than 3 m.

261.4.2 .4 Compaction Equipment

- .1 Compaction Equipment shall consist of at least one of each of the following:

- .1 Vibratory roller having a minimum mass of 8 t.

- .1 Paving in echelon on the driving lanes shall require the use of two vibratory breakdown rollers.

- .2 When the rate of placement exceeds 250 tonnes per hour (tph), the Contractor shall use two vibratory rollers.

261.4.2.4.1 .2 Pneumatic-tired roller.

- .1 A combination steel-drum vibratory/pneumatic tire roller may be used in place of the vibratory and pneumatic rollers.

- .2 Paving in echelon on the driving lanes shall require the use of two pneumatic-tired rollers.

- .3 Steel-drum tandem finish roller.

- .1 Use of a steel-drum finish roller on base courses shall be optional.

- .2 All rollers with rubber tires shall be equipped with a means to prevent the asphalt mix from adhering to the rubber tires.

- .1 Hydrocarbon fuels or solvents shall not be used.

261.4.2 .5 Material Transfer Vehicle (MTV)

- .1 Material transfer vehicles shall be used for placement of asphalt concrete, and shall be self-propelled equipment capable of transferring asphalt concrete from the hauling equipment into the paver, and shall have the following characteristics:

- .1 Minimum storage capacity of 20 t;

- .2 A conveyor system to transfer asphalt concrete from the hauling equipment to the paver hopper insert; and

- .3 An auger system in the MTV or paddle mixers in the hopper insert to remix the asphalt concrete prior to discharge from the hopper insert.

261.4 .3 Production and Placement of Asphalt Concrete Mix

261.4.3 .1 Production of Mix

- .1 Asphalt concrete shall meet the requirements of Table 261-7.

- .2 For the plant mix, the TSR shall meet the requirements of Table 261-1.

- 261.4.3 .2 Trial Mix
- .1 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.
- 261.4.3 .3 Mixing and Temperatures
- .1 Mixing temperature for all types of plants shall be such that the temperature of the asphalt 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.
 - .1 The maximum mixing temperature for hot mixed asphalt concrete shall be 165°C or the temperature recommended by the asphalt binder supplier.
 - .2 The maximum temperature of the WMA mix shall be as specified by the WMA additive supplier.
- 261.4.3.3 .2 The heating of the asphalt mix shall be controlled to prevent the fracture of the aggregate and damage to the asphalt binder.
- .1 The system shall be equipped with automatic burner controls and shall provide a printed record of the mix temperature at discharge.
 - .2 The asphalt binder recovered by extraction from the asphalt mix shall meet the requirements of the Pressure Aging Vessel (PAV) as specified in AASHTO M332329, Table 1 - Performance Graded Asphalt Binder Specification.
- .3 Overnight storage in silos shall not be permitted.
 - .4 Reclaimed asphalt concrete shall not be exposed to direct flame during and/or after introduction into the plant.
 - .5 Moisture Content:
 - .1 The maximum moisture content allowed in the asphalt concrete mix as it is discharged from the mixing unit shall be 0.10%.
 - .2 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.
 - .6 During paving operations the Contractor shall produce only the asphalt mix(es) identified in the Contract.
 - .7 When producing Hot Recycled Asphalt, the Contractor shall submit the daily production summary from the plant operating system detailing the following daily mix proportions:
 - .1 The virgin combined aggregate, from the belt scale.
 - .2 The Recycled Asphalt Pavement (RAP), from the belt scale.
 - .3 The amount of virgin asphalt binder incorporated into the mix, from the AC pump.
- 261.4.3 .4 Transportation of Asphalt Concrete

- .1 Trucks for transporting asphalt concrete shall have tight, metal boxes free of foreign materials.
- .2 Loads shall be covered with tarpaulins of sufficient size to overhang the fully loaded truck boxes and be tied down on three sides and the front shall be tight to the box of the truck or shielded to prevent air infiltration.
- .3 Truck boxes may be lightly lubricated with an environmentally acceptable release agent, as required, but must be raised and drained after each application and before loading.
 - .1 Hydrocarbon fuels or solvents shall not be used.
- .4 Tarpaulins shall be rolled back and the hot asphalt concrete shall be uncovered immediately prior to dumping the load into the paver.

261.4.3 .5 Timing of Paving Operations

- .1 Paving operations shall not commence in the spring until the DTI weight restrictions are lifted or continue after the dates specified in Table 261-3 without written permission of the Engineer.

**Table 261-3
Cut-off Dates for Paving**

County	Surface mixes	Base mixes
Gloucester, Madawaska, Restigouche, Victoria	October 07	October 22
All others	October 22	October 31

- .2 Paving operations shall only be conducted during Daylight hours unless specifically altered by written approval of the Engineer.
- .3 The placement of the new asphalt concrete mix shall commence within 14 Days of the commencement of the cold milling operation and shall continue on a daily basis until the entire milled surface has received a lift of asphalt concrete.
- .4 When the RAP is being reused in a recycled asphalt concrete mix, the placement of the asphalt concrete shall commence within 21 Days of the commencement of the cold milling operation and shall continue on a daily basis until the entire milled surface has received a lift of asphalt concrete.

261.4.3 .6 Placing Asphalt Concrete

- .1 The Contractor shall place asphalt concrete on a dry surface.
 - .1 Asphalt concrete shall not be placed under adverse weather conditions of precipitation.
 - .2 When placing asphalt concrete surface mix, the surface temperature of the material to be overlaid shall be a minimum of 5°C.
- .2 When paving on Aggregate Base, the Aggregate Base must be free from standing water.

- .3 All prepared surfaces shall be cleaned of loose or foreign material prior to placing of the asphalt concrete.
 - .1 Milled and aged asphalt concrete surfaces shall be treated with bituminous tack coat in accordance with Item 259 prior to the placing of asphalt concrete.
 - .4 Existing approaches to railway crossings and Bridge Structures, or areas adjacent to paved surfaces or other Structures, shall be removed to the depths shown on the Contract Documents or as directed by the Engineer.
 - .1 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.
 - .5 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 asphalt concrete.
- 261.4.3.6
- .6 The temperature prior to initial compaction shall be:
 - .1 A minimum of 115°C for hot mixed asphalt concrete.
 - .2 A minimum of 90°C for warm mixed asphalt concrete.
 - .7 The maximum temperature of the hot mixed asphalt concrete shall be 165°C or the temperature recommended by the asphalt binder supplier.
 - .8 The maximum temperature of the WMA behind the screed shall be 125°C.
 - .1 The allowable maximum temperature of the WMA behind the screed may be increased for Work after October 1st, if approved by the Engineer.
 - .2 The temperature shall be checked with a calibrated stem thermometer or temperature probe.
 - .9 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.
 - .10 Irregularities in alignment and grade along the outside edge of the asphalt concrete shall be corrected by the addition or removal of asphalt concrete before the edge is rolled.
 - .11 The cross slope of the asphalt 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.
 - .12 In narrow base widening, deep or irregular sections, intersections, turn-outs or driveways where it is impractical to spread and finish asphalt concrete by machine methods, the asphalt concrete shall be spread by hand in accordance with standard hand placement practices.
 - .13 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.

- .1 Driveway entrances and aprons shall be paved concurrently or after the machine laying operation of the regular mat.
- .14 Spreading of asphalt 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.
- .15 Adjacent asphalt concrete mats, including those placed on Shoulder(s), shall be completed to within 100 m of approximately the same location at the end of each Day's paving.
 - .1 For each occurrence that adjacent asphalt concrete mats are not completed to within 100 m per 261.4.3.6.15, the Contractor shall pay the Owner a penalty of \$1000 per occurrence.
 - .1 The penalty may be waived, if the Engineer deems the occurrence to be no fault of the Contractor.
 - .2 Such occurrences shall include but not necessarily limited to mechanical breakdowns and weather.
- .16 For ESAL counts equal to or greater than 3 million, no traffic shall be permitted on newly placed asphalt concrete until finish rolling is complete, and the finished mat has been permitted to cool to 60°C.
 - .1 Water required to lower the mat temperature shall be supplied in accordance with Item 191.
- .17 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.
- .18 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.
- .19 The speed of the paver shall be matched to the production of the asphalt plant to ensure continuous operation of the paver.

261.4.3 .7 Padding

- .1 Padding shall not be included as part of a Lot.
 - .1 Material for padding shall be the same asphalt concrete mix designation as specified in the Contract Documents.
 - .2 Asphalt concrete for padding shall be placed by means of a self-powered paver or by other methods approved by the Engineer.
 - .3 The compaction Equipment shall be in accordance with 261.4.2.4.
 - .1 For padding, 261.4.5.4, 261.4.5.5, 261.4.5.6 and 261.4.5.8 shall not apply.
 - .2 The Contractor shall establish a rolling pattern to achieve the maximum compaction of the asphalt concrete used for padding.

- .4 Padding is intended to be a separate operation and shall not be done as part of the construction of the subsequent lift of asphalt concrete.
- .5 For padding, loose mix sampling will be done at a rate of one sample per 500 tonnes of mix to determine the actual binder content.
 - .1 A minimum of one sample shall be obtained for quantities less than 500 tonnes.

261.4.3 .8 Driveways and Aprons

- .1 Material placed in driveways and aprons shall only be included as part of a Lot when paved concurrently with the main lanes.
- .2 Asphalt Concrete D or WMA-D to be used for driveways shall be approved by the Engineer.
- .3 A transverse key joint or straight vertical joint shall be constructed at each paved driveway and shall meet the requirements of 261.4.3.9.3.
- .4 Asphalt placed in driveways shall match the existing thickness of the driveway or apron, as approved by the Engineer.
- .5 If required, preparation of the driveway shall be paid under Item 812, with the exception of the work identified in 261.4.3.8.3.
- .6 For asphalt placed in driveways and aprons, the requirements of 261.4.3.6.1.2 shall not apply.

261.4.3 .9 Joints

261.4.3.9 .1 General

- .1 Joints shall be constructed to ensure thorough and continuous bond, and to provide a smooth riding surface.
- .2 Dirt or other foreign and loose material shall be removed from the faces against which joints are to be made.
- .3 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.

261.4.3.9 .2 Transverse Construction Joint

- .1 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 shall permit the asphalt concrete to cool.
 - .1 Below 115°C for hot mixed asphalt concrete.
 - .2 Below 90°C for warm mixed asphalt concrete.
- .2 Where the asphalt concrete surface and/or base course has been terminated due to the conditions noted in 261.4.3.9.2.1, a smooth 1.5 m long taper shall be paved.

- .3 When paving resumes, tapers from surface courses previously laid shall be cut back to full mat thickness to expose fresh, straight vertical surfaces, free from broken or loose material and tacked in accordance with 259.2, 259.3 and 259.4.

261.4.3.9 .3 Transverse Key Joint

- .1 When the elevation of the new asphalt concrete pavement is higher than the existing pavement, a transverse key joint shall be constructed per Standard Drawing 261-1 between the existing and new asphalt concrete pavement, at the beginning and at the paving limits and other locations, as determined by the Engineer.
 - .1 If a transverse key is cut in advance of paving the joint area, the Contractor shall immediately construct with hot mixed asphalt concrete a smooth ~~4.5 m~~ long taper at the joint area, as shown in Standard Drawing 261-1.
 - .2 Prior to the placement of the asphalt concrete, all transverse key joint surfaces shall be cleaned of loose foreign material and a tack coat applied in accordance with 259.2, 259.3, and 259.4.
- .2 When the elevation of the new asphalt concrete Pavement is at the same elevation as the existing pavement, a straight vertical surface equal to the thickness of the new asphalt Pavement shall be constructed between the new lift of Pavement at the beginning and at the end of the project and other locations where the new pavement terminates against an existing pavement.

.3 When the entire thickness of asphalt is removed, a transverse key joint shall be constructed in accordance with Standard Drawing 261-2.

261.4.3.9 .4 Longitudinal Joint

- .1 The following requirements shall apply when constructing longitudinal joints.
 - .1 Widths of succeeding individual courses shall be offset by 50-100 mm.
 - ~~.2 Contractors using a one paver operation between May 15th and September 15th may leave an exposed longitudinal joint for up to one-half of the day's production without an application of tack coat unless otherwise directed by the Engineer. All longitudinal joints shall receive an application of tack coat in accordance with 259.2, 259.3 and 259.4.~~
 - ~~.1 Before May 15th and after September 15th the Contractor shall be required to tack the longitudinal joint in accordance with 259.2, 259.3 and 259.4.~~
 - ~~.3 All longitudinal joints left exposed overnight or which are exposed to moisture shall receive an application of tack coat in accordance with 259.2, 259.3 and 259.4.~~
 - .34 Longitudinal joints shall not be permitted between the edges of driving Lanes in the final lift of asphalt concrete.
 - ~~.45~~ Longitudinal joints shall be constructed to ensure that maximum compression under rolling is achieved.
 - ~~.56~~ 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.

261.4.3 .10 Compaction of Asphalt Concrete

- .1 If damage to Highway components and/or adjacent property is occurring while using vibratory compaction Equipment, the Contractor shall immediately cease using this Equipment and proceed with the Work using static rolling Equipment.
- .2 Along curbs, manholes and similar Structures and places not accessible to full size rollers, the mixture shall be compacted with either smaller compactive Equipment, such as vibrating plate tampers, or by hand tampers.

261.4.3 .11 Additional Requirements for Bridge Deck Paving

- .1 The Contractor shall place asphalt concrete on the deck waterproofing system in accordance with the waterproofing manufacturer's recommendation and/or procedures.
- .2 The Contractor shall be responsible for all damage to the waterproofing membrane resulting from any aspect of the paving operation.
 - .1 Should the membrane become damaged, paving operations shall be immediately stopped and repairs made, in accordance with the manufacturer's instructions, before paving recommences.
- .3 Expansion joints and deck drains shall be protected from damage from Equipment passing over them.
 - .1 The placing of the asphalt concrete at expansion joints shall be completed as indicated on Standard Drawing 261-30-2.
- .4 The Contractor shall submit a rolling pattern for the approval of the Engineer.
- .5 A steel-drum tandem roller, operating in the non-vibratory mode and exerting a contact pressure on compression roll of at least 3.0 kg/mm of drum width shall be the breakdown roller required for Bridge deck paving.
- .6 The breakdown roller shall be required to run off the deck to stop and turn.
- .7 After breakdown rolling, the mat shall be rolled with a pneumatic tired roller, taking care not to displace the mat when stopping or turning.
- .8 The mat shall be finish rolled to remove any marks.
- .9 For Bridge decks, 261.4.5.4, 261.4.5.6 and 261.4.5.8 shall not apply.

261.4 .4 Quality Control Testing

.1 General

- .1 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.

.2 Inspection Testing Plan (ITP)

- .1 The Contractor shall submit, upon request, 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 10 Days after the Contract award.
- .2 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.
- .3 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.
- .4 Once accepted by the Engineer the plan becomes a part of the Contract and shall be enforced accordingly.
- .5 The ITP may have to be updated and revised, by the Contractor, as conditions warrant.

261.4.4 .3 Sampling and Test Results

- .1 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.
- .2 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.
- .3 The Contractor shall maintain records of all inspection and tests.
 - .1 Results of all quality control tests shall be available for examination by the Engineer at all times and copies shall be provided if requested by the Engineer.

261.4.4 .4 Asphalt Compaction Rolling Pattern

- .1 For each asphalt concrete mix type the Contractor shall establish a rolling pattern using a nuclear gauge or equivalent. Upon completion of the rolling pattern the Contractor shall immediately submit a copy to the Engineer.

261.4 .5 Quality Assurance Testing and Adjustments

261.4.5 .1 General

- .1 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.
 - .1 While the Contractor shall be fully and exclusively responsible for producing the end product, acceptance testing is the responsibility of the Engineer.
 - .2 For Work Category 1 acceptance testing is the responsibility of the Engineer and shall incorporate the quality control test results from the Contractor with the quality assurance test results from the Engineer in accordance with this Item.
 - .3 For Work Category 1 the Engineer shall perform the quality assurance testing and the Contractor shall perform the quality control testing.
- .2 Certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied.

- .1 The Engineer and the Contractor shall test for compliance with these requirements as described in 261.4.5.
- .2 The test methods indicated in Table 261-4 shall be used to determine material characteristics.

**Table 261-4
Test Methods**

Test Description	Test Method
Sampling Mixes	ASTM D 979
Coring	ASTM D 5361
Ignition Method	DTI Asphalt Concrete Quality Assurance Technician Certification Manual, Procedure # 9
Percent Fracture	DTI Method
Sieve Analysis	ASTM C 136/ASTM C 117
Bulk Relative Density	ASTM D 2726
Theoretical Maximum Relative Density	AASHTO T209
Voids Calculations, Asphalt Concrete Specimens	ASTM D 3203
Forming Superpave Specimens, Field Method	AASHTO T 312
Moisture Content, Oven Method Asphalt Concrete Mix	ASTM D 2172
Smoothness of Pavements, Profiler Method	ASTM E 950
Stratified Random Test Sites for A.C.P. 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
	AASHTO T 48 or ASTM D 92 AASHTO T316 or ASTM D 4402 AASHTO T315 AASHTO T 240 AASHTO R28 AASHTO T313
TSR (Average of Conditioned & Freeze/Thaw TSR values)	ASTM D 4867
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.	

- 261.4.5.1 .3 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.
 - .1 Such inspections and tests shall not relieve the Contractor of his/her responsibilities to control quality.
 - .2 The Engineer's approval of any materials or mixture shall in no way relieve the Contractor from her/his obligation to provide materials, mixtures and workmanship in accordance with the Specifications.
- 261.4.5.1 .4 The loose mix and core samples shall be taken by the Contractor in the presence of the Engineer.
 - .1 The random locations shall be determined by the Engineer.
 - .2 ~~The Engineer will label the loose mix samples, and the Contractor shall transport them to the Owner's laboratory once all of the loose samples have been obtained~~

~~for the Lot~~The Contractor shall be notified of the random location when the truck containing the target tonnage has arrived on-site.

.1 The Engineer shall notify the Contractor of the upcoming loose mix sample approximately 30 minutes prior to the target tonnage arriving on site.

.2 If the Contractor is not available to obtain the sample, the truck shall be parked at the paving site until it can be sampled.

.3 Once the truck has been identified for sampling the mixture from the identified truck shall become part of the Lot.

.4 Failure to provide a loose mix sample at the target tonnage will result in rejection of the segment.

.1 The samples collected from the remaining segments will be combined to evaluate the remainder of the Lot.

.3 The Engineer shall be responsible for labelling the loose mix and ~~cores~~ samples.

.4 The Contractor shall be responsible for the storage and transportation of the loose mix and cores samples to the Owner's Laboratory designated QA laboratory, within 2 hours of coring, for testing 36 hours of the completion of the Lot.

.1 The maximum may be extended to include Saturdays, Sundays and holidays when applicable.

.2 For each occurrence that the loose mix and core samples are not delivered per 261.4.5.1.4.4, the Contractor shall pay the Owner a penalty of \$1000 per Day.

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

.5 The Engineer shall provide the Contractor with a copy of the results of acceptance tests within one working Day of their availability.

~~.6 The QA results for the loose mix samples shall not be reported to the Contractor until the QC results for that Lot have been reported to the Engineer. will be reported to the Contractor once they are available, provided the cores have been delivered to the DTI lab.~~

.1 For Work Category 1, the quality control testing shall be performed by a technician who has successfully completed the NBDTI certification program.

.2 For Work Category 1, the quality control testing equipment shall be verified and approved by the Engineer before plant production begins.

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

.8 Random sampling methods shall not be applied to the following areas:

.1 Areas of obvious surface defects shall be marked and repaired in accordance with 261.4.5.11.2.

- .2 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.
- .9 The procedure for dealing with an outlier test result shall be as follows:
 - .1 When an individual test result from a Lot is questionable, the validity of the test result in question shall 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.
 - .1 An appeal is required before the Outlier Test applies.
 - .2 If the outlier test procedure shows that the challenged test result is valid then the test result shall be used in the calculations.

261.4.5 .2 ~~For~~ Work Category 1

- .1 For Work Category 1, quality assurance testing shall be done on a delayed basis for every Lot on the Contract.
- .2 If the results for a given Lot are within the tolerances stated in Table 261-5, the quality control and quality assurance ~~mean of deviations, established from the~~ test results, shall be combined together to establish the mean of deviation for payment adjustment.
- .3 The tolerance referred to in Table 261-5 is the sample mean difference for each mix characteristic between the quality control and quality assurance test results. The sample mean is defined in 261.1.2.7.

**Table 261-5
Acceptance Tolerance for Combining QA and QC Lot Test Results**

Mix Characteristics	Acceptance Tolerance Between QA and QC Test Results	
	Base Mix	Surface Mix
Air Voids	± 0.70	± 0.60
Binder Content	± 0.30	± 0.20
4.75 mm	± 5.0	± 3.0
75 µm	± 0.50	± 0.40
Note: The Mix Characteristics in Table 261-5 are based on the averagessample mean of the Lot test results.		

- .4 If any of the mix characteristics are outside the acceptable tolerance in Table 261-5, the acceptance test results for that mix characteristic shall be calculated using only the quality assurance test results.
- .5 If any of the control characteristics of a Lot is outside the acceptance limits as listed in Table 261-7 then the Lot shall be rejected automatically regardless of the values of the other control characteristics.

261.4.5 .3 ~~For~~ Work Category 2 and Work Category 3

- .1 For Work Category 2 and Work Category 3, quality assurance testing shall be done on a delayed basis for every Lot on the Contract
- .2 For Work Category 2 and Work Category 3, one sample will be selected from each Lot using random numbers and it will be tested for quality assurance.

- .1 If the test results from the selected sample meet the criteria in Table 261-6, no further testing will be required and the Lot will be paid at 100%.

**Table 261-6
Acceptance Criteria**

Test Properties	Criteria
Air Voids	2.50% - 5.00%
Asphalt Binder Content	JMF \pm 0.40
Percent Passing 4.75 mm Sieve	JMF \pm 6.0
Percent Passing 75 μ m Sieve	JMF \pm 1.0
<u>Maximum Percent Passing 75 μm</u>	<u>6.5%</u>

- .2 If the test results from the selected sample do not meet the above criteria, the Owner will test the remaining samples from the Lot. The Owner will test all mix characteristics per Tables 261-9, 261-10 and 261-14.

- .3 A Sample Mean or the Mean of Deviations for the combined test results will be determined, and this value will be used for acceptance and Unit Price Adjustment per Tables 261-9, 261-10 and 261-14.

261.4.5 .4 Work Category 4

- .1 For Work Category 4, the QA results for the loose mix samples will be reported to the Contractor once they are available.
- .2 The Lot sample shall meet the criteria in Table 261-6.
- .3 If the test results from the Lot sample do not meet the criteria in Table 261-6, the Unit Price Adjustments per Tables 261-9, 261-10 and 261-14 shall apply.
- .4 The maximum percent passing the 75 μ m from Table 261-6 shall not apply.

261.4.5 .54 Asphalt Density

- .1 Density testing shall be based on a Lot average method.
- .2 Pavement samples shall be taken on the road by coring using stratified random sampling procedures.
 - .1 For Work Category 1, five samples per Lot shall be selected, one from each of five segments of approximately equal length.
 - .2 For Work Category 2 and Work Category 3, four samples per Lot shall be selected, one from each of four segments of approximately equal length.
 - .3 For Work Category 4, three samples per Lot shall be selected, one from each of the three segments of approximately equal length.
 - .4 In each segment a test site shall 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.
 - .54 In no case shall a lateral distance be less than 0.3 m from the edge of a mat.

.~~65~~ Cores shall not be taken in the Shoulder area where only a single lift of asphalt concrete surface mix is placed, for which the Contractor shall establish a rolling pattern to achieve the maximum compaction of the asphalt concrete.

.~~76~~ Cores shall not be taken within 25 m of a loose sample location.

.~~87~~ Cores shall be obtained in accordance with ASTM D5361, within 24 hours after the placement of the Lot.

.1 The maximum may be extended to include Saturdays, Sundays and holidays when applicable.

.2 The Engineer may allow cores to be obtained within 12 hours after asphalt concrete placement.

.3 The percent density of a Lot shall be determined by comparing the average of the core densities with the average of the Theoretical Maximum Relative Density of the loose samples.

261.4.5 ~~.65~~ Asphalt Content, Gradation and Air Voids

.1 Loose samples shall be taken on the road behind the paver before compaction, or from the MTV discharge using an approved hopper, with 3 samples per Lot selected as follows:

.1 A Lot shall be divided into 3 segments of approximately equal quantity.

.2 For each segment random numbers shall be used to determine the tonnage at which to obtain the sample.

.3 Each sample shall be split in two equal portions, one portion shall be tested, and the other shall be set aside in the event that an appeal is requested by the Contractor.

~~261.4.5.5~~ .2 If the plant production is 800 t or less, one additional random loose sample shall be obtained, and the production shall be added to the previous Lot.

261.4.5 ~~.76~~ Smoothness

261.4.5.~~76~~ .1 General

.1 The smoothness requirements shall be specified in the Contract Documents.

261.4.5.~~76~~ .2 IRI Smoothness

.1 Definitions

.1 Roadway Smoothness Category

.1 The smoothness category that applies for a particular section of roadway will be classified as either Category A, ~~or~~ Category B ~~or Category C~~. Roadway categories are determined solely at the Owner's discretion based on a number of factors, including but not necessarily limited to: roadway classification, geometry, access points (intersections, driveways), rehabilitation strategies and the presence of other physical features that may impact the ability to achieve pavement smoothness.

.2 International Roughness Index (IRI)

- .1 IRI is a statistical measurement used to determine the amount of roughness in a measured longitudinal profile. IRI shall be measured in mm/m and reported to two (2) decimal places for all procedures relating to this specification.

.3 Reporting Interval

- .1 The reporting interval for this specification shall be 100 metres for overall IRI, and 10 metres for localized roughness.

.4 Localized Roughness

- .1 Localized roughness is reported in 10 metre intervals where the IRI exceeds an established value as set out in Table 261-12, for a particular roadway category.

.5 Segment

- .1 A segment of roadway shall be defined by the full lane width 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 261.4.5.6.2.4.3.

.6 Project Chainage

- .1 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.

261.4.5.76.2

.2 References

- .1 This specification refers to the following standards, specifications or publications:
- ASTM E 950 Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference

.3 Equipment

- .1 A Class 1 Inertial Laser Profiler, with moving average filter (high pass 90 m and low pass 0.3 m), shall be used for all smoothness measurements. The equipment shall be installed and operated in accordance with the manufacturer's recommendations and ASTM E 950.

.4 Smoothness Testing Procedures

- .1 The Owner will conduct smoothness testing in accordance with ASTM E 950. The Owner's smoothness testing results will be used in determining payment adjustments and areas requiring corrective work.
- .1 Smoothness testing will be carried out as soon as possible upon completion of the paving operation.

.2 Profile Measurements

- .1 The profiler will record the right and left wheel path IRI values simultaneously at 10 metre intervals. The final IRI readings will be reported at 10 metre intervals. The 100 metre interval averages will then be computed from the 10 metre interval average IRI values.

.3 Exclusions

- .1 The 10 metre segments at both ends of the section under contract shall be excluded from smoothness calculations. Bridges, underpass and overpass structures located within any 10 metre segment, including the 10 metre segments immediately before and after the structure shall be excluded from payment adjustments.
- .2 Areas requiring hand work, tapers, intersections, gore areas, aprons, etc. shall be excluded.
- .3 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, will be excluded from payment adjustments.

261.4.5.76 .3 Bump/Dip Profile Requirement

- .1 Individual bumps/dips exceeding 8.4 mm as detected by the profiler shall be subject to payment adjustment as described in 261.5.3.
- .2 The Bump/Dip profile requirements shall apply to interchangeall ramps.

261.4.5 .87 Asphalt Binder

- .1 Asphalt binder samples shall be obtained and packaged as follows:
- .1 Samples shall be a minimum size of one litre and shall be taken from the Contractor's storage tank in accordance with ASTM D 140.
- .1 The sample containers shall be supplied by the Engineer.
- .2 For Work Category 1, the Contractor shall obtain one asphalt binder sample per ~~10-8000 t of asphalt concrete mix production, taken in accordance with ASTM D140 from the Contractor's asphalt binder storage tank(s).~~
- .3 For Work Category 2, ~~and~~ Work Category 3 and Work Category 4, the Contractor shall obtain one asphalt binder sample per Contract.
- .4 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.
- .5 If a sample test result falls outside of the material requirements specified in 261.2.1.1, the Engineer may require that the Contractor suspend the asphalt concrete mix production.
- .1 Compliance shall be verified by the Engineer before the asphalt concrete mix production is allowed to continue.

261.4.5 ~~.98~~ Thickness

- .1 The Contractor shall place the asphalt concrete in lifts at the thickness indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 For Work Category 1, thickness shall be evaluated on a Lot by Lot basis.
- .3 For Work Category 1, the Pavement thickness shall be determined from the test results of the cores obtained according to 261.4.5.4.
 - .1 If the thickness does not meet the requirements of Table 261-7 then the deficient area shall be repaired as indicated in 261.4.5.11.
- .4 For Work Category 2, ~~and~~ Work Category 3 and Work Category 4, the asphalt concrete thickness shall be controlled by the Owner.

261.4.5 ~~.109~~ Surface Defects

- .1 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 3mm as measured with a 3 m straight edge.
- .2 Any obvious defects, as determined by the Engineer, shall be cause for rejection of the Pavement course.
 - .1 Multiple defects within a 10 metre section shall be considered as one defect.
 - .1 If a defect is continuous beyond 10 metres it shall be considered as one defect.

~~261.4.5.9~~

- .3 Such defects shall include but not necessarily be limited to the following:
 - .1 Segregated areas;
 - .2 Ravelling;
 - .3 Roller marks;
 - .4 Cracking or tearing;
 - .5 Improper matching of longitudinal and transverse joints;
 - .6 Tire marks;
 - .7 Sampling locations not properly reinstated;
 - .8 Improperly constructed patches;
 - .9 Contaminant spills on the mat;
 - .10 Flushed Areas; and
 - .11 Pneumatic-tired roller pickup.

**Table 261-7
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)	All	N.A. N.A.	0.00 – 0.40 0.00 – 0.30	0.41 – 0.65 0.31 – 0.50	> 0.65 > 0.50
Gradation (%) (Mean of Deviations of Lot from JMF) (See Note 1)	B, HRB, WMA-B: (4.75 mm) (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
	C, D, HRD, WMA-C, WMA-D: (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.	4 of 5	N.A.	3 of 5
Air Voids (%) (Mean of Deviations from Target Value of 4.0%)	All	N.A.	1.00	1.01 - 2.00	> 2.00

NOTES: 1) Additional Requirements for Gradation [for Work Category 1, Work Category 2 and Work Category 3:](#)

- a) If the average of Lot test results for the 4.75 mm sieve size falls outside the gradation limits of Table 261-1, the Lot shall be rejected.
- b) If the average of Lot test results for the 75 µm sieve size exceeds 6.5%, the following shall apply:
 - 6.6% to 7.5% the Lot Payment shall be reduced by \$5.00/t;
 - >7.5%, the Lot shall be rejected.
- c) For Work Category 2 and Work Category 3, when the 75 µm sieve size exceeds 6.5% for the selected sample, the remaining samples shall be tested for percent passing the 75 µm sieve size. If the average for all samples exceeds 6.5% refer to Note 1b.

2) Specified Thickness for Work Category 1:

- a) Specified Thickness = specified application rate ÷ bulk relative density obtained from core samples.
- b) Lift Thickness Tolerance by Type of Mix
 - Tolerance = 0.80 x Specified Thickness (HRB)
 - Tolerance = 0.85 x Specified Thickness (B, C, D)
- c) If the thickness of either lift of base mix is less than the tolerance, the Contractor shall place the next lift of asphalt 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.
- d) If the thickness of the surface lift is less than the tolerance, the total thickness of all lifts for the deficient Lot shall be verified by coring all the lifts in the area of the deficient Lot.

~~3) For Contracts with ≤ 3 million ESAL, a rejected Lot will be paid at 50% of the Contractors Unit Price.~~

261.4.5 ~~.110~~ Appeal of Lot Test Results

- .1 The Contractor may appeal the results of acceptance testing of the density, asphalt content, gradation, air voids and thickness for any rejected or penalized Lot only once.
 - .1 Appeals on density test results shall only be permitted if the original density of the Lot is less than 91.5%.
 - .2 For Work Category 4, the Contractor shall not be permitted to appeal, and the results shall be binding on both the Contractor and the Owner.
- .2 For Work Category 1, the Contractor may appeal the results of any quality assurance mix characteristic(s) from Table 261-5, if the difference between the quality control and quality assurance test results are outside the tolerance listed in Table 261-5, or if the calculated mean of deviation indicates that the Lot will be rejected.
- .3 Appeals shall only be considered for all tests within the Lot.
- .4 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 shall apply.
- .5 The following procedures shall apply for an appeal:
 - .1 The Contractor shall serve notice of appeal to the Engineer, in writing, within 48 hours of receipt of the test results.
 - .2 The Contractor and the Engineer shall agree on a time at which the cores for the appeal of the Lot shall be taken.
 - .1 The cores for the appeal of the Lot shall be taken within 48 hours of the submission of the notice for the appeal.
 - .2 Appeal cores shall be taken at the center of the travelling lane.
 - .3 For Work Category 1, if the density or thickness of the Lot is appealed the Contractor shall take 5 more cores at random locations as determined by the Engineer. These cores shall be tested by the Owner.
 - .4 For Work Category 2 and Work Category 3, if the density of the Lot is appealed the Contractor shall take 4 more cores at random locations as determined by the Engineer. These cores shall be tested by the Owner.
 - .5 If the asphalt content, gradation or air voids is appealed the Engineer shall take the remaining portion of the samples obtained in 261.4.5.5 and test them at the Owner's Central Laboratory in Fredericton.
 - ~~.1 For Work Category 1, all appeal testing shall be conducted at The Contractor shall deliver the appeal samples to the Owner's Central Laboratory in Fredericton.~~
 - ~~.2 For Work Category 2 and Work Category 3, air void appeal testing shall be conducted at the Owner's Central Laboratory in Fredericton. The Contractor shall deliver the Air Voids appeal samples to the Owner's Central Laboratory in Fredericton. All other appeal testing shall be conducted in the Owner's field Laboratory.~~

.6 The Contractor may have a representative present during the period of the testing; the Contractor's representative shall comment on anything concerning the testing which he does not consider to be valid and the Engineer shall respond to all comments in order to resolve them.

.1 Prior to leaving the testing Laboratory any unresolved comments regarding the testing procedures are to be given to the Engineer in writing.

261.4.5.10.5.6

.2 Any comments, with respect to the testing procedures, which are made subsequent to the Contractor's representative leaving the Laboratory, shall not be considered.

.7 For Work Category 1, when the results of the mix characteristics in Table 261-5 are appealed, the following procedures shall apply.

.1 The sample mean of the mix characteristic being appealed shall be calculated for quality assurance, quality control and appeal test results.

.24 If the ~~sample mean~~ appeal test result(s) is closer to the quality assurance ~~sample mean~~ result(s), they shall be combined together to establish the mean of deviation for payment adjustment and the Contractor shall be charged the Owners lab testing fees to cover the cost of the appeal testing as set out in Table 810-1.

.32 If the ~~sample mean~~ appeal test result(s) is closer to the quality control ~~sample mean~~ result(s) they shall be combined together to establish the mean of deviation for payment adjustment at no cost to the Contractor for the appeal testing.

.43 If the ~~sample mean~~ appeal test result(s) is spaced equally between the quality assurance and quality control ~~sample mean test results, all sample mean test results shall be lab, the results from the three labs shall be~~ combined together to establish the mean of deviation for payment adjustment at no cost to the Contractor for the appeal testing.

.54 ~~When the binder content is appealed, an additional \$1,300.00 will be charged to cover the cost of calibrating the ignition furnace~~For thickness appeals, 7 out of 10 test results must meet or exceed the lift thickness tolerance specified in Table 261-7.

.6 The new Lot test results so obtained shall be binding on both the Contractor and the Owner.

.8 The test results from the original Lot shall be combined with the test results of the ~~new samples~~For Work Category 2 and Work Category 3, only the test results from the Owners Central Laboratory shall be used to determine a new mean of deviations for acceptance and Unit Price Adjustment.

.1 ~~A new Sample Mean or the Mean of the Deviations for the combined test results shall be determined and this value shall be used for acceptance and Unit Price adjustment.~~

.2 For Work Category 1 thickness appeals, 7 of the 10 test results must meet or exceed the lift thickness tolerance specified in Table 261-7.

~~.13~~ The new Lot test results so obtained shall be binding on both the Contractor and the Owner.

.9 Analysis of Rejected Lots

- .1 Following an appeal of the entire Lot, in accordance with 261.4.5.10, if the new test results continue to indicate rejection, the new test results will be analyzed, at the discretion of the Engineer, to determine whether or not a portion of the Lot is acceptable.
- .2 An analysis, as determined by the Engineer, will be carried out to determine which segments may be acceptable.
- .3 If the analysis indicates partial Lot acceptance, only those areas corresponding to the sample segment(s) in which rejected material placement occurred shall be subject to 261.4.5.1~~4~~2.2 or 261.4.5.1~~4~~2.3, as determined by the Engineer.
- .4 Any and all price adjustments corresponding to the recalculated test results shall apply.

261.4.5 ~~.124~~ Repairs

261.4.5.1~~24~~ .1 General

- .1 Repairs to correct surface defects shall be carried out by removal and replacement as per 261.4.5.1~~4~~2.2 or routing and crack sealing. The method of repair shall be determined by the Engineer.
- .2 The asphalt concrete used for replacement to correct surface defects shall be the same asphalt concrete mix designation as that which is removed.
 - .1 Any asphalt concrete which does not conform to the requirements of this Item shall not be incorporated in the Work.
- .3 Clause 261.6.7 shall also apply.

261.4.5.1~~24~~ .2 Removal and Replacement

- .1 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.
- .2 All joints shall be tack-coated.
- .3 Repaired areas shall be retested for acceptance; those failing shall be rejected and shall require further repair.
- .4 Material removed shall become the property of the Contractor, who shall dispose of the material outside the Work Site.

261.4.5.1~~24~~ .3 Overlaying

- .1 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 34 mm for a surface course.

- .2 A key shall be constructed at each end of the overlaid section as per Standard Drawing 2610-1.
- .3 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/her own expense and to the satisfaction of the Engineer.
- .4 Repaired areas shall be retested for acceptance.
 - .1 Those failing will be rejected and a second overlay shall not be permitted.
 - .2 The Contractor shall then carry out repairs in accordance with 261.4.5.1+2.
 - .3 Removal depth shall be sufficient to remove the full thickness of the overlay lift and the original unsatisfactory surface lift.

261.5 MEASUREMENT FOR PAYMENT

261.5 .1 General

- .1 The Quantity to be measured for payment shall be the number of tonnes of asphalt concrete placed, in accordance with this Item, subject to payment adjustments.
- .1 For Work Category 1, the Quantity of asphalt concrete for a Lot shall not exceed that calculated as follows:

$$[1.10 \times (\text{application rate}) \times (\text{length}) \times (\text{specified width})] \div 1000$$

261.5 .2 Unit Price Adjustment (UPA) of the Lot

- .1 The UPAs for asphalt concrete are shown in Tables 261-8, 261-9, 261-10 and 261-14.
 - .1 For Work Category 1, the UPAs for asphalt concrete are as shown in Tables 261-8, 261-9, 261-10 and 261-14.
 - .2 For Work Category 2, the UPAs for asphalt concrete as shown in Table 261-9, 261-10 and 261-14 will be subjected to 75% of the values listed and the UPAs in Table 261-8 will be subjected to 100% of the values listed.
 - .3 For Work Category 3, the UPAs for asphalt concrete as shown in Table 261-9, 261-10 and 261-14 will be subjected to 50% of the values listed and the UPAs in Table 261-8 will be subjected to 100% of the values listed.
 - .4 For Work Category 4, the UPAs for asphalt concrete as shown in Table 261-9, 261-10 and 261-14 will be subjected to 25% of the values listed. The positive values in Table 261-8 will be subjected to 100% of the values listed. The negative values in Table 261-8 will be subjected to 50% of the values listed.
 - .1 For Work Category 4, the UPAs for asphalt concrete as shown in Tables 261-8, 261-9, 261-10 and 261-14 shall be limited to the maximum penalty. The rejection criteria shall not apply.
- .2 For asphalt concrete placed on Shoulder areas where a single lift of asphalt concrete surface mix over granulars is specified and on Bridge decks, the UPA as shown in Table 261-8 shall not apply.

- .3 For asphalt concrete placed as padding, driveways and aprons, the UPA as shown in Table 261-8, 261-9, 261-10 and 261-14 shall not apply.
- .4 If repairs are carried out by removal and replacement or overlay of the asphalt concrete, the UPA for the Lot shall be based on quality assurance testing carried out on the repaired Lot.
- .5 The Unit Price (UP) for asphalt concrete base or surface mixes shall be adjusted for each Lot as follows:

$$UP_{Lot} = UP + \Sigma (UPA_{Density} + UPA_{Asphalt\ Content} + UPA_{Gradation} + UPA_{Air\ Voids})$$

261.5 .3 Payment Adjustment for Smoothness

- .1 The Engineer will provide the Contractor with a copy of the smoothness test results, including detailed payment adjustment summaries and mandatory repair requirements.
- .2 Individual bumps and dips shall be assessed in accordance with the schedule set out in Table 261-13.
- .3 For asphalt concrete placed on Bridge decks, the payment adjustments as shown in Tables 261-11, 261-12 and 261-13 shall not apply.

261.5.3 .4 100 Metre Segments

- .1 Payment adjustment for 100 metre segments shall be calculated based on the overall average IRI in mm/m for each 100 metre segment in each lane in accordance with Table 261-11.

.5 Localized Roughness

- .1 With the exception of areas described in 261.4.5.6.2.4.3, each 10 metre segment with an IRI value greater than those shown in Table 261-12 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 payments adjustments for the defined section of roadway.

.6 Total Payment Adjustments

- .1 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, the Contractor shall be assessed the total 100 metre segment payment adjustment, and the total localized roughness payment adjustment for the defined section of roadway.
- .2 If the total 100 metre segment payment adjustment is a negative value, the Contractor shall 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.

.7 Segments Less Than 100 Metres

- .1 For segments less than 100 metres in length, price adjustments shall be determined from 10 metre segments that are not subject to exclusions as described in

261.4.5.6.2.4.3. Payment adjustments under 261.5.3.4 and 261.5.3.5 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 261-11.

**Table 261-8
Unit Price Adjustment For Density (UPAd)**

% 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		

continued next column

**Table 261-9
Unit Price Adjustment For Asphalt Content (UPAa)**

	Mean of the Deviations of Actual Asphalt Content From the Approved Asphalt Content	Unit Price adjustment for Asphalt Content (\$ per Tonne)
Type B/HRB/WMA-B	0.00 to 0.40	0.00
	0.41 to 0.45	-1.00
	0.46 to 0.50	-2.00
	0.51 to 0.55	-3.00
	0.56 to 0.60	-4.00
	0.61 to 0.65	-5.00
	> 0.65	reject
Type C/D/HRD/ WMA-C/WMA-D	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

**Table 261-10
Unit Price Adjustment For Gradation (UPAg)**

Sieve Size ASTM Designation	Mean of the Deviations of the Gradation from the JMF		Unit Price Adjustment for Gradation
	Type B/HRB/WMA-B	Type C/D/HRD WMA-C/WMA-D	\$ per Tonne
4.75 mm	0.0 to 6.0	0.0 to 5.0	0.00
	6.1 to 6.2	5.1 to 5.2	-0.50
	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
<p><u>For Work Category 1, Work Category 2 and Work Category 3, in addition to the above acceptance/rejection requirements for gradation, the following shall apply:</u></p> <p>(a) If the average of Lot test results for the 4.75 mm sieve size falls outside the gradation limits of Table 261-1, the Lot shall be rejected.</p> <p>(b) If the average of Lot test results for the 75 µm sieve size exceeds 6.5%, the following shall apply:</p> <ul style="list-style-type: none"> • 6.6% to 7.5% the Lot Payment shall be reduced by \$5.00/t; • >7.5%, the Lot will be rejected. <p>(c) For Work Category 2 and Work Category 3, when the 75 µm sieve size exceeds 6.5% for the selected sample, the remaining samples shall be tested for percent passing the 75 µm sieve size. If the average for all samples exceeds 6.5% refer to Note 1b.</p>			

**Table 261-11
Payment Adjustment 100 Metre Segments**

IRI (mm/m)	Payment Adjustment for each 100 metre Segment in each Lane		
	Category A	Category B	Category C
0.00 – 0.10	+\$750.00	+\$950.00	+\$1010.00
0.11 – 0.20	+\$670.00	+\$860.00	+\$920.00
0.21 – 0.30	+\$580.00	+\$770.00	+\$830.00
0.31 – 0.40	+\$490.00	+\$670.00	+\$740.00
0.41 – 0.50	+\$400.00	+\$570.00	+\$650.00
0.51 – 0.60	+\$305.00	+\$470.00	+\$560.00
0.61 – 0.70	+\$205.00	+\$370.00	+\$460.00
0.71 – 0.80	+\$100.00	+\$270.00	+\$360.00
0.81 – 0.90	-\$20.00	+\$160.00	+\$260.00
0.91 – 1.00	-\$250.00	+\$50.00	+\$150.00
1.01 – 1.10	-\$490.00	-\$70.00	+\$50.00
1.11 – 1.20	-\$760.00	-\$190.00	-\$60.00
1.21 – 1.30	-\$1040.00	-\$320.00	-\$190.00
1.31 – 1.40	-\$1350.00	-\$450.00	-\$310.00
1.41 – 1.50	-\$1700.00	-\$590.00	-\$440.00
1.51 – 1.60	-\$2110.00	-\$740.00	-\$570.00
1.61 – 1.70	-\$2630.00	-\$900.00	-\$720.00
1.71 – 1.80	-\$3800.00	-\$1070.00	-\$870.00
1.81 – 1.90	-\$4690.00	-\$1260.00	-\$1040.00
1.91 – 2.00	-\$4700.00	-\$1480.00	-\$1220.00
2.01 – 2.10	-\$4700.00	-\$1720.00	-\$1430.00
2.11 – 2.20	-\$4700.00	-\$2040.00	-\$1670.00
2.21 – 2.30	-\$4700.00	-\$2750.00	-\$1980.00
2.31 – 2.40	-\$4700.00	-\$3290.00	-\$2670.00
2.41 – 2.50	-\$4700.00	-\$3300.00	-\$3190.00
2.51 – 3.00	-\$4700.00	-\$3300.00	-\$3200.00

**Table 261-12
Payment Adjustment 10 Metre Segments**

Roadway Classification	Localized Roughness IRI (mm/m) for 10 metre Segments	Payment Adjustment (for each occurrence)
Category A	> 1.10	-\$250.00
Category B	> 1.40	-\$250.00
Category C	> 1.50	-\$250.00

**Table 261-13
Bump And Dip Penalty Schedule**

Bump/Dip	Penalty
8.5 to 9.4 mm	\$ 100.00
9.5 to 10.4 mm	\$ 200.00
10.5 to 11.4 mm	\$ 400.00
11.5 to 12.4 mm	\$ 600.00
12.5 to 13.4 mm	\$ 800.00
13.5 to 14.4 mm	\$1000.00
14.5 to 15.4 mm	\$1200.00
15.5 to 16.4 mm	\$1400.00
16.5 to 17.4 mm	\$1600.00
17.5 to 18.4 mm	\$1800.00
≥ 18.5 mm	\$2000.00

**Table 261-14
Unit Price Adjustment for Air Voids (UPA_{AV})**

Mean of Deviations of Air Voids from Target Value Air Voids (4.00%)	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

261.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall include a separate Unit Price for each type of asphalt concrete, as identified under the Contract.
- .2 Compensation to the Contractor or the Owner for differences between the asphalt binder content as determined by QA ignition furnace results, and the assumed asphalt binder content specified in 261.2.2.1 for the total payable tonnage, shall be as follows:
 - .1 Payment to the Contractor shall be made for asphalt content in excess of the assumed asphalt binder content specified in 261.2.2.1 for the total payable tonnage, subject to the following limitations:
 - .1 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 B/HRB mix and 0.5 % for Type C/D mix.

- 261.6.2.1
- .2 If the actual asphalt binder content is less than the assumed asphalt binder content, the Contractor shall reimburse the Owner using the MTO's PG asphalt binder price index for the month preceding the month of the tender opening.
 - .3 If the actual asphalt binder content is higher than the assumed asphalt binder content, the Owner shall reimburse the Contractor at the actual invoiced amount supplied by the Contractor.
 - .4 Payments and credits shall be determined on a Lot by Lot basis.
 - .5 This determination is independent from and has no relationship to calculations for determining Unit Price adjustments as determined under 261.6.3.
 - .6 The asphalt binder content for each mix type will be calculated by averaging all the ignition furnace results obtained throughout the contract.
 - .1 For RAP mixes, the actual asphalt binder content in the RAP will be subtracted from the ignition furnace results obtained throughout the contract.
 - .2 For padding, the actual asphalt binder content will be calculated by averaging the ignition furnace results obtained under 261.4.3.7.1.5.
 - .3 No binder adjustment shall be required for material placed in driveways and aprons.
 - .3 Payment adjustment for change in the PG asphalt binder price shall be calculated in accordance with Item 821.
 - .4 In the case that the Contractor initiates an appeal under 261.4.5.10, the following shall apply:
 - .1 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.
 - .1 Payment to the Contractor shall be made for the sampling costs.
 - .2 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 Item 810, to the Contractor.
 - .3 When the binder content is appealed, an additional \$1,300 will be charged to cover the cost of calibrating the ignition furnace.
 - .5 If the Contractor carries out ~~improvements for smoothness including repairs to individual bumps and/or dips, the smoothness shall be retested~~ IRI Compulsory Work per 261.6.8 or carried out work to repair Surface Defects per 261.4.5.9, the smoothness shall be retested. .
 - .1 The Contractor shall be charged for the smoothness retesting in accordance with Item 810.
 - .6 For each occurrence that paving is not performed per 261.4.3.5.3 or 261.4.3.5.4, the Contractor shall pay the Owner a penalty of \$1000 for each Day after the 14th Day or 21st Day, respectively, until paving commences; and \$1000 for each Day that paving is not continuous (stopped on any Day for more than 40% of the Contractor's normal Work hours), until paving resumes.

- .7 For each surface defect as per 261.4.5.9, the Contractor shall pay the Owner a penalty of \$500.00 per defect.
- .8 Mandatory Penalty for IRI Category A
- .1 The Contractor shall be subjected to a mandatory penalty of -\$2500 for each 10 metre segment with an IRI > 3.00 mm/m, with exceptions of areas defined in 261.4.5.6.2.4.3.
- .2 The Owner reserves the right to require Compulsory Corrective Work on any of the sections with an IRI > 3.00 mm/m. In sections where Compulsory Corrective Work is required the Owner will waive the -\$2500 penalty.
- .13 The Owner shall notify the Contractor if Compulsory Corrective Work is required.
- .9 Compulsory Corrective Work Procedures
- .1 Corrective work shall consist of "removal and replacement" of the surface course of asphalt concrete. The minimum length of any repair area shall be 10 metres.
- .2 On each of the 10 metre segments affected, the Contractor shall remove (by cold milling) and replace the full width of the driving lane and the full depth of the surface course of asphalt concrete affected.
- .3 The asphalt concrete repair shall conform to 261.4.5.1~~4~~2.
- .10 Retesting Following Corrective Work
- .1 After corrective work has been completed, each of the 100 metre segments containing corrective work shall be retested, using the same profiler used in the original testing. The new IRI values shall be used and recalculated results shall be binding. Should the new IRI results indicate further Mandatory Penalty, the Contractor shall be subject to the Mandatory Penalty as stated in 261.6.8 and as per 261.6.11.1
- .11 Cost for Corrective Work
- .1 All costs associated with corrective work, including retesting, shall be the responsibility of the Contractor.

ITEM 262 – PARTIAL DEPTH RECYCLING

Item was replaced per previous Particular Specifications

ITEM 263 – FULL DEPTH RECYCLING

Item was replaced per previous Particular Specifications

ITEM 265 – CHIP SEAL

265.1 DESCRIPTION

- .1 This Item consists of the supply and placement of single chip seal and double seal.
- .2 Chip seal shall be identified by the following mix designations:
 - .1 Single chip seal – S.
 - .2 Double chip seal – D.
- .3 Single chip seal shall consist of a single application of bituminous binder followed by a single application of 9.5 or 12.5 mm cover aggregate.
- .4 Double seal shall consist of an application of bituminous binder followed by a single application of 16.0 mm or 19.0 mm cover aggregate, a second application of bituminous binder, and an application of ~~16.5 or~~ 12.5 or 16.0 mm cover aggregate, as indicated in the Contract Documents.
 - .1 Under certain conditions and at the discretion of the Engineer, the application of an approved penetration primer plus a single chip seal may be an acceptable substitute for a double seal.

**Table 265-1
Requirements for Emulsified Asphalt Binder**

Grade		HF-100S		HF-150S		HF-250S		HP200		HFMS-2		MS-2	
Requirements	ASTM Test Method	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
<u>Test on Emulsion</u> Asphalt Residue by Distillation, %	D244	62		62		62		65		62		65	
Oil Distillate % by Volume;	D244	0.5	4	0.5	4	1	6	N/A		0.5	3	-	10
Saybolt Viscosity Furol Seconds at 50°C	D244	50	150	50	150	50	150	100	250	50	300	100	400
Sieve Test % Retained 1000 µm Sieve	D244		0.10		0.10		0.10		0.10		0.10		0.10
Coating Test % Coated	D244	Note (+)80		Note (+)80		Note (+)80		Note (+)80		Note (+)80		Note (+)80	
Settlement in 1 day, %	D244		1.5		1.5		1.5		-		-		-
Settlement in 5 day, %			-		-		-		3		1		3

Demulsibility-50 ml of 0.1 N CaCl ₂ , %	D244	75		75		N/A	N/A	N/A	N/A	
Test on Residue Penetration at 25°C, 100g 5 s	D5	100-175		150-250		250-500		100-250	100-250	100-250
Viscosity at 60°C, Pa·s		<u>See Note (2)</u>		<u>See Note (2)</u>		<u>See Note (2)</u>		N/A	N/A	N/A
Float Test at 60°C, s	D139	1200		1200		1200		N/A	N/A	N/A
Solubility in Trichloroethylene, %	D2042	97.5		97.5		97.5		97.5	97.5	97.5
<p>NOTES: 1) Coating Test: ASTM Method D244 except that the mixture of limestone and emulsified asphalt shall be capable of being mixed vigorously for 5 minutes, to ensure that the stone is thoroughly and uniformly coated. The mixture shall then be completely immersed in tap water and the water poured off, after which the stone shall not be less than 90% coated.</p> <p>.1 Coating Test Result:</p> <p>Good: 90 % or more of the aggregate surface coated.</p> <p>Fair: 75 % to 90 % of the aggregate surface coated.</p> <p>Poor: 75 % or less of the aggregate surface coated not acceptable.</p> <p>2) Viscosity @ 60°C and Penetration @ 25°C shall fall within the area described in Table 265-1</p>										

265.4.1.9 ~~Traffic control shall be the Contractor's responsibility in accordance with Items 916, 917 and 919. The Contractor shall be responsible for the removal of all excess cover aggregate from the Work Site, for a period of 3 weeks, after completion of the Work.~~

265.4 .3 Preparation

- .1 Leveling with hot mix asphalt concrete and crack filling ahead of single chip seals shall be the responsibility of the Owner.
- .2 All other surface preparations shall be the responsibility of the Contractor, and shall include but not be limited to the following:

~~.1 The road shall be compacted and shaped with a grader to meet an acceptable crown and super elevation, and shall be compacted in accordance with 936, and shall commence 1 Day prior to chip sealing and continue on a daily basis until the entire granular surface has received the first application of a double chip seal, as directed by the Engineer;~~

.1 Any ruts or potholes which appear in advance of the chip seal placement shall be eliminated by scarifying, shaping and compacting.

265.4 .5 Guarantee

- .1 The Contractor shall guarantee the Work performed in accordance with GC 34 against factors that may include but may not be limited to the following:
 - .1 Poor workmanship and failing to practice proven chip seal procedures;
 - .2 Poor or incompatible materials, including incompatibility of the bituminous binder with the cover aggregate;
 - .3 Improper design of application rates; and
 - ~~.4 Inadequate traffic control.~~

265.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price.
- .2 Payment adjustment for a change in the PG asphalt binder price shall be calculated in accordance with Item 821.
- .3 For each occurrence that Work is not performed per 265.4.1.9, the Contractor shall pay the Owner a penalty of \$500 for each Day until the Work is completed, and \$500 for each Day that Work is not continuous (stopped on any Day for more than 40% of the Contractor's normal work hours), until the Work resumes.

ITEM 302 – CONCRETE IN STRUCTURES

302.2.2 .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 substance which would have a deleterious effect upon concrete.
- .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.
 - .1 Curing water shall have a minimum temperature of 10°C.

302.2 .3 Composition of Concrete Mix

302.2.3 .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 types A, B, C, and D shall be exposure Class C-XL and type E shall be F-1.
 - .1 Concrete for footings shall be exposure class C-1.
- .3 A calcium nitrite corrosion inhibitor shall be added to all concrete in the abutments above the elevation of the Bridge seat, bearing blocks, approach slabs overlaid directly with asphalt concrete (excluding approach slabs buried below grade), and to concrete in the Superstructure.

302.2.3.1.3

- .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.
 - .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.
 - .4 For C-XL and C-1 concrete, the range of air content shall be 6% to 9% regardless of the nominal size of the coarse aggregate used in the concrete mix.

302.3 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 Concrete Association (ACA), 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 the Professional Engineer, who reviewed the concrete mix, and shall include:
 - .1 Specified hardened properties and age of testing for strength, air, and permeability.
- .2 The Contractor shall submit, at least 14 Days prior to commencement of the Work, the proposed method and sequencing of the placing of the concrete for approval by the Engineer.
- .3 Other submittals are required for this Item and are contained within the sections applicable to the specific phase of the Work being undertaken.
- .43 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

302.4.2 .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~~ 2 hours of initial mixing 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~~ 2 hours.

302.4 .4 Placement

302.4.4 .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, including vibration.
 - .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 re-tightened 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 pending for 24 hours~~ in advance of placing concrete.
-

302.4.6 .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.
 - .3 If a key constructed by the Contractor is deemed deficient by the Engineer, the key shall be removed and an alternate key configuration proposed for the approval of the Engineer.
-

302.4.7 .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 producing and placing 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.

.3 Proper protection measures are in place to prevent drying and/or the concrete is to be placed at night.

302.4 .8 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, including but not limited to cold weather protection method, temperatures expected, duration of curing, number of field cured cylinders required and the desired testing schedule.
- .2 Concrete shall be protected against plastic or dry shrinkage cracking by strict adherence to ACI 302 and ACI 308 by methods such as placing concrete at night or erecting wind protection and the use of sun shades.
- .3 All exposed concrete surfaces, mortar and grout shall be continuously wet cured.
 - .1 The curing period for concrete shall be for a minimum of 7 Days from the completion of concrete placement, at a minimum ambient temperature of 10°C, and until 70% of the minimum specified compressive strength is attained (90% for concrete placed between November 1st and May 1st).
 - .1 Wet curing shall be carried out by means of ponding, continuous sprinkling, absorptive mat, or fabric kept continuously wet.
 - .2 Compressive strength test specimens, used for the purpose of determining when wet curing can cease, shall be cured entirely under field conditions.

302.4.9 .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, unless otherwise approved as part of a comprehensive temperature controlled plan for mass concrete elements.

302.4.9 .4 Enclosed Protective Housing

- .1 Protective housing shall be wind and weather tight, constructed of suitable materials on a substantial framework.
 - .1 Housing shall be of adequate size so proper placing and finishing procedures can proceed unhampered.
 - .2 Provisions shall be made for access, to carry out inspection of curing adequacy, by the Contractor and the Engineer.
-

302.4.9 .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~~ 15°C nor more than 40°C.
- .3 These conditions shall be maintained for a minimum of seven continuous Days and until the minimum specified compressive strength is obtained.
 - .1 Written permission shall be obtained from the Engineer prior to cessation of curing and protection.

302.4.9 .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 ~~4~~15°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 ~~4~~15°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.

302.4 .10 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, or when the sun, wind and humidity create moderate or severe drying conditions.

302.4.11. .3 Defects Bridge Deck

- .1 Immediately after cessation of curing, the Contractor shall uncover, clean and allow the entire deck surface to dry, to facilitate inspection by the Engineer. The Engineer will determine if the deck slab surface fulfils the requirements of the contract. If the deck slab surface is generally acceptable, the Engineer may require repairs to isolated local

defects which shall begin within 14 Days after placement of concrete. Repairs shall be in accordance with the following guidelines.

.1 Isolated local depressions/defects less than 5 mm deep shall be removed by grinding the adjacent area, provided the specified cover is maintained within tolerance.

.1 If removal of the depression/defect by means of grinding cannot be carried out while maintaining specified cover then the affected area shall be repaired per 302.4.11.3.2.

.2 Isolated local depressions/defects more than 5 mm deep shall be removed and replaced as follows:

.1 If the depression/defect has an area less than 0.03 m² then the perimeter of the affected area shall be saw-cut, chipped, and patched-cut to a depth of 19 mm, chipped to a depth of 25 mm, and patched with an Engineer approved repair material.

.2 If the depression/defect has an area greater than 0.03 m² then the affected concrete shall be removed and replaced per Item 372.4.2 as directed by Engineer in accordance with the provisions of Item 372.4 as a Partial Depth Removal and replaced with concrete of the same mix proportions as the parent deck concrete.

.3 Individual 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 All repairs are subject to the approval of the Engineer, and groupings or large numbers of defects will not be considered isolated.

302.4.11 .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.

.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 of the concrete, and replace with new concrete.

302.4.11 .5 High Quality Surface Finish

.1 Prior to finishing, and without defacing the surface, the Contractor shall pressure wash the surface to identify all air voids.

.2 The surface shall first be given an Ordinary Surface Finish as specified in 302.4.11.4.

302.4.11.5 .3 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.

- .4 The entire surface shall be finished to produce a ~~smooth dense surface of uniform colour without pits or irregularities~~ sack-rubbed finish as defined by CSA A23.1.

302.4 .12 Quality Testing

302.4.12 .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. The storage facilities shall be furnished with a temperature monitoring device capable of measuring the minimum and maximum temperature range within the unit over a 24 hour period. Storage of test specimens shall conform to the latest version of CSA A23.2-3C.
- .2 Suitable F facilities shall be provided by the Contractor, for the Engineer to inspect all ingredients and processes used in the manufacture and delivery of concrete, adjacent to the placing location.
- .3 Samples shall be obtained at final point of discharge unless otherwise specified by the Engineer.
- .4 The Contractor is responsible for supplying concrete which shall have, at the point of final discharge, the characteristics specified in the Contract Documents.

302.4.12 .2 Quality Control Testing

- .1 The Contractor shall carry out Quality Control sampling/testing during the concrete placement, including air, temperature, ~~and~~ slump and density testing.

- .1 Results of Quality Control tests shall be recorded and made available to the Engineer.

302.4.12.2.1 .2 Tests shall be conducted by personnel certified under ACI Concrete Field Testing Technician Grade 1, or CSA A283.

- .2 Test specimens shall be sampled in accordance with CSA A23.2-1C.
- .3 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.

302.4.12 .3 Quality Assurance Testing

- .1 The Owner shall carry out Quality Assurance testing on samples obtained, as per 302.4.12.1.3, by the Contractor.

- .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.

- .2 Density and Yield tests shall be made, as required by the Engineer, to meet the requirements of CSA A23.2-6C.

302.4.12 .4 Age of Compressive Strength Testing

- .1 The Contractor 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, 28 days, and 56 days, ~~and 91 days~~.
 - .1 The 56 day ~~or 91 day~~ strength test may be ~~removed~~omitted if the submitted age of test request is less.

302.4.12 .5 Frequency of Compressive Strength Testing

- .1 Frequency of compressive strength testing shall conform to the schedule indicated in Table 302-4 and per 302.4.12.4.
- .2 For each age of compressive strength test (7, 28, & ~~56 Days & 91 Days~~) two tests, as defined in 302.4.12.4.1, shall be required, unless otherwise indicated on the concrete mix submittal.
 - .1 A test, as defined in 302.4.12.8.1 to be broken at the specified age submitted with the mix design.

**Table 302-4
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
<p>NOTE: <u>1.</u> An additional test shall be taken for each additional 100 cubic metres of concrete placed. <u>2. Only one test will be performed for concrete placements consisting of one truck load.</u></p>	

302.4.12 .6 Hardened Air Void Testing Frequency

- .1 A minimum of two cylinders shall be taken for hardened air void testing from each placement and cured for a minimum of 7 Days.
 - .1 Concrete placements consisting of only one truck load of concrete will have only one cylinder tested.
- .2 The hardened air void testing shall be carried out by the Owner.
- .3 All tests must be performed as per ASTM C457. Regardless of water to cementing material ratios, the hardened air void system shall meet the following:

- .1 The average of all tests shall have a spacing factor not exceeding 0.230 mm, with no single test greater than 0.260 mm.
- .4 In the event the hardened air void system does not meet these requirements, production of concrete shall cease until it can be shown that these requirements can be met on a consistent basis.
 - .1 Subsequent testing to achieve a satisfactory hardened air void system shall be carried out by the Contractor at his own expense.
- .5 Concrete cast with a noncompliant hardened air void system shall be evaluated by the Engineer and may be subject to removal and replacement at the Contractor's own expense.

302.4.12 .7 Permeability Testing Frequency

- .1 A minimum of two cylinders shall be taken for permeability testing from each placement and shall be cured for 56 Days ~~per CSA A23.4. Testing shall be carried out in accordance with ASTM C1202. Concrete placements consisting of only one truck load of concrete will have only one cylinder tested.~~
 - .1 The cylinders shall be prepared for testing immediately after the 56 days of curing.
 - .1 Where sample preparation or testing falls on a weekend, testing shall be conducted at an age not to exceed 60 Days.
 - .1 The age of cure and the age at test date shall be reported.
 - .2 The permeability testing shall be carried out by the Owner.
 - .1 Results are to be provided to the Contractor within 3 Days of the test being completed.
 - .2 The average must fall within the pay range established in Table 302-6, with no single result greater than 200 Coulombs above the pay range.
- 302.4.12.7.2.2 .1 A single result greater than 200 Coulombs above the pay range will result in the payment being reduced to the next lower level.

- .3 ~~For concrete mix designs containing a calcium nitrite corrosion inhibitor the Contractor shall establish the relationship between concrete, of similar mix proportions, with and without the corrosion inhibitor using an approved testing plan. The difference between the results will be subtracted from tests containing corrosion inhibitor for calculation of payment adjustments. A value of 200 Coulombs shall be subtracted from test results for concrete containing calcium nitrite corrosion inhibitor calculation payment adjustment.~~
- .4 In the event that testing results in a reduction in payment, referee testing may be requested and conducted by the Contractor.
 - .1 A minimum of two cores shall be taken from the component in question and shall be tested within 7 Days of the original test date.
 - .2 If referee testing indicates the original test results are not representative then the referee testing will prevail.

302.4.12 .8 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.
 - .2 Concrete that does not meet specified strength shall be subject to Payment Adjustment per 302.5.7.
- .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 302-5.

302.4.12.8.4

- .2 If the noncompliant concrete is removed and replaced, the concrete incorporated into the placement shall be paid according to 302.6.5.
- .5 Additional tests of cylinders, cured entirely under field conditions, ~~may~~ shall be required to check the adequacy of curing, ~~or~~ cold weather protection or to facilitate the removal of formwork. The Contractor shall provide the quantity of test specimens to be cast and the schedule for testing to the Engineer prior to each concrete placement.
 - .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 ± 2°C for 24 ± 8h immediately before time of testing to ensure uniform moisture conditions from cylinder to cylinder.~~

302.5 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 "D" shall include the concrete calculated based on the actual beam camber profile.
- .3 On partial depth concrete removal and replacement under Item 372, the volume shall be the actual quantity of concrete placed.
- .4 For footing and working slab concrete where Overexcavation in solid rock occurs payment shall be handled as follows:
 - .1 For Overexcavation down to a maximum of 150 mm below the specified elevation of the bottom of the footing the computed volume of the footing concrete shall be determined from design plan footing dimensions presented in the Contract Documents and the average depth of the footing.
 - .2 For Overexcavation in excess of 150 mm below the specified elevation of the bottom of the footing, the width and length of the working slab concrete will be as shown on Standard Drawing 302-3, and the average depth of the working slab shall be determined from the bottom of the excavation up to the specified elevation of the bottom of the footing.
 - .1 Concrete required to provide a working slab under footings shall be paid at the Contractor's invoice price from the supplier.
- .5 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 302.4.5.1.2.
- .6 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 958.
- 302.5 .7 The Price Adjustment for Control of Strength shall be paid in accordance with Table 302-5 based on the Owner's Quality Assurance testing.

**Table 302-5
Price adjustment for Control of Strength**

For Concrete in Structures A, B , C and D				
Strength	50 MPa+	45-49 MPa	40-44 MPa	Less than 40MPa- To be reviewed by Engineer
Payment per cubic metre component	100%	-\$50	-\$100	Removal or -\$200 (per 302.4.12. 78 .4)

- 302.5 .8 The price adjustment for Resistance to Chloride Ion Penetration shall be paid in accordance with Table 302- 6.

.1 A bonus is not applied to footing concrete.

**Table 302-6
Price Adjustment for Resistance to Chloride Ion Penetration**

For Exposure Class C-XL in CSA A23.1					
Coulombs after corrosion inhibitor correction (ASTM C1202)	0-500	500-1000	1000-1500	1500-2000	> 2000
Payment per cubic metre for component (\$/m³)	\$25	\$0	-\$25	-\$50	-\$200

302.6 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 shall make partial payment in accordance with 908.7 for associated materials identified in 302.2.4.1.
- ~~.3 In the case that the Engineer initiates further testing in accordance with the requirements in 302.4.12.5 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 \$1,000.00 per occurrence, if proper wet curing is not carried out. For the purposes of this Item, an occurrence shall be when an inspection reveals that wet curing of concrete is not being carried out in accordance with 302.4.8.3.1.1. For failure to maintain wet curing on all concrete surfaces of a placement, in accordance with 302.8, the Contractor shall be subject to a penalty of \$1000 for the first occurrence, \$2000 for the second occurrence and \$5000 for each occurrence thereafter. If there are more than two occurrences on the same section of concrete, the concrete shall be removed and replaced at the Contractors expense.~~
 - .1 This shall apply to each placement which is still being cured. An occurrence shall be when an inspection reveals that the concrete surface is not visibly wet. If proper curing is not reinstated within 2 hours of notification to the Contractor, this shall be considered a separate occurrence.
- .5 Where noncompliant concrete is removed and replaced in accordance with 302.4.12.8.4.2, the concrete incorporated into the component shall be paid in accordance with Table 302-5.
- .6 Where concrete does not meet the requirements for strength or hardened air voids or is otherwise rejected, but is allowed to remain in place, there will be no positive payment adjustments for any of the properties.

ITEM 304 – REINFORCING STEEL

304.1 DESCRIPTION

- .1 This Item consists of supplying and placing of reinforcing steel.

304.2 MATERIALS

- .1 All material shall be supplied by the Contractor.
- ~~.2 Reinforcing steel shall be designated as follows:~~
 - ~~.1 Reinforcing Steel “A” for non-coated reinforcing steel.~~
 - ~~.2 Reinforcing Steel “SS” for Solid Stainless Steel Reinforcing Bars.~~
- ~~.3 All Reinforcing Steel “A” shall be new billet steel conforming to current CAN/CSA G30.18, “Carbon Steel Bars for Concrete Reinforcement”, Grade 400W, with the following additional requirements:~~
 - ~~.1 Reinforcing steel shall be in the form of deformed round bars unless otherwise noted in the Contract Documents.~~
 - ~~.4 All Reinforcing Steel “SS” shall be Solid Stainless Steel Reinforcing Bars conforming to the requirements of A955/A955M-07A and CSA-S6 “Deformed and Plain Stainless Steel Bars for Concrete Reinforcement” and shall be Type 316LN. The minimum yield strength shall be 400 MPa. The design of the reinforcing bars, including hooks, development lengths and bar splices shall be based on a yield strength of 400 MPa.~~
 - ~~.5 Reinforcing steel shall be in the form of deformed round bars unless otherwise noted in the Contract Documents.~~
 - ~~.6 Reinforcing steel shall be free of physical defects.~~
- ~~.74 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.~~
- ~~.84 Heating shall not be used as an aid in bending steel, unless specifically authorized by the Engineer.~~
 - ~~.2 Reinforcing steel shall be free of physical defects.~~
 - ~~.3 No field bending of reinforcing will be allowed unless authorized by the Engineer.~~
- ~~.95 Welding or splicing shorter bars as a substitute for supplying bars of the specified lengths shall not be permitted.~~
 - ~~.1 For stainless steel reinforcing, splicing of shorter bars as a substitute for supplying bars of the specified length will be considered for approval. The additional quantity required by this substitution will not be considered for payment.~~
- ~~.106 Bars are subject to rejection if their actual weight varies from their theoretical weight, as specified in CAN/CSA G30.18, Grade 400W, by more than 5%.~~

~~.117~~ All Structures are designed using Metric (SI) reinforcing steel bar sizes and the Contractor shall supply accordingly.

~~.128~~ Bar splice couplers shall be supplied in accordance with the Contract Plans.

~~.13~~ No field bending of reinforcing will be allowed unless authorized by the Engineer.

~~.14~~ Stainless steel reinforcing bars at the time the concrete is placed shall be free of mud, oil, or other contaminants that adversely affect bonding strength and deposits of iron and non-stainless steels, as well as other physical defects. If mill scale is present, it shall be removed by pickling or abrasive blasting.

~~.159~~ Tie wire used to tie stainless steel, ~~Fiber Reinforced Polymer (FRP) or other corrosion resistant~~ reinforcing bars to stainless steel reinforcing bars and to Type "A" reinforcing bars shall be Type 316LN or Type 316L stainless steel wire, 1.2 or 1.6 mm in diameter.

304.3 SUBMITTALS

.1 The Contractor shall submit the manufacturer's certification that the materials supplied meet the specified requirements, at least 14 Days in advance of the commencement of the Work.

.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 New Brunswick.

~~.3~~ Submittals are required in accordance with any cross-referenced Item forming part of this Item.

304.4 CONSTRUCTION

304.4 .1 General

~~.1~~ The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

~~.1~~ Stainless steel rebar shall be used in the barrier walls and top mat deck reinforcing as shown on the Plans.

.2 The Work shall be in accordance with CSA A23.1, and Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

.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.

~~.6~~ Stainless steel reinforcing bars shall be stored separately from reinforcing steel bars.

.7 Stainless steel reinforcing shall be protected from direct contact with chlorides prior to embedment in concrete.

.8 Nylon or polypropylene slings are to be used when lifting stainless steel reinforcing.

.9 When stainless steel reinforcing bars are to be lifted by machinery or mechanical equipment, the reinforcing bars must be protected such that no damage or scratching will occur to the reinforcing bars.

304.4 .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 can demonstrate to the Engineer that this shall hold all the bars securely in position.

.4 In deck slabs, the top bar on the top mat shall be tied securely to the stirrups of the precast prestressed concrete beam or the connectors on the steel beam.

.1 Spacing of the ties shall not exceed 900 mm centre along the entire length of the beams.

.5 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.

.6 Work on partially embedded reinforcing steel shall continue only when the previously placed concrete has attained a minimum compressive strength of 20 MPa.

.7 Prior to the deposition of concrete the positioning and securing of the reinforcing steel shall be inspected and approved by the Engineer.

304.4 .3 Support of Reinforcement

304.4.3 .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 or stainless steel.

.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 chairs for supporting stainless steel reinforcing bars shall be non-metallic. Concrete chairs shall not be used to support stainless steel reinforcing bars.

.5 Bar supports shall be nonconductive and have a geometry and bond characteristics that deter the movement of moisture from the surface to the reinforcement.

~~.65~~ Bar supports in contact with the soil shall have a base area of less than 10,000 mm².

304.4.3 .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 304.4.3.1, Bar Supports.

.1 Wheel spacers shall be used when prefabricated cages are inserted into formwork.

ITEM 311 – STEEL H PILES

311.1 DESCRIPTION

- .1 This Item consists of the installation of steel H piles and the supply and installation of cap plates and pile points.
 - .2 This Item includes the supply and installation of 800 mm diameter by 3000 mm long corrugated galvanized steel pipe, the EPS Type 4 insulation board, the uniformly graded aggregate, and the excavation and any required measures to install the corrugated pipe, when shown on the Plans.
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ITEM 321 – STEEL SHEET PILE COFFERDAMS

321.1 DESCRIPTION

- .1 This Item consists of the design, supply, ~~and~~ construction and removal of all steel sheet pile cofferdam(s) required in the Contract.
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321.5 MEASUREMENT FOR PAYMENT

- .1 The design, supply, ~~and~~ construction and removal of all steel sheet pile cofferdam(s) in accordance with this Item shall be on a lump sum basis.

ITEM 335 – STEEL SUPERSTRUCTURE

335.2 .2 Structural Steel

.1 All structural steel with the exception of secondary members comprised of rolled shapes shall meet the requirements of CAN/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 demonstrates adequate toughness.

.1 This material shall possess a minimum Charpy V Notch impact energy of 27 Joules when tested at minus 30°C, on a per plate basis, as evidenced by rolling mill certificates.

335.4.6.1.9 The company undertaking field-welding shall be certified to Division 1 or 2 of CAN/CSA W47.1.

ITEM 344 – FINGER JOINT ASSEMBLIES

344.4 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 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.
- .3 All welding shall conform to the requirements of CAN/CSA W59.
- .4 Cover plates are to be anchored on the approaching traffic side of the joint.
- .5 The steel trough shall be sealed to the finger joint assembly to construct a durable watertight joint.
- .6 Steel finger joint assemblies shall be fabricated in one piece in the fabricating shop, unless otherwise specified.
 - .1 All expansion joint assemblies field welded shall be ground flush.
 - .2 Portions of inorganic zinc coating, damaged by field welding, shall be mechanically cleaned and recoated in the field.
 - .3 Inorganic zinc shall have all curing solution and residue removed by water and bristle brush, prior to installation of assemblies.
 - .4 Stud anchors on steel expansion joint assemblies shall conform to the requirements of CAN/CSA W59.
- .7 Steel finger joint assemblies shall be fabricated to the dimensions indicated in the Contract Documents and are subject to the tolerances indicated in Table 344-1.
 - .1 After fabrication and before application of coatings, finger joint assemblies shall be test fitted to verify operation.
 - .1 Test fitting shall be carried out in the presence of the Engineer with the joint compressed to a maximum gap of 25 mm, from end of fingers to root of opening, across the entire joint.
 - .1 Joints not meeting this tolerance shall be reworked until acceptable.

ITEM 346 – GUIDE RAIL SYSTEM – STRUCTURES

346.4 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, as approved by the Engineer.
 - .1 The grout shall provide a smooth bearing surface under the full base plate area and shall form a waterproof seal.
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ITEM 351 – WATERPROOFING

341.4 .9 Prior to placement of asphalt concrete, the Contractor shall survey the entire waterproofed surface using the chain drag method to identify any unbonded areas.

.1 Unbonded areas be repaired according to the Manufacturers recommendations and to the satisfaction of the Engineer prior to proceeding.

ITEM 404 – PRECAST CATCH BASIN

404.4.8.1 ~~Holes shall not be more than 25 mm greater in diameter than the outside diameter of the connecting pipe.~~ Holes shall not be more than 50 mm greater in diameter than the outside diameter of the connecting pipe for connecting pipe diameters less than 900 mm, and shall not be more than 100 mm greater in diameter than the outside diameter of the connecting pipe for connecting pipe diameters equal to or greater than 900 mm.

ITEM 510 – GUIDE POSTS

510.2 MATERIALS

- .1 All material shall be supplied by the Contractor.
- .2 Guide posts shall be of the maple, birch or beech species of hardwood.
- .3 The posts shall be sound and rot-free, and shall meet or exceed the requirements for No. 1 Structural Posts and Timbers, graded in accordance with the National Lumber Grading Authority (NLGA) Standard Grading Rules for Canadian Lumber.
- .4 Preparation, handling and treatment of posts shall be in accordance with CAN/CSA-080 and the American Wood Preservers' Association (AWPA) standards.
- .5 Prior to pressure treating, posts shall be incised on all four sides and dried to their fibre saturation point of 25 to 30% at 25 mm depth.

.1 Guide posts may be pre-cut and drilled prior to pressure treating.

ITEM 512 – GUIDE RAIL

512.1 DESCRIPTION

- .1 This Item consists of the supply and installation of steel beam guide rail.

512.2 MATERIALS

- ~~.1 Delineators shall be available from the Owner from stock at DTI, Fredericton, NB. All material shall be supplied by the Contractor.~~
- .2 If specified for use on the Contract, salvaged/straightened rail shall be made available by the Owner under Item 513 from DTI, Fredericton, NB.
 - .1 The Contractor shall be responsible to transport the salvaged rail to the Work Site.
- ~~.3 The Contractor shall supply all other materials. Guide rail delineators shall be 50 mm x 50 mm x 3 mm 6061-T6 aluminum angle stock cut to 50 mm lengths.~~
 - ~~.1 Delineators shall have a centered 19 mm slot cut in one leg from the outer edge a total of 19 mm inward. The slot shall end with a 9 mm radius.~~
 - ~~.2 The material shall be degreased and etched to ensure adhesion of reflective materials.~~
 - ~~.3 The solid leg of each delineator must have both the outside edge and both faces completely covered with 3M high-intensity silver sheeting No. 3870 or yellow sheeting No. 3871.~~
- .4 Reflective materials shall conform to CGSB 62-GP-11 and a written warranty covering the field performance of the product shall be submitted.
- .4 Guide rail shall be Class A, Type II, W-section steel beams conforming to AASHTO M180.
 - .1 Each section of guide rail, in accordance with AASHTO M180, requires markings as follows:
 - Name or brand of manufacturer;
 - Identification symbols or code for heat;
 - Number and coating lot;
 - AASHTO Spec #; and
 - Class and Type.
- ~~.5 Guide rail end marker posts shall be W-shaped thermoplastic extrusion comprised of a double-curve profile, a minimum of 95 mm wide with 4 mm walls and shall be 1.5 m long.~~
 - ~~.1 Approach guide rail marker shall be a red post with a 75 mm x 150 mm red reflector. Termination guide rail marker shall be a green post with a 75 mm x 150 mm green reflector.~~
 - ~~.1 Retro-reflective sheeting shall be ASTM Type IV or higher grade, factory applied by the manufacturer.~~
 - ~~.2 Guide rail end marker posts shall be capable of sustaining a minimum of ten direct wheel-over impacts at 100 km/hr, without damage to the post or the reflective sheeting applied to the post.~~

.3 Lag screws to attach end markers to guide posts shall be 8 mm x 50 mm galvanized and shall include an 8 mm galvanized flat washer.

512.3 SUBMITTALS

- .1 The Contractor shall submit, upon request, prior to incorporating the material in the Work, the product name and manufacturer's specifications for the guide rail.
- .2 The Contractor shall submit, upon request, in advance of the commencement of the Work, the manufacturer's certification, for all galvanized metals, that the materials supplied meet the specified requirements as detailed on the Contract Documents.

512.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 Guide rail shall be installed in accordance with Standard Drawings 510-1, 510-2, 510-3, 512-1, 512-2, ~~and 512-3~~, 512-4, 512-5 and 512-6.
 - .1 If Energy-Absorbing Guide Rail Terminal (EAGRT) systems are specified in the Contract Documents, the flared buried end treatments shown in Standard Drawings 510-2, 510-3, ~~and 512-2~~ and 512-3 shall be replaced with EAGRT systems installed in accordance with Item 515.
- .3 Guide rail sections shall be installed to produce a smooth continuous rail, paralleling the line and grade of the finished Highway surface.
- .4 Salvaged guide rail shall not be intermixed or alternated with new guide rail in the same installation.
 - .1 The Contractor shall allow for a two week turn around for straightened rail.

512.4 .5 Guide rail sections shall be lapped in direction of the traffic.

- .1 Each section of salvaged rail shall be installed such that the end that had been overlapped before dismantling is overlapped upon reinstallation.
- .2 Additional 63 mm x 19 mm slots required in the guide rail shall meet the requirements of AASHTO M180.
- .6 Cut surfaces of all wood products shall be treated with an approved preservative, as detailed in the manufacturer's application instructions.
- .7 Offset blocks and delineators shall be installed on the guide rail as specified and indicated on Standard Drawing 510-1.
 - .1 The colour of the delineator shall be consistent with the colour of the adjacent Pavement line marking.

.8 Guide rail sections with a typical buried-end treatment, the red approach guide rail marker shall be installed 200 mm onto the second guide post from the end using two lag screws spaced 100 mm apart.

.1 Guide rail sections with an energy-absorbing guide rail treatment (EAGRT) shall have approach end markers per Item 515.

.9 The green termination guide rail marker shall be installed 200 mm onto the second last guide rail post using two galvanized lag screws spaced 100 mm apart.

512.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of guide rail supplied and installed in accordance with this Item.

.1 The Quantity shall be calculated by multiplying the total number of guide rail pieces in the Work by 3.81 m.

512.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

ITEM 515 – ENERGY-ABSORBING GUIDE RAIL TERMINAL

515.1 DESCRIPTION

- .1 This Item consists of the supply and installation of an Energy-Absorbing Guide Rail Terminal (EAGRT).

515.2 MATERIALS

- .1 All material shall be supplied by the Contractor.
- .2 EAGRTs shall meet the requirements of National Cooperative Highway Research Program (NCHRP) Report 350 Test Level 3 or Test Level 3 standards of the AASHTO Manual for Assessing Safety Hardware (MASH), for the finished installed height specified.
- .3 EAGRTs shall be the straight/flared type and shall be installed to a finished height of 685/785 mm at the top of rail.
- .4 Only proprietary EAGRTs will be acceptable, including those made by the following:
 - .1 Energy Absorption Systems Inc., Chicago, Illinois.
 - .2 Road System Inc., Big Spring, Texas.
 - .3 Trinity Industries Inc., Dallas, Texas.
 - .4 Lindsay Corporation, Omaha, Nebraska.
- .5 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.
- .6 Backfill material shall be the material excavated from the Roadbed for the installation of the EAGRT, or the material otherwise specified by the manufacturer.
- .7 End marker posts shall be W-shaped thermoplastic extrusion comprised of a double-curve profile, a minimum of 95 mm wide with 4 mm walls and shall be 1.5m long.
 - .1 Markers shall be a red post with two 75 mm x 150 mm red reflectors spaced 75 mm apart.
 - .1 Retro-reflective sheeting shall be ASTM Type IV or higher grade, factory applied by the manufacturer.
 - .2 Guide rail end marker posts shall be capable of sustaining a minimum of ten direct wheel-over impacts at 100 km/hr, without damage to the post or the reflective sheeting applied to the post.
 - .3 Bolts to attach end marker to a steel post shall be 8 mm x 38 mm galvanized and shall include 8 mm galvanized nuts and washers.
 - .4 Lag screws to attach end markers to wooden post shall be 8 mm x 50 mm galvanized and shall include an 8 mm galvanized flat washer.

515.3 SUBMITTALS

- .1 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 clearly showing in detail the components and installation of the EAGRT.
- .2 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.
- .3 Submittals shall be made as required for any cross-referenced Item forming part of this Item.

515.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 Work shall be carried out as indicated in the Shop Drawings.
- .3 Grading for flared EAGRT's shall be carried out to the dimensions as indicated on Standard Drawing 515-1.
- ~~.4~~ 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 procedures are established.

515.4 ~~.5~~ The impact head of each EAGRT shall be cleaned thoroughly as recommended by the manufacturer of the reflective sheeting hazard marker.

~~.6~~ Hazard markers shall be secured squarely to the impact head.

.7 On a straight or flared EAGRT, a red end marker shall be installed 200 mm onto the first steel post using two bolts, nuts and washers spaced 100 mm apart.

.1 On a flared EAGRT, an additional red marker shall be installed 200 mm onto the first guide post following the flared section of the EAGRT using two lag screws spaced 100 mm apart.

~~.8~~ Backfilling of posts and other underground units of the EAGRT shall be completed in accordance with 510.4.

~~.9~~ Installation of any EAGRT shall be performed concurrently with the completion of the guide rail installation to which it will be attached.

515.5 MEASUREMENT FOR PAYMENT

- .1 The Quantity to be measured for payment will be the number of EAGRTs installed in accordance with this Item.

515.6 BASIS OF PAYMENT

- .1 Payment for Work under this Item shall be at the Unit Price.

ITEM 571 – PAVEMENT MARKINGS

571.1 DESCRIPTION

- .1 This Item consists of supply and application of yellow and white paint materials for traffic markings on roadway Pavement.
 - .1 Either oil-based or waterborne paint may be used in the Work.
 - .2 Only traffic markings coatings containing 150 g/L of volatile organic compound (VOC) or less will be allowed for use between May 1 and October 15.

571.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.

571.2 .2 Traffic Paint

571.2.2 .1 Oil-Based Traffic Paint

- .1 The paint shall meet CGSB Specification 1.206-M, but with paragraphs of that specification modified as shown in Table 571-1.

**Table 571-1
Modifications to CGSB 1.206-M-89**

Para.	Modifications for this Item									
3.3	"... and shall meet the requirements for consistency (para. 4.1) and no-pick-up time (para. 4.2):									
4.1	Minimum changed from 80 to 85									
4.2	Maximum changed from 6 to 8									
4.3	Maximum changed from 60 to 90									
4.7	Minimum changed from 34 to 37									
4.10	Pigment composition (minimums in kg/L): <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Pigment Description</th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Yellow</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>White</u></th> </tr> </thead> <tbody> <tr> <td>Silicon dioxide (as SiO₂)</td> <td style="text-align: center;">0.20</td> <td style="text-align: center;">0.20</td> </tr> <tr> <td>Titanium dioxide</td> <td style="text-align: center;">0.075</td> <td style="text-align: center;">0.15</td> </tr> </tbody> </table>	Pigment Description	<u>Yellow</u>	<u>White</u>	Silicon dioxide (as SiO ₂)	0.20	0.20	Titanium dioxide	0.075	0.15
Pigment Description	<u>Yellow</u>	<u>White</u>								
Silicon dioxide (as SiO ₂)	0.20	0.20								
Titanium dioxide	0.075	0.15								
4.14	Change ASTM E97 to ASTM E1347. Add: yellow not less than 60%									
4.15	<u>The colour of the paint shall conform to: White: standard number 37925 of the standard U.S. FED-STD 595 B Yellow: standard number 33507 of the standard U.S. FED-STD 595 B Paint colours to match samples provided by DTI</u>									
6.2.1	Change 60 seconds to 90 seconds									
6.2.2	Add: SiO ₂ shall be determined using classical gravimetric method on insoluble portion of paint									
NOTE: Lead Content (if present) not to exceed 600 mg/kg										

571.2.2 .2 Waterborne Traffic Paint

- .1 The paint shall be a homogeneous water-based mixture of particles well ground to a uniform smooth consistency, free of skin, dirt and other foreign matter, capable of being sprayed evenly and smoothly at its intended temperature and covering solidly when applied to the Pavement.
- .2 The paint shall be supplied ready-mixed for use without adding water.
- .3 Handling and storage qualities shall provide an acceptable degree of settling, uniformity, consistency, and absence of skinning and thixotropic properties. The paint shall be capable of being sufficiently atomized to produce a uniformly applied paint stripe without side splatter and overspray within the limitations of conventional striping equipment.
- .4 The paint materials shall be of a quality and consistency such that the paint's colour will not change in service to impair the visibility of the markings. The paint film shall be flat in finish. White and yellow markings shall be visible in Daylight and under artificial light after the addition of overlay glass beads.
- ~~.5 The colour of the paint shall conform to the colour of white and yellow paint chips supplied by the Owner upon request.~~
- ~~.56~~ The chemical composition shall be determined by the paint manufacturer but shall comply with the requirements of Table 571-2.
- ~~.67~~ The physical properties shall comply with Table 571-3.

**Table 571-2
Chemical Properties of Waterborne Traffic Paint**

Property	Min	Max	Test Method
Pigment Content (% by mass) ¹	56	62	ASTM D3723
Volatile matter (% by mass)		24	ASTM D2369
Non-Volatile Vehicle (% by mass)	16.75		CGSB 1-GP-71, Method 19.1
Coalescing Agent (2,2,4-trimethyl – 1,3 pentanediol monoisobutyrate) (% by mass of solid polymer)	10		
Type of Binder	Rohm & Haas Rhoplex Fastrack 3427 Emulsion, Dow Chemical DT-250NA Emulsion, or Engineer-approved equivalent		
White Paint			
Titanium Dioxide (g/L) ²	150		
Yellow Paint			
Titanium Dioxide (g/L) ²	150		
NOTES: 1) To be 20% talc that meets ASTM D605 with a photovolt green filter reflectance of 90% minimum			
2) Titanium Dioxide pigment shall meet ASTM D476 type II			
3) Lead Content (if present) not to exceed 600 mg/kg			
4) Volatile Organic Compound (VOC) Max 150			

**Table 571-3
Physical Properties of Waterborne Traffic Paint**

Property	Min	Max	Test Method
No-Pickup Time, minutes		18	ASTM D711
Non-tracking Time, seconds ¹		860	ASTM D711
Volatile Organic Compound (VOC) Content excluding water, g/L		150	ASTM D3960
Freeze-Thaw Resistance	Pass		ASTM D2243
Viscosity, Krebs Unit (KU) @ 25 °C	8580	95400	ASTM D562
Viscosity Change (KU) after heat-shear Stability Test @ 25 °C		10	Caltrans 8010-61G-30
Skinning Properties	Nil	Nil	CGSB 1-GP-71, Method 10.1
Coarse Particles (% by mass): 250 µm 150 µm	Nil	Nil 0.01	ASTM D185 & D2205
Settling Rate (Up to 6 months)	8.0 6.0		ASTM D869 ASTM D1309
Bleeding	4		ASTM D868 & D969
Hiding Power (m ² /L)	8.4 4.0		Pfund cryptometer w/#3.5 wedge CGSB 1-GP-71 Method 14.2
Reflectance (colour difference)% Yellow White	50 80	60	ASTM E1347
NOTE: Non-tracking time for Regular Water Based striping paint based on 375 µm (15 mils) wet film thickness applied on dry pavement having temperature > 10 °C, under humidity conditions ≥ 80%.			

571.4 .3 Timing of the Work

- .1 Pavement markings shall be applied within the following time frames after completion of paving under the Contract:
 - .1 No sooner than 7 Days (to allow the new asphalt concrete to cure), and for white edge lines no sooner than completion of Item 204; and
 - .2 No later than 14 Days for arterial highways and 21 Days for other classes of highway.
 - .3 For each occurrence that Pavement markings are not applied per 571.4.3.1.2, the Contractor shall pay the Owner a penalty of \$1000 for each Day after the 14th Day or 21st Day, respectively, until application of Pavement markings is complete.

ITEM 576 – CONSTRUCTION TRAFFIC CONTROL

576.2 .2 Traffic Control Signs

- .1 Sign sizes, letters, symbols and colours shall conform to requirements outlined in the ~~Owner's Sign Catalogue and/or~~ Work Traffic Control Manual (WATCM), or to custom details shown in the Contract Documents or as approved by the Engineer.

~~.1 The Owner's Sign Catalogue can be purchased from the Owner's Sign Shop, telephone 506-453-3939.~~

- .2 ~~A guide for sign letter sizes based upon posted speed and location is available from the Owner's Sign Shop upon request.~~ Sign letter and symbol sizes are based upon posted speed limit and location per the TAC Manual of Uniform Traffic Control Devices for Canada (MUTCDC) Sign Pattern Manual using Modified-E font.

- .3 Letters and borders shall be constructed of black non-reflective vinyl sheeting or black screen-processing ink.
- .4 Sign substrates shall be either aluminium alloy or plywood that provides a smooth surface for the sign sheeting.
- .5 Sign sheeting shall be securely adhered to the sign substrate so that the finish is smooth and the sign message or symbol is legible to motorists.

576.2 .3 Temporary Pavement Markings

576.2.3 .1 Pavement Marking Tape

- .1 Marking tape shall be composed of high quality polymeric materials, pigments and glass beads, and shall be manufactured in rolls 10.2 cm wide with pressure sensitive adhesive backing.
- .2 Marking tape shall ensure reflectivity for at least 6 months, and shall have minimum retroreflectivity requirements as follows, when measured per ASTM E1710 using a 30 m viewing distance:
 - Entrance angle of 88.76° (yellow and white tape)
 - Observation angle of 1.05° (yellow and white tape)
 - Retroreflected Luminance of 200 and 250 millicandelas for yellow and white tape, respectively.

- 576.2.3.1 .3 Minimum skid resistance of tape shall be 45 BPN per ASTM E 303.

576.2.3 .2 Pavement Marking Paint

- .1 When pavement is treated by cold milling, microsurfacing, Partial Depth Recycling, or Full Depth Recycling, traffic paint and associated reflectorization material shall ensure retroreflectivity of temporary traffic markings as follows:
 - Yellow Paint 200 mcd/m²/lx
 - White Paint 250 mcd/m²/lx

576.2 .4 Lighting Devices

- .1 Lighting devices include Flashing Arrow Boards (FAB's), Flashing Beacons and Temporary Traffic Control Signals, and shall conform to the requirements outlined in the WATCM.
- .2 All lighting devices must conform to manufacturers specifications and be approved for use on New Brunswick roadways.
- .3 The Contractor is responsible to provide temporary power to the lighting devices.
- .1 Lighting devices may be hard wired, solar or battery powered.
- .4 The Contractor shall indicated the type of lighting devices in conjunction with the Traffic Control Plan(s) at the first job meeting for review by the Engineer.

576.3 SUBMITTALS

- .1 Within 7 Days of the commencement of Work the Contractor shall submit a declaration stating that all retro-reflective materials to be used on the Contract shall meet the requirements of this Item.
- .2 Submittals are required in accordance with any cross-referenced Items forming part of this Item.

576.4 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 all Work associated with TCDs, TCPs and all related Equipment on the Contract, in accordance with the requirements of the WATCM for the various types of Work and conditions at the Work Site.

576.4 .3 Traffic Control Plans

- .1 The Contractor shall determine, from Section 1.3 of the WATCM, the typical layouts that apply to the type(s) of Work under the Contract the appropriate site specific traffic control requirements for the type and sequence of Work under the Contract, taking into consideration all points identified in Section 1.3 of the WATCM..
- .2 Any of the Contractor's signing plans that are different from the WATCM typical layouts shall be stamped by a Professional Engineer.
- .3 The Contractor shall present the Traffic Control Plan(s) at the first Job Meeting for review and acceptance by the Engineer.

ITEM 613 – TOPSOIL

613.1 DESCRIPTION

- .1 This Item consists of the placement of topsoil, either available on site or including the supply from an off site source, and/or the supply and application of a soil amendment.

613.2 MATERIALS

- .1 Topsoil shall be material salvaged and stockpiled under Item 106 and 107.
 - .1 If additional material is required beyond that available on the Work Site, the Contractor shall obtain that material from outside the Work Site.
- .2 Topsoil composition shall consist of 20 to 70% sand and contain 2 to 10% organic matter by weight.
- .3 Topsoil shall be free of debris and stones larger than 75 mm in greatest dimension and large clods, roots and any other coarse vegetative material, of a size equal to or greater than the thickness of the layer of topsoil to be placed.
 - .1 In areas of lawn restoration, topsoil shall be free of debris and stones larger than 25 mm in greatest dimension.

.4 All soil amendment materials shall be supplied by the Contractor.

- .1 Accepted soil amendment products are shown in Table 613-1. Alternatives must be approved by the Engineer.

Table 613-1
Soil Amendment Products

<u>Manufacturer</u>	<u>Product</u>
<u>ECB Verdyol</u>	<u>Biotic Earth (Black)</u>
<u>Profile Products LLC</u>	<u>ProGanics Biotic Soil Media</u>

- .2 Soil stabilizing tackifier shall be supplied by the Contractor in accordance with the manufacturers recommendations.

613.3 SUBMITTALS

- .1 The Contractor shall notify the Engineer of the source(s) of topsoil to be obtained from outside the Work Site, at least 7 Days prior to importing material from off site.
- .2 The Contractor shall submit the manufacturer's recommended procedures for application of soil amendment, at least 7 Days in advance of the commencement of the Work.

613.4 CONSTRUCTION

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Areas to be topsoiled shall be scarified or otherwise loosened to a depth of at least 50 mm within 1 Day preceding the placement of topsoil.

.3 Soil amendment shall be applied in the locations identified in the Contract Documents.

.1 Areas requiring soil amendment will not require topsoil.

.2 Application rate shall be a minimum of 5600 kg/ha.

.3 Soil amendment shall be applied in accordance with the manufacturers recommendations.

~~.43~~ Topsoil and soil amendment placement in the Work Area shall be completed prior to the placement of any Roadbed materials above Subgrade, unless otherwise approved by the Engineer.

~~.54~~ Topsoil shall be spread on the prepared area(s) to a depth of 100 mm ± 25 mm and shall be brought to a true and even surface meeting the required grade.

.1 Hand placement and raking shall be required in areas adjacent to finished lawns or in areas of restricted access.

.2 In areas of lawn restoration, topsoil shall be rolled using a lawn roller or approved equivalent.

.3 Topsoil shall be placed on Foreslopes from Subgrade shoulder down in cuts and fills, including the slopes of the layer of Borrow A/A1- quality material as identified in the Contract Documents; and on Backslopes or as directed by the Engineer.

613.4 ~~.65~~ Placing of topsoil and soil amendment shall not be carried out on frozen materials or when materials are wetted to such a degree that balling and clumping results.

~~.76~~ Topsoil and soil amendment shall not be placed after the end of the week in which September 30th occurs without prior approval of the Engineer.

~~.87~~ Topsoil that is contained within the Work Site that can be or has been salvaged shall be used prior to importing topsoil.

.1 The Contractor shall incorporate imported topsoil into the Work only after receiving written authorization from the Engineer.

~~.98~~ If excess topsoil material exists after completion of the Work, this material shall remain the property of the Owner.

613.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of topsoil and/or soil amendment placed in accordance with this Item.

.2 The area shall be measured along the slope of the ground.

613.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for topsoil and soil amendment, as identified under the Contract~~be at the Unit Price.~~

ITEM 615 – FERTILIZING

615.1 DESCRIPTION

- .1 This Item consists of supplying and applying fertilizer.

615.2 MATERIALS

- .1 All materials shall be supplied by the Contractor.
 - .2 Fertilizer shall have a composition of 20-10-10 (N-P-K) with 50% of the nitrogen being derived from sulphur-coated urea and/or polymer-coated urea.
-

ITEM 621 – TEMPORARY WATER CONTROL WORKS

641.4.4 The Contractor is responsible for control and/or removal of any water entering the Work Area due to infiltration. Methods to remove infiltrated water may include the construction of sumps and pumping.

.1 If pumping is used as the method of temporary water control through the Work Area, the Contractor shall supply and maintain, ready on site, a second pumping system capable of accommodating the flow capacity of the TWCW.

.1 The second pumping system shall include, but not limited to, pumps and backup power supply.

ITEM 907 – SUBCONTRACTORS

907.1 DESCRIPTION

- .1 The Contractor may apply to have portions of the Contract carried out by an approved subcontractor(s).
- .2 The Contractor shall apply in writing to the Engineer with the name of the company to be considered for approval as a subcontractor for the Work.
 - .1 This submission shall also include a description of the Item(s), estimated Quantities and approximate value of the Work (the approximate Quantity multiplied by the Unit Price for the Item(s)) to be subcontracted.
- .3 The Engineer may approve the subcontractor, by response in writing, to the Contractor prior to the commencement of the Work proposed under 907.1.2.
- .4 The Contractor shall ensure that the approved subcontractor is entirely familiar with the Contract Documents and has a copy of the Contract Documents.
- .5 The approval for use of any subcontractor shall be exclusive to the Contract under which the application is made.
- .6 The Superintendent shall be on-site at all times when the subcontractor is working on the Contract.

ITEM 921 – CONSTRUCTION ROADS

921.1 HAUL ROADS

- .1 Haul roads are off-Highway access to material sources required for Highway construction.
- .2 Haul roads shall be constructed in a location as approved by the Engineer, and in a manner to provide safe and reasonable access for the Engineer.
- .3 Construction, dust control and maintenance of all haul road(s) shall be the Contractor's responsibility except:
 - .1 Construction of haul roads on lands controlled by the Owner, and as indicated in the Contract Documents or as directed by the Engineer, ~~shall form part of the Work.~~

921.2 WORK AREA ACCESS ROADS

- .1 The Contractor shall be responsible for procuring access to and from the Work Site, and for getting permission from landowners to build access roads or to use existing woods roads or trails on private property.
 - .1 Vehicles and Equipment used during construction activities shall utilize only approved roadways and access areas.
- .2 Access roads shall be constructed in a location as approved by the Engineer, and in a manner to provide safe and reasonable access for the Engineer.
- .3 Construction, dust control, ~~and~~ maintenance, removal and reinstatement of the access road shall be the Contractor's responsibility.
 - .1 The Contractor shall submit a maintenance plan for the access roads on the Contract for approval by the Engineer 5 Days prior to construction of the access roads. The Contractor shall implement the access road maintenance plan for review and acceptance by the Engineer.
 - .4 ~~Construction of access roads may be directed by the Engineer and if so, construction shall be paid for by the Owner.~~

921.3 ENVIRONMENTAL PROTECTION

- .1 The Contractor shall ensure that the use of any existing private or public access roads does not cause sedimentation of any watercourses that cross such roads.
- .2 On any new access roads constructed by or for the Contractor, natural water flows shall not be impeded, ditches shall not drain directly into watercourses, and erosion shall be controlled.
- .3 A vegetated buffer zone shall be maintained between an access road and any watercourse, to the extent possible.
- .4 The cost of supply and application of hydroseeding and/or mulching for the access roads within 30 metres of the shoulders of the watercourse shall be paid for under Item 614 and 616 respectively, otherwise it shall be the Contractor's responsibility.

- .5 The cost, installation, maintenance and removal of all sediment control fencing required for any access roads within 30 metres of the shoulder of the watercourse shall be paid for under Item 602, otherwise it shall be the Contractor's responsibility.

921.4 ACCESS TO PUBLIC ROADS

- .1 The Contractor shall make every effort to avoid tracking mud, snow, and debris onto public roads. Any such materials that are tracked onto a public road shall be scraped or swept off no later than sunset each Day, and during the Day if so needed, to the satisfaction of the Engineer.

ITEM 922 – PITS AND QUARRIES

922.1 DESCRIPTION

- .1 Notwithstanding the Ownership of the property the Contractor shall operate all pit and quarry sources in such a manner that the Work places are maintained in a neat and safe condition at all times during the period of the Contract and in accordance with the laws of municipalities, the Province of New Brunswick and the Government of Canada.
- .2 The Contractor shall be responsible to ensure he/she has obtained all permits, leases and other regulatory requirements pursuant to the laws of municipalities, the Province of New Brunswick and the Government of Canada for the operation of the Work, and copies of the relevant documents shall be provided to the Engineer before commencing the Work.

.1 Any new pit or quarry, or the expansion of an existing pit of quarry shall be developed and operated in accordance with all applicable federal and provincial guidelines, policies, acts and regulations, including (where applicable on Crown Lands) the Crown Lands Use Policy for Pits and Quarries and the Quarriable Substances Act.

ITEM 931 – SCALES AND WEIGHING PROCEDURES

931.7 SCALE HOUSE

.1 The Contractor shall provide a scale house meeting the following minimum requirements:

- .1 A minimum work area of 2.5 m by 1.8 m with a minimum height clearance of 2.1 m, containing a functional desk and chair.
 - .2 Heating or cooling to provide a room temperature between 20°C and 25°C, with adequate ventilation~~A minimum room temperature of 20 °C, and adequate ventilation.~~
-
-

ITEM 936 – COMPACTION

936.1 DESCRIPTION

- .1 This Item details the general requirements to be carried out with respect to compaction of soil, aggregate and RAP construction materials, by the Contractor.

936.2 SOIL and AGGREGATE

- .1 All Roadbed materials shall be placed in lifts of a loose thickness not greater than that specified in the Item under which the material is excavated or supplied, and compacted to at least the specified percentage of maximum dry density uniformly throughout the lift.
 - .1 Frozen materials shall not be incorporated into the Roadbed, and Roadbed materials shall not be placed on a frozen Roadbed surface without prior approval of the Engineer.
- .2 For most soils, and for Aggregate Base and Shoulder Material, the maximum dry density will be determined by ASTM D698.
 - .1 If the sample used in carrying out ASTM D698 has greater than 5% but less than 30% of oversize particles (retained on the 19 mm sieve), the maximum dry density will be the corrected value determined as per ASTM D4718.
 - .2 If the material being placed in the Work has a percentage of oversize particles more than 5% higher or lower than the percentage in the sample of 936.2.2.1, the maximum dry density will be the value calculated using the actual field percentage of oversize, as per ASTM D4718.
 - .3 For coarse granular materials and Aggregate Subbase the maximum dry density will be determined as per ASTM D4253.
- .3 For Aggregate Base/Subbase and soil, the Contractor shall take all necessary measures to ensure that the moisture content is such that compaction is achieved in accordance with 936.2.1 and the following:
 - .1 For Aggregate Base/Subbase, the moisture content shall be such that compaction is achieved without adversely breaking down or segregating the aggregate (such that its gradation falls outside the specified grading limits, as determined by sieve analyses on random samples of the compacted in-place material).
 - .1 The average moisture content of Aggregate Base/Subbase shall not be less than 3% or greater than the optimum moisture content at time of compaction.

ITEM 947 – DISPOSAL AREAS

947.2 LICENCE OF OCCUPATION

- .1 For waste disposal areas on Crown Land the Contractor shall apply to the NB Department of ~~Natural Resources (DNR)~~ Energy and Resource Development (DERD) for a Licence of Occupation.
 - .2 The licence will be issued for all Crown Land adjacent to the Work Site. DNR district staff shall be responsible for approving the locations of individual waste disposal sites on the Crown Land.
 - .3 Inquiries should be made to the Crown Lands Branch at (506) 453-3826.
-

ITEM 948 – ENVIRONMENTAL REQUIREMENTS

948.3.1.14 Earthwork shall be carried out in accordance with Item 946. Erosion control measures shall be as detailed in the Contract Documents and if additional measures are required in addition to those indicated, the Engineer or the Contractor's on-site environmental representative shall order ~~and approve~~ such Work under the appropriate Items.

ITEM 953 – AUDITED SAFETY PROGRAM

953.1 DESCRIPTION

- .1 This Item outlines the Contractor's responsibilities with respect to an audited safety program for Work performed on this Contract.

953.2 DETAILS

- .1 The Bidder shall submit, as part of their tender, a Certificate of Recognition (COR) issued under the Certificate of Recognition Program by the New Brunswick Construction Safety Association (NBCSA), or a Safety Certified Certificate issued under the Safety Certified Program by Safety Services New Brunswick, or approved alternative.
 - .1 Tenders without certification at tender opening will be rejected.
- .2 The Contractor shall maintain a valid COR, as evidenced by a Letter of Good Standing or a "Letter of Good Standing – In Process" certified by NBCSA. Alternatively, the Contractor may provide the following:
 - .1 Evidence of COR status from other member associations of the Canadian Federation of Construction Safety Associations using the NBCSA Reciprocal Process; or
 - .2 Evidence of an audited safety program certified by an independent agency, which will be evaluated by the Engineer using the NBCSA Safety Audit Instrument. Acceptance of an audited safety program will be at the discretion of the Engineer.
 - .1 Alternate audited safety program shall be submitted 7 Days prior to the tender closing date.
 - .2 Bidders are responsible to obtain approval for their alternate audited safety program prior to placing their bid.
- .3 The Contractor shall maintain a valid COR until final completion of all Work under the Contract.

ITEM 956 – CONSTRUCTION DRAWINGS AND CALCULATIONS

956.3..5 Any damaged or deteriorated components will not be permitted for use and shall be immediately removed from site when identified by the Engineer.

956.5 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.

.2 All elements or components shall be in like new condition or certified by the Manufacturer to perform as designed.

ITEM 957 – FALSEWORK

957.1.7 .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 will 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 the girders.

.11 Pre-manufactured bridge overhang brackets shall be used for the construction of the deck overhang.

.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.

.12 Plywood, for constructing deck slab soffits, may be placed with the grain of the outer plies parallel to the joists provided it is clearly noted on the drawing and reflected in the design calculations.

.1 Plywood must be continuous over 3 joists.

ITEM 958 – FORMWORK

958.1 GENERAL

- .1 The Contractor shall be responsible for all formwork design and construction and shall ~~carry out the Work~~ provide submittals in accordance with Item 956.
- .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 co-ordinating 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 (with the exception of formwork lateral pressure) shall be in conformance with CSA S269.13 and as specified herein.
 - .1 Formwork lateral pressure shall be calculated in accordance with the formulas in ACI 347R-14 Clause 4.2.2.

958.2 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.
- .4 Plywood must be continuous over 3 joists or studs.
- .7 Forms for concrete columns, capbeams 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 free of rust, pitting, holes or other defects.

958.3 FORM TIES AND BRACING

- .1 Internal form ties shall be proprietary and designed to provide a specified cover ~~metal and of a type approved by the Engineer.~~
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ITEM 961 – PARTNERING

961.1 DESCRIPTION

- .1 The concept of Partnering is to develop a proactive effort and spirit of respect, trust and cooperation among all key players in a Contractual relationship. It utilizes a structured systematic methodology for developing a spirit of teamwork and cooperation through shared goals, open communication, problem identification and resolution, conflict escalation procedures and the monitoring of team performance.

961.2 PARTNERING

- .1 The Owner encourages partnership with the Contractor and its principal subcontractors and suppliers.
 - .1 The Owner anticipates considerable mutual benefit can be achieved on the Contract through Partnering and strongly recommends entering into a voluntary agreement.
 - .2 This partnership shall be structured to draw on the strengths of each organization to identify and achieve reciprocal goals.
 - .3 The objectives are effective and efficient Contract performance and completion of the Contract within budget, on schedule, and in accordance with Plans and Specifications.
 - .4 This partnership shall be bilateral in makeup, and participation shall be totally voluntary.
 - .5 A representative of the Contractor and a representative of the Owner shall initiate a partnering development seminar/team building workshop which should be held before Work commences on the Contract. These representatives shall make arrangements to determine attendees at the workshop and the agenda, duration and location.
 - .1 Persons required to be in attendance should include, but are not limited to: key NB-DTI District personnel, the Contract design Engineer(s) and the Contractor's on-site project manager and supervisor(s) as well as key subcontractors.
 - .2 Where appropriate, representatives of major suppliers, Department of Environment and Local Government (DELG), Worksafe NB, Department of Energy and Resource Development (DERD)~~Natural Resources (DNR)~~, Canada Department of Fisheries and Oceans (DFO), utilities and municipal governments shall also be invited to attend.
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